Plan Choice in the ACA Exchanges: Evidence from Covered California*

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Abstract

I analyze three aspects of plan choice in Covered California, the state-based Affordable Care Act (ACA) Exchange of California: partial year coverage, inefficient choices, and plan switching. With respect to partial year coverage, I do not find evidence that supports the common perception that special enrollment enrollees abuse the opportunity to obtain partial year coverage by signing up, getting treated, and then immediately dropping coverage. My analysis of inefficient choices shows enrollees are likely making mistakes in plan choice by selecting plans that are dominated from the perspective of out-of-pocket spending. As for plan switching, I find the switching rate on Covered California to be close to 15 percent. My estimates from a mixed logit consumer choice model imply household plan switching costs range from $1,000 to $5,000, depending on the age and income of households.

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1 Introduction

The Patient Protection and Affordable Care Act (ACA) of 2010 significantly reformed health insurance in the United States. Among the changes brought about by the ACA was the creation of state-based health insurance markets known as the Exchanges (or Marketplaces). The Exchanges were created to provide affordable health insurance for Americans not receiving coverage from their employers or public programs such as Medicare (elderly) or Medicaid (low-income). Along with the ACA's Medicaid expansion, the Exchanges helped reduce the percentage of Americans without health insurance from 16 percent in 2010 to 9 percent by 2015 (Ward et al. 2016). But despite their contribution to reducing the uninsured rate, the Exchanges have been plagued by rising premiums and an exodus of insurers, which has given many analysts concern about their long-term stability (Tracer 2017).

This paper uses 2014-2016 individual level Exchange enrollment data from Covered California, the state-based ACA Exchange of California, to comment on three aspects of Exchange plan choice: (1) partial year coverage, (2) inefficient choices, and (3) plan switching.

It is easy to see how partial year coverage could become a problem for an Exchange. If individuals sign up for coverage, get treated, and then immediately drop coverage, insurers would undoubtedly become hesitant to continue participating in the Exchange. The potential for partial year coverage to become a problem was exacerbated by the rules that dictate when individuals can sign up for Exchange coverage. The Exchanges' set aside a few months at the end of each year (commonly referred to as "open enrollment") when individuals interested in obtaining health insurance for the upcoming year can sign up. Outside these few months, individuals are only allowed to sign up for Exchange coverage if they experience a "life event" (e.g. loss of employer-sponsored health insurance, getting married, having a baby) that qualifies them to enroll at a time outside of open enrollment.[1]

[1] https://www.healthcare.gov/glossary/special-enrollment-period/

One of the primary motivations for allowing this "special enrollment" was to avoid the situation where people became uninsured mid-year and then had to go uninsured until they either found a job that provided health insurance or the next open enrollment arrived.

While the reason for allowing special enrollment was admirable, insurers have contended that the rules determining eligibility were too lax and resulted in individuals gaming the system by waiting until they became sick before signing up for coverage. The Blue Cross Blue Shield Association (BCBSA) stated that their Exchange customers who signed up through special enrollment in coverage year 2014 used 55 percent more services than their open enrollment counterparts (Pear 2016). Aetna claimed that 25 percent of its 2014 HealthCare.gov enrollees came through special enrollment and that this group generated more medical claims than open enrollment enrollees while staying enrolled for less than four months on average less than half the time of open enrollment enrollees (Pear 2016). Similarly, UnitedHealth Group claimed 20 percent of its Exchange enrollments came outside open enrollment in 2014 and that this group was 20 percent more expensive than open enrollment enrollees (Pear 2016).

Given the data privacy of the aforementioned insurers, these claims have gone unverified. Additionally, data from the Centers of Medicare & Medicaid Services (CMS) counter the numbers quoted by the insurers. In 2015, CMS placed the percentage of Exchange enrollees who enroll during the special enrollment period at close to 10 percent, which differs from the 25 percent figure Aetna gave as their share of enrollees who came through the special enrollment.

This paper makes two contributions to the special enrollment debate. First, it compares the observable characteristics of the open enrollment enrollees to special enrollment enrollees. Without medical claims data, a definitive statement about whether one population is sicker than the other is impossible. However, the results are clear that the special enrollment population in California is younger and higher income than the open

enrollment population. Enrollees under 30 make up 25 percent of the open enrollment population and 33 percent of the special enrollment population. Enrollees above 400 percent of the federal poverty level (FPL), the income bracket that does not receive subsidies under the ACA, make up 10 percent of the open enrollment population and 18 percent of special enrollment population. As health is generally negatively associated with age and positively associated with income, these results run opposite the claims made by some insurers of a sicker population enrolling through special enrollment.

This paper's second contribution to the debate addresses the length of time special enrollment enrollees stay enrolled. It is almost true by definition that special enrollment enrollees will be enrolled for a shorter period of time than open enrollment enrollees. If someone signs up through special enrollment in September, the longest this person can be credited with maintaining Exchange coverage for the year is four months. An enrollee that signed up during open enrollment, which has always ended on or before March 31, would have at least nine months to potentially be enrolled. This paper analyzes not just how long special enrollees stay enrolled, but also what percentage of time they stay enrolled of the maximum time they could have been enrolled.[2] The results show open enrollment enrollees stay enrolled for an average of 286 days a year, while special enrollment enrollees stay enrolled for an average of 142 days a year. As for percentage of time enrolled, open enrollment enrollees stay enrolled for 90 percent of the maximum time they could be enrolled, while special enrollment enrollees stay enrolled for 93 percent of the maximum time they could be enrolled. Going by the percent of time enrolled, it does not appear special enrollment enrollees are less likely to maintain coverage to the end of each coverage year than open enrollment enrollees.

The second aspect of plan choice that this paper addresses is inefficient plan choice. Exchange plans fall into four broad coverage tiers (average percentage of medical expenditures covered): bronze (60 percent), silver (70 percent), gold (80 percent), and platinum

[2]For instance, if a special enrollment enrollee signed up for coverage on August 1, the maximum amount of time he could enrolled for the coverage year is five months (August 1-December 31).

(90 percent).[3] In most Exchanges, while plans offered in a tier are required to meet the actuarial values listed in the parentheses, insurers may vary their benefit designs. Covered California is one of the few Exchanges that does not allow benefit designs to vary within coverage tiers. Each year, Covered California officials create a standard benefit design for each of the four main coverage tiers.

The interest of this paper in terms of inefficient choice are the choices of households between 138 percent and 250 percent of the federal poverty level (FPL) the income group that is eligible for cost-sharing reductions on silver plans.[4] The cost-sharing reductions are significant. For households between 138 and 150 percent FPL, the actuarial value of silver plans jumps from 70 percent to 94 percent because of the cost-sharing reductions. This jump in the actuarial value of the silver plan makes gold and platinum plans strictly dominated by silver plans, as gold and platinum plans have lower actuarial values and higher premiums than the cost-sharing reduced silver plan.[5] While only 2 percent of the individuals in the 138 to 150 percent FPL range choose gold and platinum plans, this amounts to over 8,000 plan selections from 2014-2016.

Also of note on this subject is the amount of bronze plan selections by the 138 to 150 percent FPL group. Bronze plans are not strictly dominated by the cost-reduced silver plans because bronze plans still have lower premiums than silver plans. If an individual were to use little to no medical services during the year, a bronze plan would be a better choice than the cost-sharing reduced silver plan. However, if an individual receives services that add up to more than $700, the bronze plan becomes dominated by the

[3]There is also a minimum coverage tier which is often referred to as the catastrophic tier. Plans in this tier are only available to people under age of 30 or those who qualify for a hardship exemption. See https://www.healthcare.gov/choose-a-plan/plans-categories/ for details.

[4]Technically, incomes between 100 and 250 FPL are eligible for cost-sharing reductions. Ive excluded individuals between 100 and 138 FPL from my analysis is because this group is eligible from Medicaid in California as a result of California taking up the ACA option of expanding Medicaid. The plan choice problem for this group differs significantly from the rest of my sample because of the Medicaid option. Hence, they've been excluded from my analysis.

[5]Insurers in Covered California are required to offer plans on every coverage tier if they enter the exchange. So, an individual would have every insurer available to it at the silver level that it would have available at the gold or platinum level.

cost-reduced silver plan. Additionally, the out-of-pocket maximum for the cost-reduced silver plan is $2,250 from versus $6,500, which would make the silver plan look even more favorable if any sort of risk aversion were accounted for. The number of bronze plan selections from the 138 to 150 percent FPL group was over 42,000 from 2014-2016, which accounts for 9 percent of the total selections made by this group. Notably, 138 to 150 percent FPL enrollees that sign up through a certified insurance agent select bronze 7 percent of the time versus the 11 percent of the time 138 to 150 percent FPL enrollees sign up for bronze when they sign up unassisted.

The third aspect of plan choice that this paper analyzes is how often enrollees switch plans from year-to-year. The premium tax credits offered through the Exchanges are tied to the premium of the second-lowest-cost silver (hereafter, benchmark) plan in the "rating area" in which an enrollee resides.[6] As such, as premiums rise so do subsidies. Jaffe and Shepard (2017) do a nice of job of showing how price-linked subsidies weaken price competition and lead to higher markups and subsidy costs for the government. Given that price-linked subsidies weaken price competition (relative to a system with "fixed" subsidies which are independent of market prices), consumers being vigilant about switching away from high-cost/low-quality plans becomes particularly important for robust price competition. If consumers do not show a willingness to switch plans either because selecting a health insurance plan is a painstaking process or subsidies shield them from premiums to such an extent that they see no reason to switch then the prospect of strong price competition in the Exchanges diminishes significantly.

Only 14 percent of enrollees switch plans from year-to-year on Covered California. The estimates from a mixed logit discrete choice model imply a switching cost of between

[6]The ACA required each state to set a number of geographic rating areas that all insurers in the state would use as part of their rate setting. Premiums under the ACA can only vary by geographic rating area, age, smoking status, and household size. Thus, individuals that are identical on the latter three dimensions, and who live in the same rating area, must be offered the same premium. States generally chose rating areas to be a collection of one or more counties. There are 499 rating areas across the United States. See https://www.cms.gov/cciio/programs-and-initiatives/health-insurance-market-reforms/state-gra.html for the number of rating areas in each state.

$1,000 and $5,000, depending on the age and income of enrollees. Additionally, the estimates suggest that all age and income groups are roughly 500 percent more likely to choose a plan that is their "default" plan. Both of these estimates are broadly consistent with other findings in the health insurance plan switching literature.

This paper contributes to three sets of literature. First, it adds another market to the growing list of papers that have shown evidence of health insurance switching costs. Handel (2013) provides convincing evidence of switching costs in the context of employer-sponsored health insurance. Switching costs in Medicare Part D have been particularly well researched as Abaluck and Gruber (2016), Polyakova (2016), Ho, Hogan, and Morton (2015), Yeo and Miller (2015), and Ericson (2014) all provide evidence of the existence and impact of switching costs in Medicare Part D. Ketcham et al. (2012) is a notable paper that argues that inertia is not a key concern in Medicare Part D.

Second, this paper adds to the literature on plan choice in the Exchanges. Much of this literature uses data from the Massachusetts Health Connector (hereafter, Connector), Massachusetts' pre-ACA health insurance exchange which served as a model for the ACA Exchanges. Ericson and Starc (2016) analyze the impact of the Connector's policy change of standardizing insurer cost-sharing parameters and the impact this had on plan choice. The authors find that post-change, consumers chose more generous plans and different brands, but were not more price-sensitive. Ericson and Starc (2015), also using data from the Connector, find substantial heterogeneity in preference by consumer type, with younger consumers twice as price sensitive as older consumers. Because of this difference in price sensitivity, older consumers face higher market markups over costs.

Third, this paper contributes to the literature that specifically analyzes plan choice on Covered California. Gabel et al. (2017) shows that Covered California enrollees overwhelming select the plans with the lowest premiums within each coverage tier. A takeaway from this result is that reports of changes to the average offered premium price overstate the premium changes that enrollees actually face, as very few enrollees select

the higher premium plans within each tier.

Tebaldi (2017) uses the same individual level data from Covered California that I do, but for 2014 only the first year of the Exchange. Using this data, he performs a rigorous analysis of consumer demand and cost to study how different subsidy schemes affect insurers' incentives. He finds that younger households are significantly more price sensitive and cheaper to cover. His counterfactual simulations show that tailoring subsidies to age leads to equilibria where all buyers are better off and per-person public spending is lower.

The rest of the paper proceeds as follows. Section 2 provides an institutional background of the ACA Exchanges. Section 3 discusses the role adverse selection, one of the major impediments to efficient health insurance markets, plays in the Exchanges. Section 4 briefly outlines the switching costs theory that motivates one of the econometric models that is estimated in the plan switching section of the paper. Section 5 describes the data used to conduct the analysis in the paper while Section 6 provides descriptive evidence of partial year coverage, inefficient plan choice, and plan switching. Section 7 describes the econometric models used for analysis while Section 8 presents the estimates from these models. In Section 9, several alternative model specifications are estimated to access the robustness of the estimates of the baseline consumer choice model used in the paper. Section 10 discusses the policy implications of the results and Section 11 concludes.

2 Institutional Background: ACA Exchanges

Health insurance in the United States can be categorized broadly into three sectors: employer-sponsored insurance, public insurance (i.e. Medicare and Medicaid), and individual private insurance.[7] Employer-sponsored insurance and public insurance are perceived to

[7]The individual private insurance market consists of Exchange and off-Exchange enrollment. Off-Exchange is purchased directly from insurers. Individuals who purchase insurance through the off-Exchange individual market are not eligible for government subsidies.

work well in terms of coverage. Employer-sponsored insurance and Medicare take-up rates are particularly high at over 85 percent and 95 percent, respectively (Blavin et al. 2016, Baicker, Congdon, and Mullainathan 2012). Estimates for Medicaid vary, but generally put take-up at around 60 percent with significant variation across states (Sommers et al. 2012). On the other hand, the private individual market has been historically problematic (Gruber 2014). Exchange participation among eligible enrollees was estimated to be only 35 percent after the Exchanges' second year of open enrollment (Buettgens, Kenney, and Pan 2015).[8] Additionally, while employer-sponsored insurance premiums increased by 9 percent from 2013 to 2016 (Kaiser Family Foundation 2016b), average Exchange premiums were 105 percent higher for the 39 states using Healthcare.gov in 2017 than average individual market premiums of these states in 2013 (Office of the Assistant Secretary for Planning and Evaluation 2017).

The ACA required that each state create its own Exchange. Each Exchange would have its own website where residents without employer-sponsored insurance, Medicare, or Medicaid coverage could go to obtain health insurance. While the old individual insurance market (where individuals dealt directly with insurance companies) would continue to coexist alongside the Exchanges, only individual insurance purchased through the Exchanges would be eligible for advanced premium tax credits or cost-sharing reductions. If a state decided it did not wish to create an Exchange of its own, its residents would be directed to HealthCare.gov, the Exchange website operated by the federal government. Only 12 states (one of which is California) currently run their Exchanges completely independent of the federal government (Kaiser Family Foundation 2017b).

As of mid-March 2017, 10.3 million Americans had effectuated their Exchange coverage for 2017, meaning they selected a plan that started in January or February and had paid their first month's premium (Centers for Medicare and Medicaid Services 2017). Of these 10.3 million enrollees, 84 percent receive advanced premium tax credits and 57 per-

[8]Estimates of the off-Exchange individual market range from 5 to 9 million. https://aspe.hhs.gov/system/files/pdf/208306/OffMarketplaceSubsidyeligible.pdf

cent receive cost-sharing reductions from the federal government to make coverage more affordable. Households with incomes between 100 percent and 400 percent FPL are eligible for advanced premium tax credits.[9] These credits limit the amount a household is expected to pay for the second-lowest-cost silver plan (hereafter, benchmark plan) in the rating area in which it resides. The credit decreases with income: households at 100 percent FPL are expected to pay 2 percent of their annual income toward the premium while households at 400 percent FPL are expected to pay 9.5 percent (see Table A1 in the appendix).[10]

Cost-sharing reductions are available for households between 100 and 250 percent FPL. The Exchanges' four main coverage tiers are bronze, silver, gold, and platinum. A bronze plan pays 60 percent of an enrollee's medical expenses, on average. Silver, gold, and platinum plans are structured to pay 70 percent, 80 percent, and 90 percent, respectively, of an enrollee's medical expenses.

Early evidence from the Exchanges shows that premiums seems to be particularly important to enrollees. Of the four major coverage tiers offered through the Exchange, 90 percent of enrollees chose bronze and silver plans the lower two coverage tiers (Kaiser Family Foundation 2016a). Moreover, within a particular tier, the carrier offering the lowest premium tends to receive the lion's share of the tier's enrollment (Avery et al. 2015, Gabel et al. 2017).

[9]Households under 100 percent FPL are not eligible for advanced premium tax credits under the ACA. The Supreme Courts' decision to make Medicaid expansion optional created the possibility that households under 100 percent FPL in non-expansion states could be both ineligible for Medicaid and ineligible for Exchange subsidies. This situation is commonly referred to as the Medicaid coverage gap (see Garfield and Damico (2016) for details).

[10]As an example of how the tax credit works, consider an individual living in San Francisco where the benchmark plan in 2016 cost an unsubsidized 40-year-old $4,656 in annual premiums. A 40-year-old at 200 percent FPL would be responsible $1,473 of that premium (0.0634*$23,240), which implies a premium subsidy of $3,183 ($4,656-$1,473). Premium subsidies can be applied to the plan premiums of any coverage tier except the catastrophic tier.

2.1 Covered California

As of June 2017, Covered California covers 1.4 million people and accounts for 14 percent of the nation's Exchange enrollment (Centers for Medicare and Medicaid Services 2017).[11] Covered California is unique for being one of the 12 state-based Exchanges and also for being one of the four selective contractor states (Dash et al. 2013). The selector contractor model differs from the more commonly used clearinghouse model.[12] Under the clearinghouse model, all plans meeting minimum criteria are allowed to participate on the Exchange. Selective contractor states negotiate with insurers prior to allowing them to participate on the Exchange. Additionally, they often manage plan choices through limits on the number and types of plans that insurers can offer.

Covered California used its selective contracting power to implement a standardized benefit design for each coverage tier and to negotiate premiums and provider networks with insurers.[13] Covered California's active role of negotiating with insurers has been advanced as a possible reason for why the Exchange has had more success than many of the other Exchanges around the country (Scheffler et al. 2016).

Covered California plans are currently sold across 19 rating areas by 11 insurers (see Figure A1 in the appendix for a map of the rating areas).[14] The largest rating area by enrollment is Rating Area 16 (which is made up of a collection of Los Angeles County zip codes) at just over 200,000 enrollees. Rating Area 13 is the smallest rating area at just over 12,000 enrollees. Five insurers account for 94 percent of Covered California enrollment: Kaiser Permanente (28 percent), Blue Shield of California (26 percent), Anthem Blue Cross of California (18 percent), Health Net (11 percent), and Molina Healthcare (11 percent).[15]

[11] This makes California the second largest Exchange in the country. Florida is the largest at just over 1.4 million covered lives.

[12] All states that use HealthCare.gov use the clearinghouse model.

[13] See Table A2 in the appendix for the standard benefit designs Covered California used in 2016.

[14] As of March 2017.

[15] These enrollment figures were taken from Covered Californias March 2017 Profile which is available at http://hbex.coveredca.com/data-research/.

3 Adverse Selection

Adverse selection in health insurance markets has shown the potential to be a major impediment to efficient health insurance markets (e.g. Frech and Smith 2015, Handel 2013, Lo Sasso and Lurie 2009, Thomasson 2004, Cutler and Reber 1998, Frech 1996, pp. 139-140). Adverse selection in health insurance markets occurs when less healthy people choose more generous plans. In the classic case, adverse selection occurs because of asymmetric information; consumers are better informed about their risk of future claims than insurers (Pauly 1974, Rothschild and Stiglitz 1976). Adverse selection can occur both when consumers initially enroll (unhealthier consumers sign up) and at renewal (unhealthier consumers are more likely to renew).

In the extreme, adverse selection can lead to a "death spiral" (Cutler and Reber 1998, Sutton, Feldman, and Dowd 2004, Frech and Smith 2015). A death spiral starts with a plan raising premiums and its healthier members dropping out as a result. The plan subsequently experiences a higher loss rate due to its now unhealthier population, so it raises premiums to compensate, which starts the cycle all over again. Eventually, only very unhealthy remain with the plan charging very high premiums, or the plan incurs such large losses that it "dies."

Absent asymmetric information, adverse selection and death spirals can occur as a result of policy if insurers cannot fully differentiate rates to reflect known risk. Under the ACA, insurers are required to offer the same premium to consumers of the same age regardless of differing levels of risk. Additionally, the ACA limited insurers to a 3:1 premium ratio across different age groups, which is a significant age rating compression of the 4.5:1 ratio observed in the market prior to the ACA (O'Connor 2013, p. 19). The result of this compression is a large increase in premiums for young people, estimated at over 50 percent for males aged 25 to 36 (O'Connor 2013, p. 20). This creates adverse selection on age, even though age is observable by insurers.

The ACA includes both carrots (subsidies) and sticks (coverage mandates/penalties)

to incentive individuals to obtain Exchange coverage (Layton, Montz, and Shepard 2017). Einav and Finkelstein (2011) show that both subsidies and mandates/penalties can mitigate adverse selection. Three years into the Exchanges, however, it appears that the subsidies might not be generous enough and the mandates/penalties might not be strong enough to fully counter adverse selection. Subsidies are only available to households with incomes below 400 percent FPL, which creates the possibility that healthy middle- to high-income refuse to buy coverage at Exchange prices prices that reflect higher demand for insurance among the sick. As for the mandate stick, 8.1 million households chose to pay the penalty for not purchasing insurance in 2015, with an average penalty paid of $210, suggesting that the current health insurance mandate is fairly weak (Layton, Montz, and Shepard 2017, p. 35).

Subsidies and mandates are mechanisms to reduce adverse selection *into* the individual market.[16] The Exchanges are also subject to adverse selection *within* the individual market (Frech and Smith 2015, Layton, Montz, and Shepard 2017). It is perhaps surprising, given all the attention the Exchanges receive in the media, that 38 percent of individuals with individual market coverage are enrolled in an off-Exchange plan (Layton, Montz, and Shepard 2017, p. 32). Individuals purchasing off-Exchange plans are not eligible for subsidies.

"Grandfathered" and "grandmothered" plans, two types of individual market plans available only on the off-Exchange market, are likely more appealing to healthy consumers than unhealthy consumers making it probable that these plans create adverse selection against Exchange plans. A grandfathered plan is a plan that existed prior to the enactment of the ACA (March 23, 2010), has not changed coverage terms, and has continuously covered at least one person. These plans are exempt from all ACA market changes, including the condition that insurers cannot offer different premiums to individ-

[16]Subsidies are only available if households select Exchange plans, so subsidies only reduce adverse selection into the Exchange portion of the individual market. The individual mandate should reduce adverse selection for both the Exchange and off-Exchange portions of the individual market.

uals of different health statuses. Differing premiums by health status results in lower premiums for healthy individuals, making these plans relatively more attractive to healthy individuals than unhealthy individuals.

Grandmothered plans are plans that were originally meant to exist for the time between the enactment of the ACA and the opening of the Exchanges on January 1, 2014. All plans created during this four-year window were supposed to be closed on January 1, 2014. In late 2013, the Obama administration gave states the option to allow these plans to continue through 2017, or to discontinue them on January 1, 2014, as was originally intended. Grandmothered plans are subject to some ACA rules (e.g. prohibition on annual and lifetime coverage limits), but do not have to comply with the rating and benefit rules put in place in 2014. The absence of these rating rules makes grandmothered plans more appealing to healthier individuals, which like grandfathered plans, creates adverse selection against the Exchanges.

Early evidence supports the hypothesis of selection against Exchange plans. In 2014, Mathews and Weaver (2014) reported the overall percent of enrollees who used health care and had serious health conditions was 27 percent in Exchange plans as opposed to 12 percent and 16 percent in grandfathered and grandmothered plans, respectively.

Layton, Montz, and Shepard (2017) point out that even without grandfathered and grandmothered plans, there is the potential for the off-Exchange market to receive more favorable selection than the Exchange market. The entire individual market makes up a single risk pool. However, if low-income individuals eligible for subsidies are higher cost conditional on risk adjustment, then insurers may wish to avoid them by only offering plans on the off-Exchange market, which most states allow. In 2017, many of the large insurers exiting the Exchanges remained in the off-Exchange market, suggesting there is likely differential risk selection across the two markets (Layton, Montz, and Shepard 2017, pp. 33-34).

4 Switching Costs

This section outlines the theory of how switching costs impact how insurers set premiums and serves as the motivation for the estimation of equation (2) in Section 7.

Switching frictions lead individuals to exhibit inertia in plan choice. Inertia in plan choice implies individuals are more price sensitive during their initial enrollments than their later enrollments. Rational firms should respond to this inertia by setting low prices initially to acquire market share, and then raising prices later when consumers become less price sensitive.

If they could, firms would offer different prices to new enrollees versus continuing enrollees. But this type of price discrimination is not allowed in the Exchanges. Nevertheless, firms have an incentive to find a way to replicate this same idea in other ways. One way, which Ericson (2014) shows occurs in Medicare Part D, is to raise prices on plans that have a base of enrollees "stuck in place," while introducing new plans at low prices to attract new individuals entering the market. In general, if consumers exhibit inertia, theory predicts firms will use an "invest-then-harvest" pricing strategy in which products are initially sold at low prices and then sold at higher prices in later periods (see Farrell and Klemperer (2007) for a review of this literature).

Based on this theory, I model insurer behavior as follows. Each firm j offers one plan with price p_{jt} in period t. Quantity sold in period t is a function of this price and the plan's past market share. The expected cost of each enrollee, net of risk adjustment, to the firm is c_j. Firms are infinitely lived with discount factor δ and seek to maximize their expected discounted present value of profits V_{jt}. A firm's value is given by the recursive equation

$$V_{jt} = \left(p_{jt} - c_{jt}\right) s_{jt} + \delta V_{jt+1}\left(s_{jt}\right),$$

where the second term implies that a firm's future value may depend on its current mar-

ket share. The first-order condition for optimal pricing is

$$p_{jt} - c_{jt} = \frac{s_{jt}}{-ds_{jt}/dp_{jt}} - \delta \frac{dV_{jt+1}(s_{jt})}{ds_{jt}}, \tag{1}$$

where ds_{jt}/dp_{jt} is the firm's demand curve. From (1), markups increase as demand becomes more inelastic (e.g. due to switching frictions). The sum of the demand curves of three different individuals make up ds_{jt}/dp_{jt}: (i) new enrollees entering the market, (ii) potential repeat customers, and (iii) potential switchers from other plans. Among these three groups, the demand of potential repeat customers is likely to be the most inelastic. As such, older plans are likely to optimally set prices higher than new plans which do not have potential repeat customers. A simple example should help make this clear. Suppose all plans are perfect substitutes and we are in the market's last period (i.e. $\delta = 0$).[17] Since demand for new plans is perfectly elastic, all new plans would set price equal to marginal cost. Existing plans facing demand that is not perfectly elastic (due to the presence of potential repeat enrollees) would set price equal to marginal cost plus a markup term $\frac{s_{jt}}{-ds_{jt}/dp_{jt}}$ that depends on the elasticity of repeat demand. New plans would thus have lower prices than comparable existing plans.

5 Data

An individual level dataset obtained via a Public Records Act request from Covered California serves as the primary data source for the analysis in this paper. The data shows the plan selections of every enrollee on Covered California from the start of the first open enrollment (hereafter, 2014) on October 1, 2013 to roughly two and half months after the third open enrollment (hereafter, 2016) on April 15, 2016. Each observation contains an individual identifier, household identifier, coverage year (2014, 2015, or 2016), age, gender,

[17] Ericson (2016) shows that an invest-then-harvest pricing pattern is also the equilibrium of this environment when $\delta > 0$.

FPL income bracket, household size, plan coverage tier (e.g. bronze), plan carrier (e.g. Kaiser), rating area, household net premium paid, and coverage start and end dates. My analytic dataset contains roughly 70 percent of Covered California plan selections made in 2014 and roughly 90 percent of the Covered California plan selections made in 2015 and 2016.[18] A full discussion of the data cleaning performed to construct the analytic datafile is available in the appendix.

Table 1 presents summary statistics, by coverage year, of the plan characteristics in the analytic datafile. The data contains 836,767, 1,156,196, and 1,177,727 individual-year observations in 2014, 2015, and 2016, respectively. The average annual premium, net of advanced premium tax credits, in the dataset increased by 15 percent from $1,514 in 2014 to $1,742 in 2016. Selections by coverage tier over the study period were 1 percent catastrophic, 27 percent bronze, 63 percent silver, 5 percent gold, and 4 percent platinum, with this distribution being very stable from year-to-year. There is clear a "Big 4" of insurance companies in Covered California (market share): Anthem Blue Cross (28 percent), Blue Shield (27 percent), Kaiser (22 percent), and Health Net (16 percent). These four firms account for 93 percent of the plan selections in the data. The most notable market share movements over the study period are the decrease in Health Net's market share from 20 percent in 2014 to 13 percent in 2016 and the increase in Kaiser's market share from 18 percent in 2014 to 24 percent in 2016. Among the small insurers, Molina Healthcare made a considerable market share stride by increasing its market share from 1 percent in 2014 to 5 percent in 2015.

Table 2 presents summary statistics of enrollee demographics. Enrollee demographics appear to be very stable over the three-year study period: females make up 52 percent of the data, the under 30 and 50-59 age brackets make up the largest shares of enrollment at 26 percent, one and two-person households account for 80 percent of plan selections, and the 150-200 percent FPL bracket, at 34 percent of plan selections, is the most represented

[18] I'm comparing my totals to the June 2014, June 2015, and June 2016 enrollment figures listed on the Covered California website. See http://hbex.coveredca.com/data-research/

income group in the data.

Complete coverage years need to be observed in order to analyze partial year coverage. This limits me to analyzing only the first two open enrollments (2014, 2015) as my 2016 data ends on April 15, 2016 creating no way of knowing whether enrollees maintained coverage for the entire 2016 coverage year.

To estimate the discrete choice model presented in Section 6, I need to know not only the plan characteristics of the plan each household selected, but also the plan characteristics of all plans available to the household (i.e. the household's entire choice set). Thus, I merged onto each plan selection the entire choice set that the household was choosing from when it made its decision. The choice set available to a household is the set of plans offered in the rating area in which it resides. The number of alternatives available to households varied from 12 to 35 plans across 3 to 7 insurers. Attaching the choice set to each plan selection greatly expands the dataset for the discrete choice segment of the analysis.

I merged on the choice set using posted premiums and the standard financial characteristics of each plan.[19] Premiums were then varied so that the choice set showed the net premiums facing each household. Three pieces of information were needed to compute the net plan premium for each household: the household's FPL income bracket and age, and the premium of the benchmark plan in the rating area in which the household resided.[20] The Health and Human Services (HHS) default standard age curve which most states, including California, adopted shows how to calculate the premium for each age group (see Figure A2). The ACA only allows premiums to vary by age at a 3:1 ratio.

Table A1 shows the FPL levels for 2016 and the maximum premium contribution households in each poverty level are responsible for. The table's notes explain how the

[19]Posted premiums in each year are available from the Covered California website (http://hbex.coveredca.com/data-research/). Standard benefit designs are also available from the Covered California website (http://www.coveredca.com/PDFs/2016-Health-Benefits-table.pdf).

[20]I used the age of the oldest member of the household for the "age of the household." My results were similar when I instead used the mean age of household members as a household's age.

maximum premium contribution is tied to the cost of the benchmark plan in a household's rating area. Finally, I varied the financial characteristics of the silver plans in the choice sets of households between 100 percent and 250 percent FPL. Table A2 shows how the financial characteristics of silver plans changed for this group in 2016.

6 Descriptive Evidence

6.1 Partial Year Coverage

Tables 3 presents cross tabulations of the demographic characteristics of open enrollment enrollees and special enrollment enrollees. The large number of observations in each group makes most of the differences in means between the two groups statistically significant. The average enrollment duration for open enrollment enrollees in the 2014 and 2015 coverage years was 286 days. In contrast, special enrollment enrollees were enrolled for 142 days on average. These figures closely match Aetna's claim that special enrollment enrollees stay enrolled for less than four months on average and less than half the time that open enrollment enrollees stay enrolled.

As mentioned in the introduction, it seems very likely that the average enrollment duration of special enrollment enrollees would be shorter than the average enrollment duration of open enrollment enrollees. Anyone who enters through special enrollment in September can only be enrolled for a maximum 120 days of the coverage year in question. But are special enrollment enrollees more likely to be enrolled for a lesser percentage of the maximum time that they could be enrolled? An answer of yes to this question would be consistent with the hypothesis that special enrollment enrollees are more likely than open enrollment enrollees to get covered, get treated, and then immediately drop coverage.

My analysis suggests the answer is no to the aforementioned question. I find open enrollment enrollees are enrolled on for 90 percent, on average, of the maximum time

they could be enrolled while special enrollment enrollees are enrolled for 93 percent of the time that they could be enrolled.

For the question on which group is healthier, I can only comment on the observable differences in terms of the gender, ages, household size, and income. Without medical claims data, I cannot conclusively say which group is healthier. However, the results of the analysis are clear that the special enrollment population is both younger and higher income than the open enrollment population. The under 30 age bracket makes up 33 percent of the special enrollment population and only 25 percent of the open enrollment population. The highest income bracket (400+ percent FPL/Unsubsidized) accounts for 17 percent of the special enrollment population and 10 percent of the open enrollment population. As age is generally negatively associated with health and income is generally positively associated with health, these two results suggest the special enrollment population in California is actually healthier than the open enrollment population. The gender and household size differences between the two groups appear minor: the gender composition of the two groups differs by 1 percent and the special enrollment population consists of slightly fewer two-person households in favor of more four to five-person households.

The last takeaway from Table 3 is the differences in coverage tier selections between the two groups. The special enrollment population is more likely to choose gold (7 percent vs. 5 percent) and platinum plans (7 percent vs. 4 percent) than the open enrollment population. On the surface, these differences suggest the special enrollment population may be sicker than the open enrollment population as one would expect sicker enrollees to choose more generous coverage tiers. However, the differences in the coverage tier distributions of the two groups could be driven by the differences in the incomes of the two groups, rather than differences in the health of the two groups. This will become clearer in the next section, but briefly, the cost-sharing reductions available to the lower income brackets, particularly the 138-150 percent FPL and 150-200 percent FPL brackets,

make silver plans much more generous.[21] The combination of reduced cost-sharing and premiums that are lower than the gold and platinum plans often makes silver plans the advisable choice for unhealthy, low-income households. Thus, even if the open enrollment and special enrollment groups were identical in terms of health, one would expect the open enrollment population to select more silver plans simply due to a greater share of its enrollees being eligible for generous cost-sharing reductions.

6.2 Inefficient Plan Choice

Table 4 shows coverage tier selections by household income bracket. The first thing to notice from the table is that the actuarial value of the silver plan decreases with income. For households with income of 138 to 150 percent FPL, the actuarial value (i.e. the percentage of medical expenditures that the plan covers for the average enrollee) is 94 percent. Given gold and platinum plans have lower actuarial values and higher premiums than the silver plans for this income bracket, it does not make sense for enrollees in this income group to be selecting gold and platinum plans. While in percentage terms the number of gold and platinum selections by this group is low at only 1 percent each, this corresponds to a not insignificant 8,000 plan selections over the 2014-2016 study period. Further, given the 87 percent actuarial value of the silver plan for 150 to 200 FPL households, the gold plan is clearly dominated for that group.[22] Yet, 2 percent of households in that income bracket still select a gold plan. These inefficient selections cannot be explained by households searching out a specific insurer or provider network. Covered California insurers are required to offer a plan in each coverage tier in the rating areas in which they participate. So, households that want a Kaiser plan never have to choose a gold plan over a silver

[21] Households at 138-150 percent FPL and 150-200 percent FPL are eligible for silver plans with actuarial values of 94 percent and 87 percent, respectively. The actuarial values of gold and platinum plans are 80 percent and 90 percent, respectively, and do not vary by household income.

[22] The minimal difference in actuarial value between the silver and platinum plans for this group (87 percent vs 90 percent), along with platinum plans having much larger premiums than silver plans, probably makes the platinum plan the wrong choice for many households as well.

plan for a reason such as Kaiser only offering a gold plan.

Another interesting aspect of Table 4 is the number of bronze plans selected by households between 138 to 150 percent FPL and 150 to 200 percent FPL. Bronze plans are not strictly dominated by the cost-sharing reduced silver plans because bronze plans have lower premiums. The net annual premium for 138 to 150 percent FPL individuals that chose bronze plans was $216 versus $792 for 138 to 150 percent FPL individuals that chose silver plans. Thus, if a 138 to 150 percent FPL individual expected to receive minimal medical treatment throughout the year, selecting a bronze plan would be optimal. However, Figure 1 shows how out-of-pocket spending of bronze and silver plans increases as a function of medical spending. The plans intercept the vertical axis at the average annual premium individuals with income between 138 and 150 FPL paid for bronze and silver plans in 2016. The silver plan deductible for this income group is $75, after which medical spending is covered at a rate of 94 percent. The two lines in the figure intersect when medical spending equals $688. If an individual's medical spending surpasses $688, a silver plan dominates a bronze plan from the perspective of out-of-pocket spending.

Given the low medical spending threshold at which silver plans begin to dominate bronze plans, some of the bronze selections by the 138 to 150 percent FPL households (and to a lesser extent the 150 to 200 FPL households) are probably suboptimal. It is also perhaps telling that bronze plans are less frequently selected by 138 to 150 percent FPL and 150 to 200 percent FPL households when these households are assisted by certified insurance agents versus when they sign up unassisted through the online Exchange website. In the 138 to 150 percent FPL income bracket, 11 percent of unassisted households selected a bronze plan while 7 percent of certified insurance agent assisted households selected a bronze plan. For the 150 to 200 percent FPL income bracket, 22 percent of unassisted households selected a bronze plan while 15 percent of certified insurance agent assisted households selected a bronze plan.

6.3 Plan Switching

Table 5 presents the plan switching rates of different demographic groups. Overall, 15.4 percent of continuing enrollees switched plans between 2014 and 2015 and 13.4 percent of continuing enrollees switched plans between 2014 and 2015. There is not much of a pattern to how the switching rate varies by household size except that single coverage households appear slightly less likely (1 to 2 percentage points) to switch plans. As for how income affects plan switching, higher income brackets are generally more likely to switch than lower income brackets. This could be due to the fact that lower income brackets are more insulated from premium increases as a result of the price-linked nature of the ACA's premium subsidies. Switching rates by gender are almost identical and, outside the under 30 age group, switching rates appear to decrease with age.

If new and continuing enrollees are similar along multiple dimensions (e.g., health status, risk preference, age, income), we'd expect the plan selections of new and continuing enrollees to also be similar in the absence of inertia. Table 6 presents summary statistics on the gender, age, household size, income, and coverage tier selections for new and continuing enrollees in 2014, 2015, and 2016. New and continuing enrollees are remarkably similar in terms of income and gender in 2015 and 2016. Some differences in terms of age, household size, and metal tier are readily apparent from Table 6. The age distribution of new enrollees appears to be skewed younger than the age distribution of continuing enrollees. Given the younger age distribution of new enrollees, it is perhaps unsurprising that new enrollees chose single coverage plans more often than continuing enrollees. Additionally, new enrollees chose bronze plans more often than continuing enrollees.

Figure 2 displays plan selections by insurer carrier for new and continuing enrollees in 2015 and 2016. There are significant differences in terms of the insurers selected by the two groups. In 2015, the most notable differences between the two groups were in with regards to Blue Shield and Kaiser enrollment. Blue Shield's market share was 29 percent among continuing enrollees, but only 22 percent among new enrollees. Conversely,

Kaiser's market share among continuing enrollees was 20 percent and 28 percent among new enrollees. In 2016, the largest differences in market share between new and continuing enrollees came from Health Net and Molina. Health Net's market share among continuing enrollees was 15 percent in 2016 while its market share among new enrollees was 10 percent. Molina's market share among continuing enrollees was 3 percent and 8 percent among new enrollees.

7 Econometric Models

7.1 Correlation between Enrollment and Past Prices

To test the switching theory presented in Section 4, I estimate regressions of the following form:

$$\ln s_{jmt} = \alpha_1 p_{jmt} + x_{jmt}\beta_1 + \alpha_2 p_{jmt-1} + x_{jmt-1}\beta_2 + \epsilon_{jmt}, \tag{2}$$

where $\ln s_{jmt}$ is plan j's log market share in market (rating area) m at time t, p_{jmt} is plan j's annual premium, and x_{jmt} is a vector of plan characteristics. I only include an insurer fixed effect (i.e., a "brand" effect) and a metal tier fixed effect as part of x_{jmt}. As financial characteristics of Covered California plans are standardized within tiers, plans differentiate themselves by the premiums they offer and their networks of providers. Ideally (2) would include a measure of network size, but accurate provider directory information has been notoriously difficult to obtain for Covered California plans (Sisson 2016).

It should be noted, that in the absence of inertia, α_2 is expected to be positive. This comes from the fact that firms set prices endogenously to unobserved quality, and price is presumed to be increasing in quality. Thus, conditional on present prices, the expectation of quality should increase in lagged price p_{jmt-1}, implying $\alpha_2 > 0$ in the absence of inertia. Inertia predicts $\alpha_2 < 0$: higher past prices induce lower enrollment which persists into later periods.

Table 7 presents the coefficient estimates that result from the estimation of equation 2. The dependent variable in Table 7 is the log of a plan's 2016 market share. The two independent price variables are the plan's monthly premium in 2016 ("today's price") and the plan's monthly premium from 2014. I estimate the model separately for new and continuing enrollees and include both tier and carrier fixed effects.

Inertia suggests that past price should have a significant effect on the current enrollment of continuing enrollees. Column (2) in Table 7 suggests this is indeed the case in Covered California – the coefficient on 2014's monthly premium is significant and negative, while the coefficient of 2016's monthly premium is insignificant. Column (1) serves as a nice placebo test of the model. Conditional on current premiums, premiums from two years ago should not impact the enrollment decisions of new enrollees. The insignificant coefficient of 2014's month premium in column (1) shows this to be the case.

7.2 Consumer Choice Model

It has been known for some time that consumers have a higher probability of choosing products that they have purchased in the past (see Frank (1962) and Massy (1966) for early examples). There are two conceptually distinct explanations for this inertia in product choice. Once explanation is that past purchases directly influence consumers' choice probabilities for different products. Following Heckman (1981), I call this *structural state dependence* in choice. The other explanation is that consumers differ in some serially correlated unobserved propensity to make purchase decisions, which Heckman (1981) refers to as *spurious state dependence*. This second explanation contends that the relationship between past purchases and current choice probabilities only arises because unobserved consumer differences were not properly accounted for.

Several features of the Exchanges allow me to distinguish between these two explanations. First, there has been significant variation in the observed contract space over the first three years of the Exchanges. This variation comes from premium changes, regula-

tory changes to the standard benefit design, and entry/exit of carriers from rating areas. Second, since my data starts in the first year of the Exchange, I am able to see the first choice of every household. This fact, plus the ability to track individuals across years, allows me to compare choices in active decision situations and potentially passive situations (i.e. households being re-enrolled automatically into their current plans) for the same household. Additionally, there are a number of first time enrollees in both 2015 and 2016, which means in 2015 and 2016 I observe households choosing with and without inertia. Observing households with and without inertia choosing from the same contract space helps separate persistent household heterogeneity from the switching friction.

I assume choice decisions by households to be a function of default plans and heterogeneous preference for different plan features. Importantly, the model does not attempt to identify different sources of inertia, but rather simply quantifies how likely an individual is to select his default plan conditional on plan characteristics, choice set, and idiosyncratic preferences. The choice model takes a contract-value approach rather than a realized utility approach. This means I am projecting plans into a set of discrete characteristics and specifying a stochastic indirect utility function over these characteristics, rather than projecting plan characteristics into the mean or variance of spending and specifying a utility function over spending (see Einav, Finkelstein, and Levin (2010) for an extensive discussion of both approaches).

In each year t, individuals who live in market m can choose from among J_m plans offered by N insurers. J_m varies by rating area because insurers are not required to offer coverage in every rating area in a state. Under the ACA, the rating area is the finest level of geography by which insurers can vary plan premiums. Individual i's utility from choosing plan j ("plan" is market-specific, so m is suppressed) in year t is given by:

$$u_{ijt} = \alpha p_{ijt} + X'_{ijt}\beta + \gamma_{it}\mathbf{1}\{\text{Default}\}_{ijt} + \epsilon_{ijt}, \tag{3}$$

where p_{ijt} is the annual premium (net of advance premium tax credit) for a plan in a given year, X_{ijt} is a vector of plan characteristics, $\mathbf{1}\{\text{Default}\}_{ijt}$ is an indicator for whether the plan was chosen by the individual in the previous year, and ϵ_{ijt} is an i.i.d. Type 1 extreme value error term. The plan characteristics I include in the model are deductible, actuarial value, and insurer brand. Individuals are assumed to choose the plan that maximizes their utility. As formulated, individuals are choosing the plan with the highest "perceived" utility. This could differ from the plan that is optimal under some sort of actuarial risk-protection perspective (Abaluck and Gruber 2011, 2016).

As is, the model does not incorporate how an individual's health risk or risk aversion affects his preferences for health insurance. To address this, I first allow individual preference for plan features to depend on age.[23] Additionally, I allow for unobserved heterogeneity in the model, by including random coefficients on the premium, deductible, and actuarial value.[24] The distribution of the random coefficients is specified to be normal. The unobserved heterogeneity allows for private information about health risk, heterogeneity in risk aversion, or individual-specific preferences (or "mistakes") for certain contract features.

Assuming households choose plans that maximizes utility, the model lets me calculate the probability of households choosing different plans from their choice sets as a function of the parameters. I use maximum likelihood estimation to find the values of the parameters that best rationalize the set of observed choices. The estimation utilizes the panel structure of my data to model the probability of a sequence of choices. There is no analytic closed-form solution for the probability integral that is part of the log-likelihood function. As such, the model is estimated using a maximum simulated likelihood approach as described by Train (2009) and Hole (2007). Details on how the mixed logit model I estimate can be derived from utility-maximizing behavior is available in the appendix.

[23] I operationalize this by interacting each of the variables in the model by age.

[24] Specifications that allow for different sources of unobserved heterogeneity are available in the appendix. The main estimates are not significantly altered.

7.3 Identification

The intuition for identification follows that used in Handel (2013), Polyakova (2016), and Ho, Hogan, and Morton (2015). The panel structure of my data allows me to observe consecutive choices for continuing enrollees, along with first time choices of new enrollees who enter the Exchange each year. I assume new enrollees choose without inertia and that the normally distributed random coefficients fully capture the unobserved heterogeneity in their preferences. Under this assumption, the random coefficients capture individual-specific persistence in preferences, while the structural state dependence is captured by the lagged dependent variable parameter. The initial conditions problem (e.g., Heckman (1991)) does not arise in my data because I observe the first Exchange enrollment decision of all individuals.

8 Consumer Choice Model Estimates

Table 8 displays the estimates from the consumer choice model described in the previous section. The model is estimated separately for each of the five FPL income brackets in the data. The coefficient estimates displayed are the structural coefficients from a mixed logit model; they are not marginal effects. The coefficient estimates can be roughly interpreted as the impact of a one-unit increase in the variable of interest on the probability that a plan is chosen.[25] A premium coefficient of -0.44 implies that a $100 increase in net annual premiums decreases a plan's probability of selection by 44 percent. All models estimated in Table 8 include insurer ("brand") fixed effects and insurer-age fixed effects.

Moving along the first row of coefficients in Table 8 shows that lower income households are more sensitive to premiums than higher income households. Specifically, the coefficient on net annual premiums for 138 to 150 percent FPL households is -0.4351 compared to -0.2136 for 400+ percent FPL/Unsubsidized households. The coefficient on the

[25] This holds exactly for plans that are a negligible share of the overall market.

net annual premium/age interaction term is positive across all household incomes, which indicates older households are less sensitive to premiums than younger households.

The negative coefficients on the deductible variable supports the intuition that households have a distaste for higher deductibles. Focusing in on the 200 to 250 percent FPL column, the coefficients imply that a $100 increase in net annual premiums would reduce a plan's probability of selection by 38 percent whereas a $100 increase in a plan's deductible would reduce a plan's probability of selection by 3 percent. The other income groups likewise show that an increase in a plan's net annual premium reduces a plan's probability of selection far more than an equal-sized increase in the plan's deductible. The positive coefficients on the deductible/age interaction terms indicate older households are less sensitive to increases in a plan's deductible than younger households.

The coefficients corresponding to the actuarial value variable are positive suggesting that household prefer plans with higher actuarial values, as intuition would suggest. The actuarial value coefficients for 138 to 150 percent FPL and 150 to 200 percent FPL households are notably larger than the actuarial value coefficients of the other income groups. This is likely because households in these two income groups are much more likely to select silver plans (which also have high actuarial values due to cost-sharing reductions) over plans in other coverage tiers. The actuarial value/age coefficient is positive and statistically significant across most income groups, suggesting that older households exhibit a greater preference for high actuarial value plans than younger households.

The magnitude of the coefficient on the default plan variable is much greater than the magnitude of any other variable suggesting that households are much more likely to stay with their default plan over selecting a different plan. Across the income groups, the magnitude of the default plan variable coefficient ranges from 4.47 to 4.93, suggesting households are 450 to 500 percent more likely to choose their default plan over an alternative plan. The default plan/age interaction variables are negative (and generally statistically significant) indicating that older households are less likely to choose their

default plans than younger households. This is perhaps surprising as older households are likely to have a stronger preference for keeping their doctors as they have had more time to build up relationships with doctors. Then again, older households are probably much more likely to think carefully about their health, so perhaps they are more likely to actively shop each open enrollment than younger households.

The estimated standard deviations of the net annual premium, deductible, and actuarial value shows there is considerable unobserved preference heterogeneity across households. Larger standard deviations imply more unobserved preference heterogeneity. Preferences toward net annual premiums and actuarial value show signs of considerable unobserved preference heterogeneity while preferences toward deductibles do not.

The bottom two lines of Table 8 show the switching costs for households age 30 and age 60 implied by the coefficient estimates in the table. If there were no age interactions in the model, household switching costs could be obtained by simply dividing the coefficient on the default plan variable by the coefficient on net annual premiums.[26] With age interactions involved, calculating the switching cost is only moderately more complicated as the net annual premium/age coefficient and the default plan/age coefficient have to be accounted for when calculating household switching costs.

The model implies switching costs that generally increase in household age and income. Starting with the 138 to 150 percent FPL income bracket, the switching cost estimate is $1,434 for age 30 households and $2,126 for age 60 households. Switching costs increase for the 400+ percent FPL/Unsubsidized income bracket to $3,060 for an age 30 household and $4,977 for an age 60 household. The implied switching costs for higher income groups are due to the fact that they are less sensitive to premiums than lower income households while being similarly likely to remain in their default plans. These switching cost estimates are roughly consistent with other estimates in the literature.[27]

[26] An explanation of why this is true is available in the appendix.

[27] Handel (2013) estimates the switching cost to be about $2,000 in the context of employer-provided health insurance. Nosal (2012) estimates switching costs of roughly $4,000 in the context of Medicare Advantage. For Medicare Part D, Abaluck and Gruber (2016) estimates a switching cost of around $600, Poly-

9 Robustness

Tables A3 and A4 in the appendix estimate alternative choice models to test the robustness of the switching cost estimates presented in Table 8. Table A3 estimates four different model specifications using the plan choice data of 138 to 150 percent FPL households. The first model is a simple conditional logit model no random coefficients and no age interactions. The second model adds four age interactions net annual premium/age, deductible/age, actuarial value/age, and default plan/age. The third model adds heterogeneity in preferences for specific insurers by adding insurer/age interactions to the set of insurer fixed effects already in the model. The fourth model adds unobserved preference heterogeneity, for plan characteristics and insurers, by allowing random coefficients for net annual premium, deductible, actuarial value, and the fixed effects of the "Big 4" Covered California insurers Anthem Blue Cross, Blue Shield of California, Health Net, and Kaiser Permanente. Table A4 estimates the same four models as Table A3, but with the plan choice data of 400+% FPL/Unsubsidized households.

Tables A3 and A4 show that the magnitude of switching cost estimates decrease as more unobserved preference heterogeneity is added to the model. Model 4 in Tables A3 and A4 adds considerable preference heterogeneity to my baseline model by allowing unobserved preference heterogeneity for the "Big 4" insurers. The switching cost estimates implied by Model 4 in Tables A3 and A4 are lower, but still generally close, to the switching cost estimates of the 138 to 150 percent FPL and 400+% FPL/Unsubsidized columns of Table 8. Specifically, Table 8 estimates the switching cost for 138 to 150 percent FPL households to be $1,434 for age 30 households and $2,126 for age 60 households, while Model 4 in Table A3 estimates the switching cost for this income group to be $1,128 for age 30 households and $1,913 for age 60 households. For the 400+% FPL/Unsubsidized income group, Table 8 estimates a switching cost of $3,060 for age 30 households and

akova (2016) estimates a switching cost of roughly $1,200, and Yeo and Miller (2015) estimate a switching cost of about $1,700.

$4,977 for age 60 households, while Model 4 in Table A4 estimates a cost a switching cost of $2,765 for age 30 households and $4,803 for age 60 households.

10 Discussion

As of this writing, the future of the ACA Exchanges is very much in question. With control of both the House and Senate, Republican leadership is pushing to repeal and replace the ACA. Should the ACA be repealed, it is not clear whether the Exchanges would remain. And even if they do remain, it seems likely that the subsidies available to households that enroll will change. Regardless of the ACA's future, there are lessons to be learned from the ACA Exchanges.

First, the current price-linked nature of the premium subsidies seems particularly problematic (Jaffe and Shepard 2017). As this paper has shown, there is not much plan switching in Covered California.[28] One of the reasons there is probably not much switching is that lower income groups are heavily shielded from premium increases: if the premium of the benchmark plan in a household's rating area goes up, then so will the household's subsidy. As one example of how shielded households could potentially be from premium increases, consider a household that is enrolled in the benchmark plan in year 1. If the premiums of all plans increase by 15 percent going into year 2, so that benchmark plan remains the benchmark plan since relative prices did not change, the household's subsidy would increase by 15 percent and the household would experience no increase in its net annual premium. While this is great for the household, the federal government's bill just went up 15 percent.

If the trend of insurers dropping out of the Exchanges continues (Kaiser Family Foun-

[28] An ASPE publication in early 2016 put the national Exchange switching rate at 43 percent (https://aspe.hhs.gov/pdf-report/marketplace-premiums-after-shopping-switching-and-premium-tax-credits-2015-2016). That switching rate is larger than the typical health insurance switching rate reported in the literature. It likely includes a lot of "forced" switches where a household switched plans from one year to the next as a result of its original insurer no longer offering coverage or changing its plan offerings.

dation 2017a), there is a good chance that the price-linked nature of the premium subsidy becomes a bigger problem for the Exchanges going forward. Many rating areas are now down to being served by only one insurer (O'Donnell 2017). And in most Exchanges, insurers are not limited to offering only one plan per tier as they are on Covered California. This gives insurers that operate alone in a rating area a tempting strategy: offer two plans in the silver tier, one that is priced at a level that households will enroll in, and one that is priced much higher. The one that is priced much higher becomes the benchmark plan by way of being the second-lowest-cost silver plan. By setting the benchmark plan very high, the insurer creates a very large subsidy for potential enrollees and increases demand for their plan offerings. The insurer gets more enrollees, enrollees get a larger subsidy, everyone wins except the federal government, who ends up with a large subsidy bill.

Aside from the price-linked subsidy design, Covered California shows that ACA Exchanges can be stable. In this paper, I do not find evidence of special enrollment enrollees gaming the system by signing up for coverage, getting treated, and then immediately dropping coverage. Additionally, special enrollment enrollees do not appear unhealthier than the open enrollment enrollees, at least in terms of observable characteristics.

Maybe the biggest indicator that Covered California will remain stable is that there has been very little insurer exit from the Exchange. The "Big 4" insurers have not indicated that they have plans to leave the Exchange, and only a couple small insurers have come in and out of the Exchange. From 2014 to 2017, Covered California has always had between 10 and 12 insurers participating with every rating area having at least 3 insurers to choose from. Insurer participation is much lower than this in a number of states, making a well-functioning Exchange more of an uphill battle for these states (Kaiser Family Foundation 2017a).

11 Conclusion

This paper comments on the extent of partial year coverage, inefficient plan choice, and plan switching in Covered California, the state-based Exchange of California. I do not find evidence that supports the notion that special enrollment enrollees abuse the opportunity to obtain partial year coverage by signing up, getting treated, and then immediately dropping coverage. Also, at least from observable characteristics, the special enrollment population in Covered California does not appear less healthy than open enrollment population. In fact, it appears healthier as the special enrollment population is noticeably younger and higher income than the open enrollment population.

With regards to inefficient plan choice, it appears that some enrollees are making mistakes when it comes to plan choice. For the lowest income groups, the cost-sharing reduced silver plan often dominates plans in the gold and platinum coverage tiers by way of having lower premiums and a higher actuarial value. Additionally, at relatively low levels of medical spending, cost-sharing reduced silver plans will begin to dominate bronze plans. Thus, some of the bronze selections in Covered California by the lower income groups are probably mistakes as well.

As for plan switching, I find the switching rate on Covered California to be close to 15 percent. My estimates from a mixed logit consumer choice model imply plan switching costs ranging from $1,000 to $5,000, depending on the age and income of households.

More research on the Exchanges is needed. If the Exchanges continue, there appears to be room to improve how they function. If the Exchanges do not continue, research on the Exchanges will be necessary in order to inform policymakers about how to go about helping the individual insurance market in the United States a market that has never been free of problems.

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Tables and Figures

Table 1: Summary Statistics – Plan Selections

	2014	2015	2016	2014-2016
Net Annual Premium	$1,514	$1,595	$1,742	$1,628
Coverage Tier				
Catastrophic	0.01	0.01	0.01	0.01
Bronze	0.25	0.27	0.28	0.27
Silver	0.63	0.62	0.62	0.63
Gold	0.06	0.05	0.05	0.05
Platinum	0.05	0.05	0.04	0.04
Insurer				
Anthem Blue Cross	0.29	0.28	0.26	0.28
Blue Shield	0.25	0.27	0.28	0.27
Chinese Community	0.01	0.01	0.01	0.01
Contra Costa	< 0.01	—	—	< 0.01
Health Net	0.20	0.17	0.13	0.16
Kaiser	0.18	0.24	0.24	0.22
LA Care	0.03	0.01	0.01	0.01
Molina	0.01	0.02	0.05	0.03
Oscar	—	—	< 0.01	< 0.01
Sharp	0.01	0.01	0.02	0.01
United	—	—	< 0.01	< 0.01
Valley	< 0.01	< 0.01	< 0.01	< 0.01
Western	< 0.01	< 0.01	0.01	< 0.01
HH-Yr Observations	570,850	798,708	830,796	2,200,354
Indiv-Yr Observations	836,767	1,156,196	1,177,727	3,170,690

Notes: HH = household, Indiv = individual, Yr = year.

Table 2: Summary Statistics – Demographic Characteristics

	2014	2015	2016	2014-2016
Female	0.52	0.52	0.51	0.52
Age				
Under 30	0.26	0.27	0.26	0.26
30 – 39	0.16	0.16	0.16	0.16
40 – 49	0.21	0.19	0.19	0.20
50 – 59	0.27	0.26	0.26	0.26
60 – 64	0.11	0.11	0.13	0.12
Household Size				
1	0.45	0.47	0.49	0.47
2	0.34	0.32	0.32	0.33
3	0.11	0.11	0.10	0.11
4 – 5	0.09	0.09	0.09	0.09
Income				
138 – 150% FPL	0.15	0.15	0.16	0.15
150 – 200% FPL	0.35	0.34	0.34	0.34
200 – 250% FPL	0.17	0.18	0.17	0.17
250 – 400% FPL	0.21	0.23	0.23	0.23
400+% FPL / Unsubsidized	0.11	0.11	0.11	0.11
HH-Yr Observations	570,850	798,708	830,796	2,200,354
Indiv-Yr Observations	836,767	1,156,196	1,177,727	3,170,690

Notes: FPL = federal poverty level, HH = household, Indiv = individual, Yr = year.

Table 3: Open vs. Special Enrollment Enrollees, 2014 and 2015

	All Enrollees	Open Enrollment Enrolles	Special Enrollment Enrollees	*P* value (difference in means, open vs. special)
Enrollment Duration (Days)	266	286	142	$p < 0.01$
Proportion of Time Enrolled	0.91	0.90	0.93	$p < 0.01$
Female	0.52	0.52	0.53	$p < 0.01$
Age				
Under 30	0.26	0.25	0.33	$p < 0.01$
30 – 39	0.16	0.16	0.19	$p < 0.01$
40 – 49	0.20	0.20	0.18	$p < 0.01$
50 – 59	0.26	0.27	0.21	$p < 0.01$
60 – 64	0.11	0.11	0.10	$p < 0.01$
Household Size				
1	0.46	0.46	0.46	$p < 0.01$
2	0.33	0.34	0.30	$p < 0.01$
3	0.11	0.11	0.11	$p = 0.11$
4 – 5	0.09	0.09	0.12	$p < 0.01$
Income				
138 – 150% FPL	0.15	0.16	0.12	$p < 0.01$
150 – 200% FPL	0.34	0.35	0.30	$p < 0.01$
200 – 250% FPL	0.17	0.18	0.16	$p < 0.01$
250 – 400% FPL	0.22	0.22	0.24	$p < 0.01$
400+% FPL / Unsubsidized	0.11	0.10	0.17	$p < 0.01$
Coverage Tier				
Catastrophic	0.01	0.01	0.02	$p < 0.01$
Bronze	0.26	0.26	0.25	$p < 0.01$
Silver	0.63	0.63	0.60	$p < 0.01$
Gold	0.06	0.05	0.07	$p < 0.01$
Platinum	0.05	0.04	0.07	$p < 0.01$
HH-Yr Observations	1,375,634	1,181,450	194,184	
Indiv-Yr Observations	1,992,963	1,714,389	278,574	

Notes: FPL = federal poverty level, HH = household, Indiv = individual, Yr = year.

Table 4: Coverage Tier Selections by Income Bracket, 2014-2016

	All	Unassisted	Certified Agent	*P* value (diff. in means, unass. vs. cert.)
138 – 150% FPL				
Catastrophic – N/A	0.00	0.00	0.00	$p < 0.01$
Bronze – 60%	0.09	0.11	0.07	$p < 0.01$
Silver – **94%**	0.90	0.86	0.92	$p < 0.01$
Gold – 80%	0.01	0.01	0.01	$p < 0.01$
Platinum – 90%	0.01	0.01	0.01	$p < 0.01$
150 – 200% FPL				
Catastrophic – N/A	0.00	0.00	0.00	$p < 0.01$
Bronze – 60%	0.19	0.22	0.15	$p < 0.01$
Silver – **87%**	0.77	0.73	0.82	$p < 0.01$
Gold – 80%	0.02	0.02	0.02	$p < 0.01$
Platinum – 90%	0.02	0.02	0.01	$p < 0.01$
200 – 250% FPL				
Catastrophic – N/A	0.00	0.01	0.00	$p < 0.01$
Bronze – 60%	0.35	0.38	0.31	$p < 0.01$
Silver – **73%**	0.54	0.50	0.59	$p < 0.01$
Gold – 80%	0.06	0.06	0.06	$p < 0.01$
Platinum – 90%	0.05	0.06	0.03	$p < 0.01$
250 – 400% FPL				
Catastrophic – N/A	0.02	0.03	0.00	$p < 0.01$
Bronze – 60%	0.40	0.42	0.38	$p < 0.01$
Silver – 70%	0.43	0.39	0.48	$p < 0.01$
Gold – 80%	0.10	0.09	0.10	$p < 0.01$
Platinum – 90%	0.06	0.07	0.05	$p < 0.01$
400+% FPL / Unsub.				
Catastrophic – N/A	0.04	0.05	0.02	$p < 0.01$
Bronze – 60%	0.35	0.35	0.35	$p = 0.15$
Silver – 70%	0.32	0.30	0.38	$p < 0.01$
Gold – 80%	0.14	0.14	0.14	$p = 0.08$
Platinum – 90%	0.14	0.15	0.11	$p < 0.01$
HH-Yr Observations	2,200,354	1,200,064	1,000,290	
Indiv-Yr Observations	3,170,690	1,678,667	1,492,023	

Notes: FPL = federal poverty level, HH = household, Indiv = individual, Yr = year. Certified agent refers to a certified insurance agent (1,273,753), certified enrollment counselor (163,026), or a certifed plan based enroller (55,244). Percentages next to each coverage tier represent actuarial values.

Table 5: Switching Demographics

	2014–2015 (%)	2015–2016 (%)
Total	15.4	13.4
Household Size		
1	14.8	12.1
2	15.9	14.6
3	15.7	14.9
4 – 5	16.8	13.5
Income		
138 – 150% FPL	13.5	12.4
150 – 200% FPL	13.7	11.9
200 – 250% FPL	17.7	14.8
250 – 400% FPL	18.3	15.1
400+% FPL / Unsubsidized	17.1	13.1
Gender		
Male	15.2	13.1
Female	15.7	13.6
Age		
Under 30	15.4	12.6
30 – 39	17.7	14.1
40 – 49	15.6	13.6
50 – 59	14.8	13.6
60 – 64	14.5	12.9

Notes: FPL = federal poverty level.

Table 6: New vs. Continuing Enrollees, 2014 – 2016

	All	2014	2015		2016	
		New	New	Cont.	New	Cont.
Female	0.52	0.52	0.51	0.52	0.50	0.52
Age						
Under 30	0.26	0.26	0.30	0.22	0.32	0.22
30 – 39	0.16	0.16	0.18	0.15	0.18	0.15
40 – 49	0.20	0.21	0.19	0.20	0.18	0.19
50 – 59	0.26	0.27	0.23	0.30	0.22	0.29
60 – 64	0.12	0.11	0.10	0.13	0.09	0.14
Household Size						
1	0.47	0.45	0.50	0.43	0.53	0.47
2	0.33	0.34	0.31	0.36	0.29	0.33
3	0.11	0.11	0.10	0.12	0.10	0.11
4 – 5	0.09	0.09	0.09	0.10	0.08	0.09
Income						
138 – 150% FPL	0.15	0.15	0.15	0.15	0.16	0.16
150 – 200% FPL	0.34	0.35	0.33	0.35	0.34	0.34
200 – 250% FPL	0.17	0.17	0.18	0.17	0.17	0.17
250 – 400% FPL	0.23	0.21	0.24	0.22	0.23	0.23
400+% FPL / Unsub.	0.11	0.11	0.11	0.10	0.11	0.11
Coverage Tier						
Catastrophic	0.01	0.01	0.01	0.01	0.02	0.01
Bronze	0.27	0.25	0.29	0.24	0.31	0.26
Silver	0.63	0.63	0.60	0.65	0.59	0.64
Gold	0.05	0.06	0.05	0.05	0.05	0.05
Platinum	0.04	0.05	0.04	0.05	0.03	0.04
HH-Yr Obs.	2,200,354	570,850	455,846	342,862	297,789	533,007
Indiv-Yr Obs.	3,170,690	836,767	643,175	513,021	404,694	773,033

Notes: FPL = federal poverty level, HH = household, Indiv = individual, Yr = year.

Table 7: Enrollment Response to Current and Past Prices

	New Enrollees ln(share 2016)	Continuing Enrollees ln(share 2016)
Monthly Premium 2016 ($10s)	-0.058***	0.008
	(0.017)	(0.017)
Monthly Premium 2014 ($10s)	-0.009	-0.087***
	(0.022)	(0.022)
Coverage Tier FE	Yes	Yes
Insurer FE	Yes	Yes
Observations	399	399
R^2	0.666	0.744

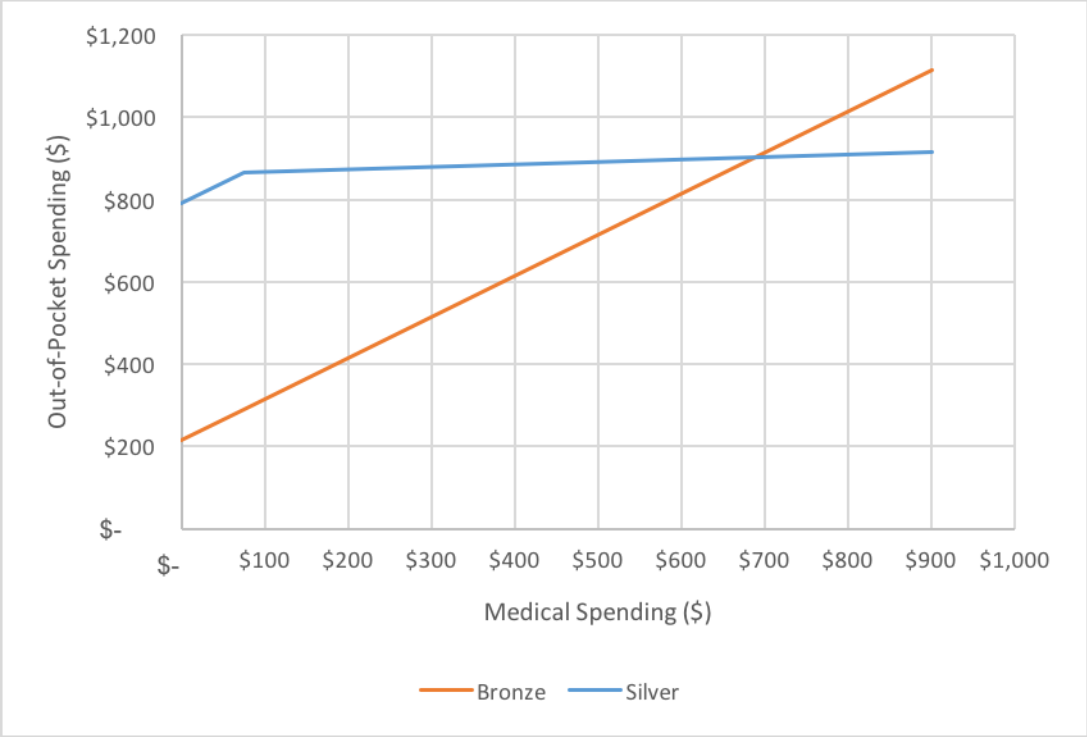
Notes: OLS regressions. Dependent variable: log of plan market share for new or continuing enrollees in year 2016. Monthly prices are measured in $10s. Heteroskedasticity robust standard errors, clustered at the insurer level, are in parentheses. *** $p < 0.01$

Table 8: Enrollment Response to Current and Past Prices

	FPL Income Bracket				
	138-150% FPL	150-200% FPL	200-250% FPL	250-400% FPL	400+% FPL / Unsub.
Annual Premium, $100	-0.4351***	-0.4924***	-0.3752***	-0.1764***	-0.2136***
	(0.0134)	(0.0075)	(0.0095)	(0.0072)	(0.0111)
x Age	0.0041***	0.0049***	0.0038***	0.0016***	0.0021***
	(0.0003)	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Deductible, $100	-0.0106	-0.0177***	-0.0282***	-0.0107***	-0.0340***
	(0.0090)	(0.0045)	(0.0039)	(0.0032)	(0.0041)
x Age	0.0004*	0.0007***	0.0005***	0.0006***	0.0001
	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Actuarial Value, %	0.1636***	0.0708***	0.0057	0.0366***	0.0088
	(0.0175)	(0.0093)	(0.0115)	(0.0099)	(0.0117)
x Age	0.0014***	0.0017***	0.0001	0.0021***	0.0007***
	(0.0004)	(0.0002)	(0.0003)	(0.0002)	(0.0003)
Default Plan, 1/0	4.9330***	4.6865***	4.4659***	4.5610***	4.8575***
	(0.2027)	(0.1243)	(0.1428)	(0.1294)	(0.1584)
x Age	-0.0152***	-0.0061**	-0.0009	-0.0049*	-0.0083**
	(0.0042)	(0.0026)	(0.0029)	(0.0026)	(0.0036)
	Standard Deviations of Random Coefficients				
Annual Premium, $100	0.1026***	0.1028***	0.0657***	0.0457***	0.0764***
	(0.0039)	(0.0023)	(0.0022)	(0.0016)	(0.0033)
Deductible, $100	0.0005	0.0000	0.0137***	0.0029	0.0001
	(0.0038)	(0.0026)	(0.0012)	(0.0041)	(0.0020)
Actuarial Value, %	0.1383***	0.1128***	0.0012	0.0349***	0.0730***
	(0.0124)	(0.0033)	(0.0072)	(0.0052)	(0.0058)
Observations	387,791	827,896	414,013	425,074	254,582
Choice Situations	17,871	39,248	20,040	21,005	11,742
Unique Households	12,021	25,482	13,867	13,619	7,469
Max. Alternatives	35	35	35	35	35
Log-likelihood	-22,497	-57,497	-35,533	-38,641	-22,947
Switching cost at age 30	**$1,434**	**$1,304**	**$1,699**	**$3,438**	**$3,060**
Switching cost at age 60	**$2,126**	**$2,178**	**$2,997**	**$5,307**	**$4,977**

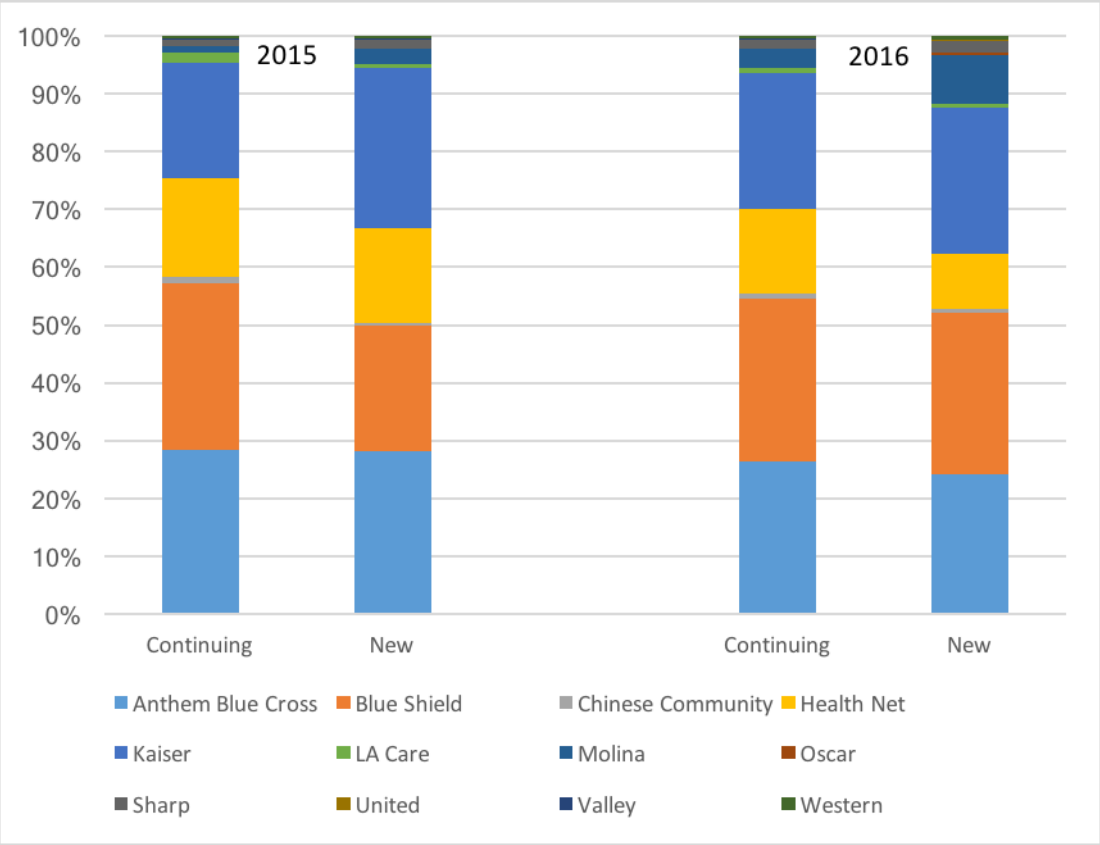
Notes: All models include insurer and insurer x age fixed effects. Estimates are structural coefficients from the mixed logit model specified in the main text, not marginal effects. *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$

Figure 1: Out-of-Pocket Spending, Bronze vs. Silver Plan, 138 – 150% FPL, 37-year-old Individual, 2016



Notes: FPL=federal poverty level. The average annual premium (net of advanced premium tax credits) for single coverage individuals with a bronze plan in 2016 was $216. The average age of this group was 37-years-old. The 2016 average annual premium (net of advanced premium tax credits) for single coverage individuals with a silver plan was $852. The average age of this group was 42-years-old. Using the HHS age curve shown in Figure A2, I age-adjusted the $852 silver premium to $792 to make it comparable to the $216 bronze premium of a 37-year-old displayed in the figure. The silver plan deductible for an individual at 138-150% FPL is $75. After this deductible is met, the plan pays on average 94 percent of the individuals medical expenses. The bronze plan deductible for this individual is $6,000. As the figure makes clear, silver plans begin to dominate bronze plans for this individual at a relatively low level of medical spending ($688 to be specific).

Figure 2: 2015 and 2016 Market Shares by Insurer, Continuing vs. New Enrollees



Appendix

Analytic Dataset Construction

I obtained individual-level plan enrollment data from Covered California via a Public Records Act request. The raw dataset contains over 4.8 million observations and captures all plans selected from October 1, 2013 (the first day of the first open enrollment) to April 15, 2016 (two and a half months after the close of the third open enrollment). By open enrollment year, the dataset contains 1,450,477 (2014), 1,750,291 (2015), and 1,615,289 (2016) observations.

I merged the enrollment data with publicly available plan premiums.[29] In California, Exchange carriers can vary premiums by tier, age, and rating area. The California Exchange instituted a standard benefit design, so carriers were limited to offering one plan in each tier. Additionally, if a carrier chose to participate in a rating area, it was required to offer a plan for all five tiers. Thus, as a general rule, each carrier offered five plans in the rating areas where it participated. There were two exceptions to this rule. First, carriers were allowed to offer a health savings account (HSA) version of their bronze plans. In 2016, six out of twelve carriers decided to offer both HSA bronze and bronze plans in the rating areas in which they participated. The difference in premiums between the two versions was 1.7 percent on average, with bronze slightly more expensive. As my data did not allow me to differentiate HSA bronze enrollment from bronze enrollment, I matched bronze premiums to all individuals listed as being enrolled in Bronze plans, with the understanding that some of these individuals might be enrolled in the HSA version.

The second exception is that Anthem offered, in select rating areas, two plans in each of the silver, gold, and platinum tiers over the first three years of the Exchange. Anthem was allowed to do this because one plan in each tier was offered as an HMO, while the other plan was offered as a PPO. In 2016, Anthem offered its PPO in all 19 rating areas,

[29] http://hbex.coveredca.com/data-research/

while its HMO was offered in eight. I match Anthems PPO premiums to all Anthem enrollees, with the understanding that some of these enrollees might be in the HMO plan. Anthems PPO enrollment has generally far exceeded its HMO enrollment in rating areas where both plans were offered.[30] The HMO version has higher premiums in several rating areas, which makes it perhaps unsurprising that the PPO version received the majority of enrollment.

I dropped observations from the raw data for several reasons related to coverage start and end dates. This was necessary to enable me to conduct the partial year coverage analysis presented in the main text. First, I dropped observations without a coverage start date as start date was a necessary variable for my partial year coverage analysis.[31] This resulted in 109 observations being dropped all from the 2014 coverage year. Second, I removed duplicate individual-year observations. This occurred occasionally, and when it did occur it was usually the result of an individual being moved from one version of a silver plan to another version which had better cost sharing (e.g. Kaiser Silver to Kaiser Enhanced Silver 73). I only kept each individuals latest selection in each coverage year. This results in 228,702 observations being dropped 62,599 from 2014, 106,385 from 2015, and 59,718 from 2016. Third, I dropped observations with a coverage end date which occurred either during open enrollment, or the immediate six weeks following the close of open enrollment. Open enrollment for each of the three open enrollments I analyzed ran from October 1, 2013 March 31, 2014, November 15, 2014 February 15, 2015, and November 1, 2015 January 31, 2016 for open enrollments 2014, 2015, and 2016, respectively.[32] I did this to remove plan selections in which an individual selected a plan, but never effectuated coverage by paying his first months premium. This resulted in 298,474 observations being dropped 97,913 from 2014, 122,230 from 2015, and 78,331

[30] https://www.coveredca.com/PDFs/7-27-CoveredCA-2016PlanRates-prelim.pdf

[31] I was told that an observation without a coverage end date listed implied that the individual maintained coverage for the entire coverage year. Thus, I coded all missing end dates as 12/31/20xx, where xx equaled either 14, 15, or 16.

[32] https://obamacarefacts.com/obamacare-open-enrollment/

from 2016.

I restricted the sample further by dropping observations where plan coverage tier was missing, age was missing or outside the range of 0-64, gender was missing, a household identifier was missing, household size was greater than five, and the income bracket of the individual was unavailable or below 138 percent of the federal poverty level (FPL).[33] I dropped any households where there was missing data on one or more of these dimensions. This procedure resulted in 453,089, 365,480, and 299,513 observations being dropped in 2014, 2015, and 2016, respectively.

Ultimately, I was left with 836,767, 1,156,196, and 1,177,727 individual plan enrollments for 2014, 2015, and 2016, respectively. This corresponds to 570,850, 798,708, and 830,796 household observations in the three years.

Mixed Logit Model

This section more fully describes the mixed logit model used in the main text of the chapter. The discussion here closely follows the discussion in Chapter 6 of Kenneth Trains Discrete Choice Methods with Simulation (Train 2009). For simplicity, the section discusses the mixed logit model in terms of a single choice by individuals. This discussion can be easily generalized to the case of repeated choices by individuals, which is the case analyzed in the main text of this chapter. Section (a) provides background on mixed logit models. Section (b) explains why dividing the default plan coefficient by the premium coefficient calculates the switching costs presented in the main text of the chapter.

a. Background

McFadden and Train (2000) show a mixed logit model can approximate any random

[33]Dropping observations with income below 138 percent FPL was done because these individuals face a significantly different plan choice problem from the rest of the individuals in the data as being below 138 percent FPL makes people eligible for Medicaid in California. Ages above 64 were dropped due to that populations Medicare eligibility.

utility model. Mixed logit models improve on standard logit models by allowing for random taste variation, unrestricted substitution patterns, and correlation in observed factors over time. Mixed logit models are defined by the functional form of their choice probabilities:

$$P_{ij} = \int L_{ij}(\beta) f(\beta) d\beta, \tag{A1}$$

where P_{ij} represents the probability that decision maker i chooses alternative j and $L_{ij}(\beta)$ is the logit probability evaluated at parameters β:

$$L_{ij}(\beta) = \frac{e^{V_{ij}(\beta)}}{\sum_{k=1}^{K} e^{V_{ik}(\beta)}}$$

and $f(\beta)$ is a density function. $V_{ij}(\beta)$ is the observed portion of the utility, which depends on parameter β. If utility is linear in β, which is the case for the model estimated in the main text (see equation (3)), then $V_{ij}(\beta) = \beta' x_{ij}$. If this is the case, then the mixed logit probability can be written as

$$P_{ij} = \int \frac{e^{\beta' x_{ij}}}{\sum_{k=1}^{K} e^{\beta' x_{ik}}} f(\beta) d\beta.$$

Any behavioral specification that leads to derived choice probabilities of the form (A1) is called a mixed logit model.

In most applications of mixed logit, $f(\beta)$ is specified to be continuous. In main text of this paper, $f(\beta)$ is specified to be normal with mean b and covariance W. The estimates of b and W are reported in Tables 8, A3, and A4.

The mixed logit model can be derived from utility-maximizing behavior in several ways. The most common way used in applications, and the method used in this chapter, is based on random coefficients. With random coefficients, the utility of person i from alternative j is

$$u_{ij} = \beta_i' x_{ij} + \epsilon_{ij}$$

where x_{ij} are observed variables about either the alternative or the individual, β_i' is a vector of coefficients of these variables that represent individual i's tastes, and ϵ_{ij} is a random error term that is iid extreme value. The coefficients vary over individuals with density $f(\beta)$.

If the researcher observed the β_i's, the the choice probability would be standard logit, since the ϵ_{ij}'s are iid extreme value. That is, the probability conditional on β_i is

$$L_{ij}(\beta) = \frac{\beta' x_{ij}}{\sum_{k=1}^{K} \beta' x_{ik}}.$$

Since the researcher does not know the β_i's, he cannot condition on β. Hence, the unconditional choice probability is the integral of $L_{ij}(\beta)$ over all possible values of β_i:

$$P_{ij} = \int \frac{\beta' x_{ij}}{\sum_{k=1}^{K} \beta' x_{ik}} f(\beta) d\beta. \tag{A2}$$

The researcher then specifies a distribution for (A2) and estimates the parameters of that distribution. In the main text, I specify $f(\beta)$ to be normal and estimate its mean and covariance.

b. Switching Cost Calculation

The main text presented

$$u_{ijt} = \alpha p_{ijt} + X_{ijt}'\beta + \gamma_{it}\mathbf{1}\{\text{Default}\}_{ijt} + \epsilon_{ijt}, \tag{4}$$

as the utility function of households.

A household's willingness to pay to keep its default plan is the decrease in premiums that keeps the household's utility constant if $\mathbf{1}\{\text{Default}\}_{ijt}$ changes from 1 to 0. Specifically, take the total derivative of utility with respect to premium and default plan and set

this derivative to zero (subscripts suppressed for simplicity):

$$du = \alpha dp + \gamma d\mathbf{1}\{\text{Default}\} = 0. \tag{5}$$

Solving this yields

$$WTP = \frac{dp}{\mathbf{1}\{\text{Default}\}} = -\frac{\gamma}{\alpha}, \tag{6}$$

which shows households' willingness to pay to avoid changing from their default plan (i.e. their switching cost) can be calculated by dividing the coefficient on the default plan variable by the coefficient on premiums.

References

McFadden, Daniel, and Kenneth Train. 2000. "Mixed MNL Models for Discrete Response." *Journal of Applied Econometrics* 15 (5):447-470.

Train, Kenneth E. 2009. *Discrete Choice Methods with Simulation*. 2 ed. Cambridge, MA: Cambridge University Press.

Appendix Tables and Figures

Table A1: Federal Poverty Level (FPL) and Associated Maximum Premium Contribution for 2016

	FPL					
	100%	138%	150%	200%	250%	400%
Individual	$11,670	$16,105	$17,505	$23,240	$29,175	$46,680
Family of Four	$23,850	$32,913	$35,775	$47,700	$59,625	$95,400
Max. Premium Contribution (% of income)	2.01%	3.31%	4.02%	6.34%	8.10%	9.56%

Source: Federal Register. "Annual Update of the HHS Poverty Guidelines."
https://www.federalregister.gov/documents/2014/01/22/2014-01303/annual-update-of-the-hhs-poverty-guidelines

Notes: The 2014 FPL for the 48 contiguous states and DC is presented above. This level is used for 2015 cost assistance and taxes filed by April 15, 2016. The maximum premium contribution is relative to the second-lowest-cost silver (benchmark) plan in a rating area. For example, the benchmark plan for an unsubsidized 40-year-old individual in San Francisco (Rating Area 4) cost $4,656 in annual premiums in 2016. A 40-year-old at 200% FPL would be responsible for 0.0634*23,240=$1,473 of that premium, which implies a premium subsidy of $3,183 (4,656-1,473). Premium subsidies can be applied to plan premiums of any coverage tier except the catastrophic tier.

Table A2: Standard Benefit Designs, 2016

	Actuarial Value	Annual Medical Deductible	Annual Out-of-Pocket Maximum
Catastrophic	N/A	N/A	$6,850
Bronze	60%	$6,000	$6,500
Silver	70%	$2,250	$6,250
200-250% FPL	73%	$1,900	$5,450
150-200% FPL	87%	$550	$2,250
100-150% FPL	94%	$75	$2,250
Gold	80%	$0	$6,200
Platinum	90%	$0	$4,000

Source: Covered California. http://www.coveredca.com/PDFs/2016-Health-Benefits-table.pdf
Notes: FPL=federal poverty level. Deductibles and out-of-pocket maximums in the table correspond to the levels for single coverage. Family deductibles and out-of-pocket maximums are double the single coverage levels.

Table A3: Alternative Choice Models, 138 – 150% FPL

	(1)	(2)	(3)	(4)
Annual Premium, $100, μ	-0.1829***	-0.4890***	-0.4960***	-0.5532***
	(0.0023)	(0.0102)	(0.0111)	(0.0165)
x Age	---	0.0062***	0.0063***	0.0055***
		(0.0002)	(0.0002)	(0.0003)
Deductible, $100, μ	-0.0041***	-0.0065	-0.0086*	-0.0079
	(0.0010)	(0.0043)	(0.0044)	(0.0085)
x Age	---	0.0000	0.0001	0.0002
		(0.0001)	(0.0001)	(0.0002)
Actuarial Value, μ	0.0937***	0.0775***	0.0759***	0.1249***
	(0.0021)	(0.0075)	(0.0076)	(0.0153)
x Age	---	0.0005***	0.0005***	0.0012***
		(0.0002)	(0.0002)	(0.0003)
Default Plan, 1/0	4.4656***	4.8681***	4.8687***	4.4913***
	(0.0458)	(0.1702)	(0.1705)	(0.2256)
x Age	---	-0.0115***	-0.0116***	-0.0037
		(0.0036)	(0.0036)	(0.0048)
Number of Random Coefficients	0	0	0	7
Heterogeneity in preferences for specific insurers	No	No	Yes (observed)	Yes (obs. + unobs. for "Big 4" insurers)
Observations	387,791	387,791	387,791	387,791
Choice Situations	17,871	17,871	17,871	17,871
Unique Households	12,021	12,021	12,021	12,021
Max. Alternatives	35	35	35	35
Log-likelihood	-23,820	-22,945	-22,918	-22,117
Switching cost at age 30	**$2,442**	**$1,493**	**$1,473**	**$1,128**
Switching cost at age 60	**$2,442**	**$3,571**	**$3,536**	**$1,913**

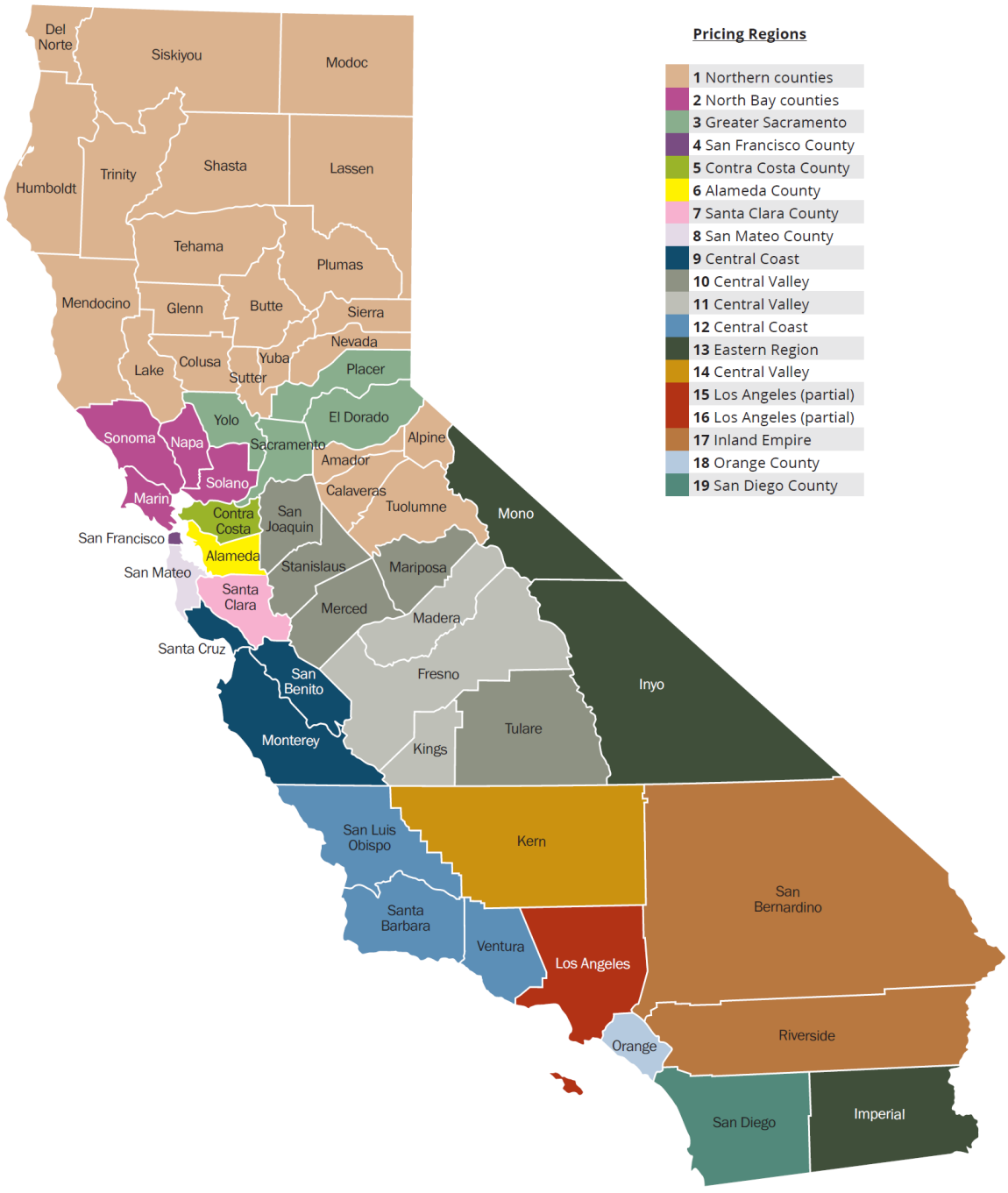
Notes: All models include insurer and insurer x age fixed effects. *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$

Table A4: Alternative Choice Models, 400+% FPL / Unsubsidized

	(1)	(2)	(3)	(4)
Annual Premium, $100, μ	-0.0345***	-0.1158***	-0.1150***	-0.2442***
	(0.0013)	(0.0061)	(0.0062)	(0.0118)
x Age	---	0.0015***	0.0015***	0.0026***
		(0.0001)	(0.0001)	(0.0002)
Deductible, $100, μ	-0.0106***	-0.0158***	-0.0160***	-0.0260***
	(0.0009)	(0.0028)	(0.0028)	(0.0041)
x Age	---	0.0001	0.0001***	0.0003***
		(0.0001)	(0.0001)	(0.0001)
Actuarial Value, μ	-0.0192***	0.0149**	0.0135*	0.0298***
	(0.0023)	(0.0071)	(0.0071)	(0.0110)
x Age	---	0.0007***	0.0006***	0.0010***
		(0.0002)	(0.0002)	(0.0002)
Default Plan, 1/0	4.7771***	5.2465***	5.2533***	4.9559***
	(0.0465)	(0.1531)	(0.1533)	(0.1762)
x Age	---	-0.0111***	-0.0114***	-0.0120***
		(0.0034)	(0.0034)	(0.0040)
Number of Random Coefficients	0	0	0	7
Heterogeneity in preferences for specific insurers	No	No	Yes (observed)	Yes (obs. + unobs. for "Big 4" insurers)
Observations	254,582	254,582	254,582	254,582
Choice Situations	11,742	11,742	11,742	11,742
Unique Households	7,469	7,469	7,469	7,469
Max. Alternatives	35	35	35	35
Log-likelihood	-23,072	-22,967	-22,939	-22,485
Switching cost at age 30	**$13,847**	**$6,940**	**$7,016**	**$2,765**
Switching cost at age 60	**$13,847**	**$17,754**	**$18,277**	**$4,803**

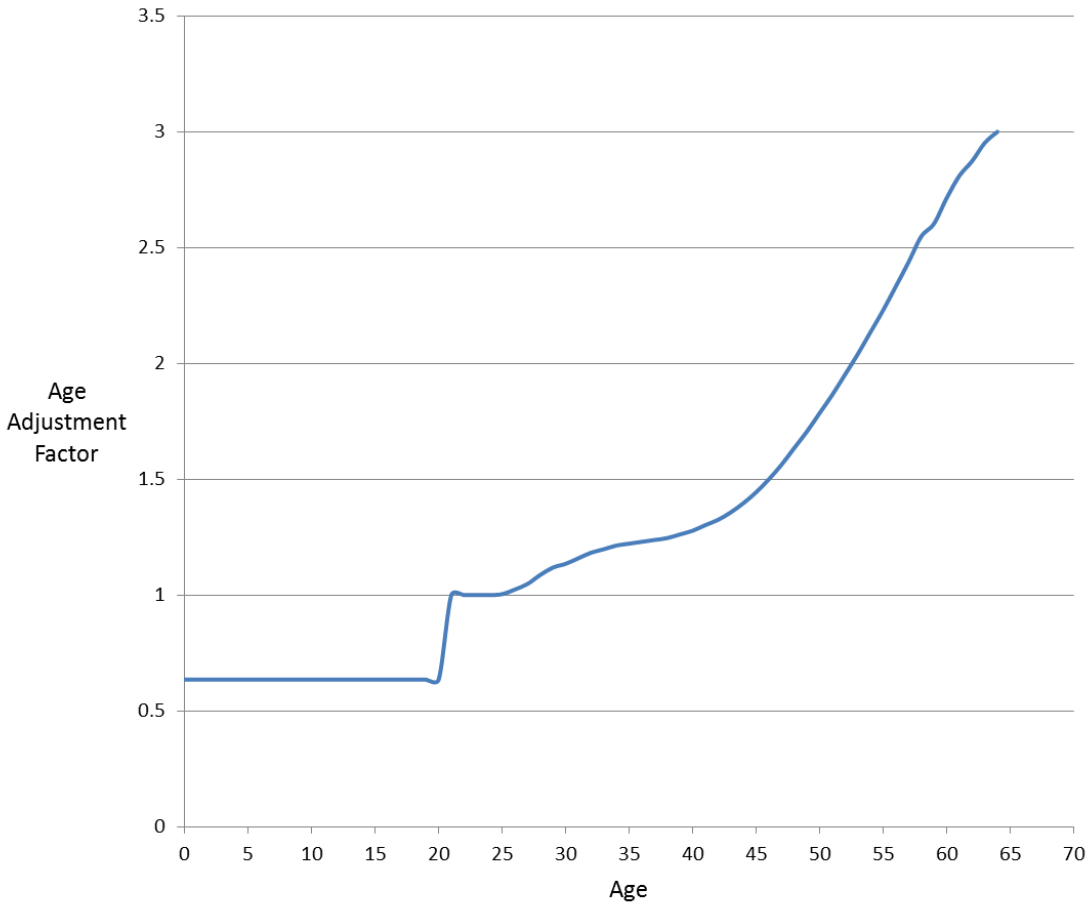
Notes: All models include insurer and insurer x age fixed effects. *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$

Figure A1: Covered California Rating Areas



Source: Covered California. 2014. "Health Insurance Companies and Plan Rates for 2015." https://www.coveredca.com/PDFs/CC-health-plans-booklet-2015.pdf

Figure A2: HHS Default Standard Age Curve



Source: Centers for Medicare & Medicaid Services. "Sub-Regulatory Guidance Regarding Age Curves, Geographical Rating Areas and State Reporting." https://www.cms.gov/CCIIO/Resources/Files/Downloads/market-reforms-guidance-2-25-2013.pdf