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The Health Insurance Exchanges of the Affordable Care Act

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in Economics

by

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ABSTRACT

The Health Insurance Exchanges of the Affordable Care Act

by

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This dissertation consists of three chapters that analyze the Affordable Care Act (ACA)'s Health Insurance Exchanges.

The first chapter analyzes plan choice in Covered California, the state-based Exchange of California. Specifically, I analyze three aspects of plan choice: partial year coverage, dominated 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 dominated choices shows enrollees to be 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 that household plan switching costs range from $1,000 to $5,000, depending on the age and income of households.

The second chapter is joint work with Richard Scheffler, Brent Fulton, and Sherry Glied and was published in the May 2016 issue of *Health Affairs*. The chapter analyzes how health plan, hospital, and medical group market concentration impacted the growth of health insurance premiums between 2014 and 2015 in two ACA state-based Exchanges: Covered California and NY State of Health. The results show that both states exhibited a positive association between hospital concentration and premium growth. Our results for health plan concentration differed between two states: it was positively association with premium growth in New York, but negatively associated with premium growth in California. We suggest the health plan concentration finding in Covered California may be the result of the Exchange selectively contracting with health plans.

The third chapter is joint work with Jon Gabel, Brent Fulton, Sam Stromberg, Matthew Green, Heidi Whitmore, and Richard Scheffler and was published in the January 2017 issue of *Health Affairs*. The chapter analyzes differences between "offered" premiums (a straight average across plan premiums) and "purchased" premiums (an enrollment-weighted average of plan premiums) on Covered California. We find purchased premiums are 10 to 15 percent lower than offered premiums and premium growth is lower by 2 percentage points when measured using purchased premiums as opposed to offered premiums.

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I. Plan Choice in the ACA Exchanges: Evidence from Covered California

A. 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 Exchange of California, to comment on three aspects of Exchange plan choice: (1) partial year coverage, (2) dominated 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] 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).

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

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 dominated 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 (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.

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[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).

[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.

The interest of this paper in terms of dominated 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 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

[4] Technically, incomes between 100 and 250 FPL are eligible for cost-sharing reductions. I've 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.

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

[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.

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 $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 B provides an institutional background of the ACA Exchanges. Section C discusses the role adverse selection, one of the major impediments to efficient health insurance markets, plays in the Exchanges. Section D 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 E describes the data used to conduct the analysis in the paper while Section F provides descriptive evidence of partial year coverage, dominated plan choice, and plan switching. Section G describes the econometric models used for analysis while Section H presents the estimates from these

models. In Section I, several alternative model specifications are estimated to access the robustness of the estimates of the baseline consumer choice model used in the paper. Section J discusses the policy implications of the results and Section K concludes.

B. 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 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

[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.

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

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 percent 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

[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).

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).

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

[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.

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:

[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.

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]

C. 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."

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

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 individuals 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,

[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.

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).

D. 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 E.

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

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

where the second term implies that a firm's future value may depend on its current market share. The first-order condition for optimal pricing is

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

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.

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

E. 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, 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),

[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/

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% FPL bracket, at 34 percent of plan selections, is the most represented 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 F, 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 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.

[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.

F. Descriptive Evidence

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+% 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.

2. Dominated 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

[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

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 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.[23] 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.

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premiums than silver plans, probably makes the platinum plan the wrong choice for many households as well.

[23] The average age of 138 to 150 FPL households that selected bronze plans was 37 in the data. The average age of 138 to 150 FPL households that selected silver plans was 42 in the data. The $792 quoted as the average premiums for silver plans was age-adjusted to represent the average premiums of a 37-year-old household in order to make premiums comparable.

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.

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.

G. Econometric Models

1. Correlation between Enrollment and Past Prices

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

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

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 coverage tier fixed effect in x_{jmt}. As financial characteristics of Covered California plans are standardized within tiers, plans mostly 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 notorious 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 period.

Table 7 presents the coefficient estimates that result from the estimation of equation (2). The dependent variable in Table 3 is the natural log of a plan's 2016 market share. The two independent prices 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 insurer 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 monthly premium in column (1) shows this to be the case.

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, regulatory 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:

$$u_{ijt} = \alpha p_{ijt} + X'_{ijt}\beta + \gamma_{it} 1[Default]_{ijt} + \epsilon_{ijt}, \qquad (3)$$

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, $1[Default]_{ijt}$ 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.[24] Additionally, I allow for unobserved heterogeneity in the model, by including random coefficients on the premium, deductible, and actuarial value.[25] 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

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

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

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.

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.

H. 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.[26] 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 x 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 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

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

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.[27] 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.[28]

I. 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

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

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

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 $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.

J. 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.[29] 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

[29] 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.

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 Foundation 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).

K. 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 dominated 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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M. 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	0.27	0.25	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: HH = household, Indiv = individual, Yr = year.

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

	All Enrollees	Open Enrollment Enrollees	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	$p < 0.01$
<u>Age</u>				
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	$p < 0.01$
<u>Household Size</u>				
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	$p < 0.01$
<u>Income</u>				
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	$p < 0.01$
<u>Coverage Tier</u>				
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: 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: HH = household, Indiv = individual, Yr = year. Certified agent refers to a certified insurance agent (1,273,753), certified enrollment counselor (163,026), or a certified 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+	14.5	12.9

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+	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: HH = household, Indiv = individual, Yr = year, Obs = observations.

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	-0.87***
	(0.022)	(0.022)
Tier FE	Yes	Yes
Carrier FE	Yes	Yes
Observations	399	399
R^2	0.666	0.744

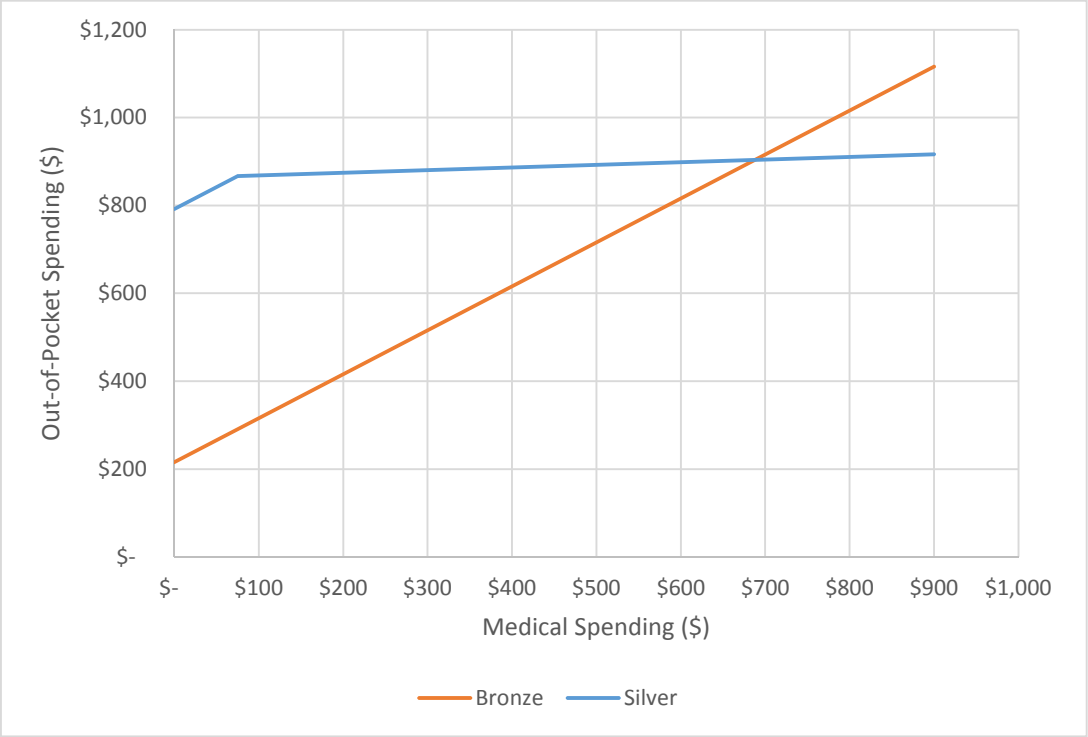
Notes: OLS regressions. Dependent variable: log of plan market share for new or continuing enrollees in year 2016. Monthly prices are measured in $10s. Heteroskedasticity robust standard errors, clustered at the carrier level, are in parentheses. *** $p < 0.01$

Table 8: Choice Model Parameter Estimates

	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**

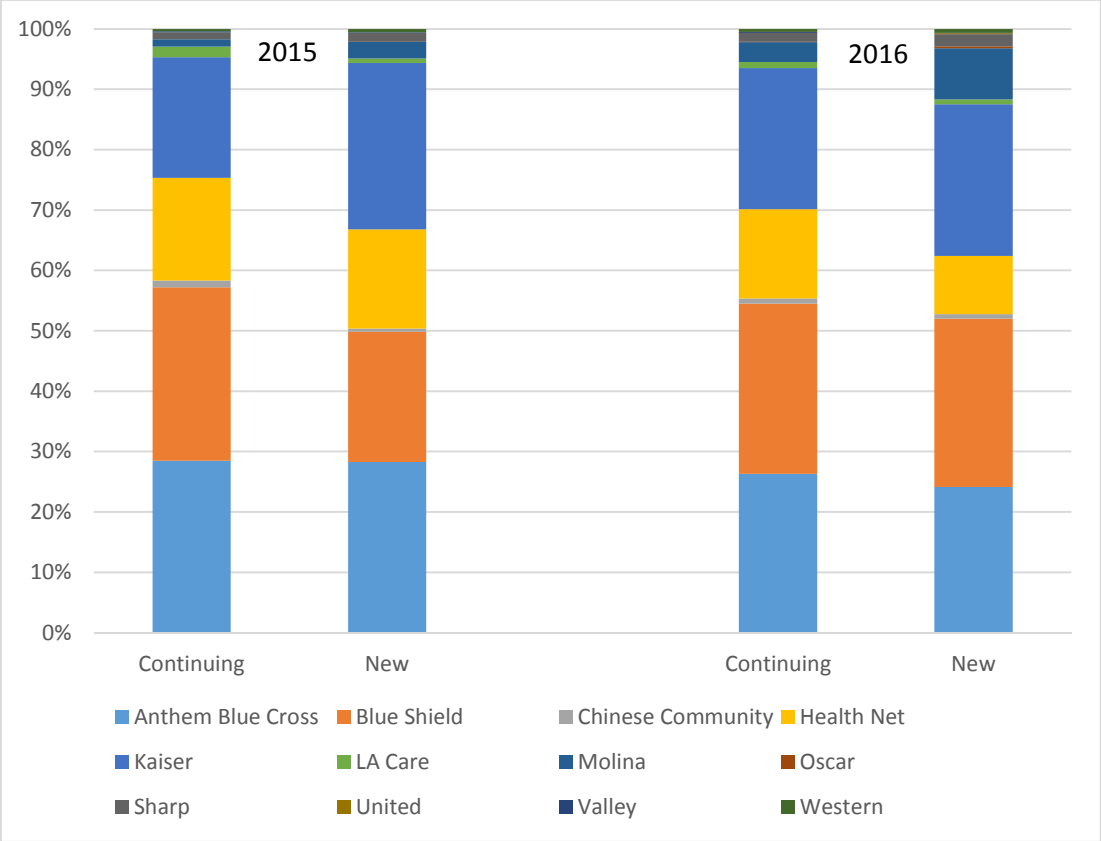
Notes: All models include insurer and insurer x age fixed effects. Estimates are structural coefficients from the mixed logit model specified in the main text, not marginal effects. *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$

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 2, 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 individual's 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



N. 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.[30] 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.

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

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, while its HMO was offered in eight. I match Anthem's PPO premiums to all Anthem enrollees, with the understanding that some of these enrollees might be in the HMO plan. Anthem's PPO enrollment has generally far exceeded its HMO enrollment in rating areas where both plans were offered.[31] 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.[32] 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 individual's 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

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

[32] 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.

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.[33] I did this to remove plan selections in which an individual selected a plan, but never effectuated coverage by paying his first month's premium. This resulted in 298,474 observations being dropped – 97,913 from 2014, 122,230 from 2015, and 78,331 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).[34] 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.

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

[34] 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 population's Medicare eligibility.

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 Train's *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 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:

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

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 in 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 this chapter, $f(\beta)$ 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, then 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

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

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

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

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

b. Switching Cost Calculation

The main text presented

$$u_{ijt} = \alpha p_{ijt} + X'_{ijt}\beta + \gamma_{it} 1[Default]_{ijt} + \epsilon_{ijt},$$

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 $1[Default]_{ijt}$ 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):

$$du = \alpha dp + \gamma d1[Default]_{ijt} = 0.$$

Solving this yields

$$WTP = \frac{dp}{d1[Default]_{ijt}} = -\frac{\gamma}{\alpha},$$

which shows households' willingness to pay to avoid changing from their default plan (i.e. their switching cost) can be calculated by diving 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

	Federal Poverty Level (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 fixed effects. *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$

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

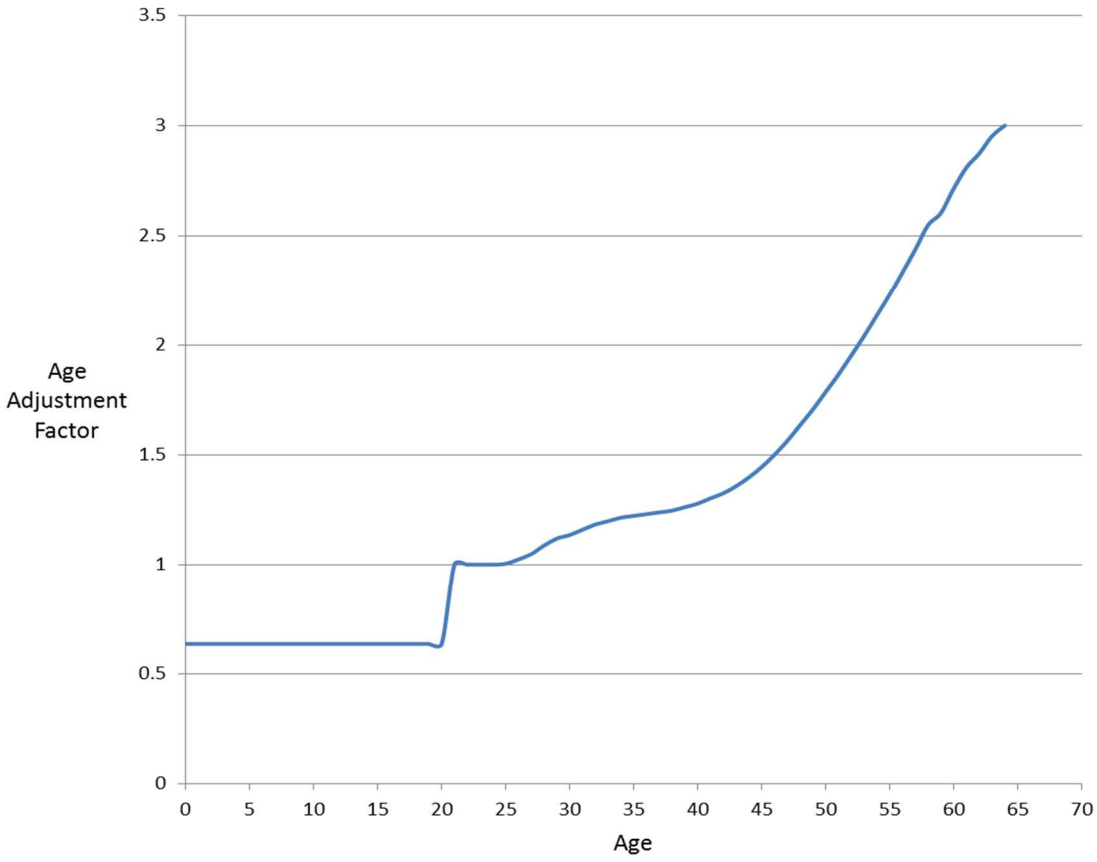
	(1)	(2)	(3)	(4)
Annual Premium, $100, μ	-0.0345***	-0.1158***	-0.1150***	-0.2442***
	(0.0013)	(0.0061)	(0.0062)	(0.0118)
x Age	---	0.0015***	0.0015***	0.0026***
		(0.0001)	(0.0001)	(0.0002)
Deductible, $100, μ	-0.0106***	-0.0158***	-0.0160***	-0.0260***
	(0.0009)	(0.0028)	(0.0028)	(0.0041)
x Age	---	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 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://coveredca.com/PDFs/CC-health-plans-booklet-2015.pdf

Figure A2: Health and Human Services (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

II. Differing Impacts Of Market Concentration On Affordable Care Act Marketplace Premiums

A. Introduction

In July 2015, two major health plan mergers were announced: Anthem announced a $54 billion deal to buy Cigna, and Aetna announced a $37 billion deal to buy Humana. If these mergers pass regulatory scrutiny, the field of large national health plans will decrease from five to three, with UnitedHealthcare being the third. Medical providers are also merging. From 2010 to 2014, hospital mergers and acquisitions increased by 44% (Benoit 2015). What impact will all this consolidation have on consumers? In particular, how will health insurance premiums change as a result of these mergers? These timely questions motivate us to examine the relationship between health insurance premiums and both health plan and provider market power in the Affordable Care Act (ACA) Marketplaces (or Exchanges).

Health plans take on risk and serve as intermediaries between consumers and medical providers, including hospitals and medical groups. On the one hand, consolidation

could produce scale economies for health plans and give them increased leverage in negotiations with hospitals and medical groups: both of which position health plans to potentially offer lower premiums to consumers. On the other hand, higher premiums are possible from plans exercising their increased market power. The impact of health plan consolidation will likely vary across markets. For example, a health plan's negotiation leverage with a provider partially depends on the plan's ability to exclude a provider from its networks, which may not be possible in markets with few providers because of consumer preferences or network adequacy requirements.

This study explores the impact of health plan, hospital, and medical group market power on the growth of health insurance premiums between 2014 and 2015 in Covered California and New York State of Health, two of the ACA's state-based Marketplaces. We selected these states because they both release health plan premium and enrollment data at the rating area-level, and because they are two large and important states with different active purchaser Marketplace policies (Dash et al. 2013). Covered California stipulates a standard benefit design, and selectively contracts and directly negotiates premiums with health plans. New York State of Health serves as a market organizer that manages product choices and places limits on the number and type of products that health plans can offer, but does not selectively contract with health plans. New York State of Health also has a standard benefit design requirement, but allows health plans to offer up to three non-standard products per county (New York State of Health 2014b).

B. Impact of Health Plan and Provider Concentration on Premiums

In this section, we review studies on hospital, medical group, and health plan concentration.[1]

1. Provider Concentration

Numerous studies have looked at the impact of hospital concentration on hospital prices (Gaynor and Town 2012). Overall, these studies suggest that greater hospital concentration is associated with higher hospital prices. Hence, we expect hospital concentration to be positively associated with premium growth.

Until recently, there had been little work addressing how medical group concentration impacts physician prices. In 1983, 20% of physicians worked in practices with 11 or more physicians, but by 2014, this percentage almost doubled to 39% (Kane 2015). With more physicians joining medical groups, studies show that today's physicians have the market power to negotiate higher reimbursement prices (Berenson et al. 2012, Dunn and Shapiro 2014, Sun and Baker 2015).

2. Health Plan Concentration

Unlike the case of provider concentration, where higher concentration is expected to lead to higher prices, the impact of health plan concentration on premiums is theoretically ambiguous (Dafny, Duggan, and Ramanarayanan 2012, Ho and Lee 2016). As found in a number of studies, greater plan concentration can lead to higher premiums as health plans exercise market power over purchasers (Dafny, Duggan, and Ramanarayanan 2012, Starc

[1] For early evidence on the impact of hospital, medical group, and health plan market concentration on Covered California premiums, see Scheffler, Richard M., Eric Kessell, and Margareta Brandt. 2015. Covered California: The Impact of Provider and Health Plan Market Power on Premiums. *Journal of Health Politics, Policy and Law* 40 (6): 1179-1202.

2014, Ericson and Starc 2015, Guardado, Emmons, and Kane 2013, Trish and Herring 2015). Although studies have found greater plan concentration has given health plans the necessary bargaining power to negotiate lower provider prices (Melnick, Shen, and Wu 2011, Moriya, Vogt, and Gaynor 2010), there is little evidence that these savings are then passed through to consumers in the form of lower premiums (Trish and Herring 2015, Dafny, Duggan, and Ramanarayanan 2012).

Pass through to consumers becomes more likely as the competitiveness of the health insurance market and the threat of market entry by other plans both increase. Pass through may also be more likely in light of changes made by the Affordable Care Act. Health insurance premiums are now heavily regulated via federal and state rate review authority and the federal medical loss ratio requirement (Fulton et al. 2015). State prior approval authority over rates was found to be associated with lower health insurance premium growth from 2010 to 2013 in the individual market (Karaca-Mandic et al. 2015). Victor Fuchs and Peter Lee argue savings pass through will occur because the federal medical loss ratio requires health plans in the individual market to spend 80% of every premium dollar on consumer medical claims and activities that improve the quality of care (Fuchs and Lee 2015).

There has been very little research on the effects of plan concentration in the post-ACA period. Early evidence from the Marketplaces suggests that increased health plan competition leads to lower premiums. Leemore Dafny and colleagues study the impact of competition on premiums by exploiting variation in rating area-level competition induced by UnitedHealthcare's decision not to participate in any of the federally-facilitated Marketplaces during the first year of open enrollment (Dafny, Gruber, and Ody 2015). The

authors estimate that the second-lowest-price silver premium (which is linked to federal subsidies) would have decreased by 5.4%, on average, had UnitedHealthcare participated.

C. Study Data and Methods

1. Health Insurance Premiums

Health insurance premium data are from Covered California and New York State of Health for the 2014 and 2015 plan years (Covered California 2015a, New York State of Health 2015b). In each state, there are five coverage tiers with the following actuarial values (percent of medical expenses covered by the plan for an average individual): catastrophic (<60%), bronze (60%), silver (70%), gold (80%), and platinum (90%). We focus our analyses on silver tier premiums, because the majority of plan enrollment – 63% in California and 58% in New York – is in the silver tier in 2015 (Covered California 2015b, New York State of Health 2015a).

In California, we focus on premiums for 40-year-old individuals. Because premiums for other ages are proportional to 40-year-old premiums, our results would be similar for different age groups. In New York, premiums are the same for each age group because New York does not allow age-based pricing.

An observation in our dataset is the premium of a standard benefit product that was observed in both years.[2] Each standard product is defined by a health plan, rating area, and

[2] We excluded the nonstandard products that New York health plans are allowed to offer because it was not feasible to examine how each plan's benefit design change between 2014 to 2015 might have affected premium changes. The standard benefit designs in California and New York appeared to be very similar within each state in 2014 and 2015; any changes would affect every plan (within the same state) equally and likely leave our conclusions unchanged.

product type (HMO, EPO, PPO, and POS). In both states, most health plans offered only one standard product in a rating area. In California, there were 91 and 90 observations in 2014 and 2015, respectively, and 82 of these observations were in both years. In New York, there were 64 and 63 observations in 2014 and 2015, respectively, and 57 of these were in both years. Neither California nor New York had significant insurer entry into or exit out of their Marketplaces between 2014 and 2015. California had one plan exit (Contra Costa Health Plan). New York had one plan enter (Wellpoint of New York) and one plan exit (Today's Options of New York). Each of these one-year plans had less than 1% of statewide Marketplace enrollment in 2014.

2. Concentration Measures

For each rating area, we calculated health plan, hospital, and medical group Herfindahl-Hirschman Indices (HHI).[3] HHI is calculated by squaring the market shares of each firm and then summing the values across all firms.[4] HHI ranges from zero to 10,000, with 10,000 corresponding to a market with one firm. The Horizontal Merger Guidelines, published by the U.S. Department of Justice and the Federal Trade Commission, classifies markets by HHI as follows: unconcentrated (below 1,500), moderately concentrated (between 1,500 and 2,500), and highly concentrated (above 2,500) (U.S. Department of Justice and the Federal Trade Commission 2010). Increases in HHI are thought to be associated with a decrease in competition and an increase of market power.

[3] As a sensitivity analysis, we substituted the number of plans in a rating area for health plan Herfindahl-Hirschman Index (HHI). Our results were directionally the same. We think significant health plan enrollment differences make our HHI more appropriate.

[4] For instance, the Herfindahl-Hirschman Index for a three-firm market with a 30 percent, 30 percent, 40 percent market share split would be $30^2 + 30^2 + 40^2 = 3{,}400$.

We calculated rating area health plan HHIs in California and New York using ACA Marketplace rating area enrollment shares for 2014 (Covered California 2015a, New York State of Health 2014a). We calculated rating area hospital and medical group HHIs using county-level HHIs. When a rating area included two or more counties, we weighted county-level HHIs based on the county's population in order to calculate rating area HHIs. Hospital market shares were based on the number of hospital beds using data from the American Hospital Association's 2010 Annual Hospital Survey. Medical group market shares were based on the number of physicians in a group using data from the 2011 IMS Physician Insights database.

3. Healthcare Cost Adjustment

The Medicare hospital prospective payment system (PPS) adjusts payments to hospitals based on the local market conditions facing each hospital, including wage rates. We use the FY 2015 Medicare area wage index tables to control for rating area differences in the cost of providing care (Centers for Medicare and Medicaid Services 2015).

4. Statistical Models

Our statistical models are designed to align with how health plans set premiums. Plans set 2015 premiums by starting with 2014 premiums, which we included in our model, and then make adjustments based on how healthcare expenditures compared to these premiums. Healthcare expenditures are driven by healthcare utilization, which we could not model, and unit prices, which we modeled using plan and provider concentration measures as well as the Medicare area wage index. Finally, plans may adjust premiums based on their goals, such as wanting to gain market share with lower premiums versus short-term profits with higher premiums.

Formally, we use a multivariate regression model to estimate the association between 2014 to 2015 premium growth and market concentration. Our model is estimated separately for California and New York. We regress 2015 premiums on health plan HHI (in 2014), hospital HHI, medical group HHI, and the Medicare area wage index. Importantly, we also control for 2014 premiums, which gives our model the interpretation of a growth in premiums.

We natural logged each variable to limit the influence of outliers and allow our coefficients to be interpreted as elasticities. Our coefficients should be interpreted as follows: for a 1% increase in an HHI variable, we would expect an approximate β% increase in 2015 premiums (the dependent variable), where β is the regression coefficient of the HHI variable. Because premiums are correlated at the rating area-level, we cluster standard errors by rating area.

We tested two alternative premium growth model specifications to test the sensitivity of our results. The first alternative kept the log-log model form, but used the difference of logged premiums as the dependent variable. This model produced similar results to our primary model.[5] We also estimated a log-level version of the model where the concentration variables were levels. In this verison, the results were directionally the same, but with some reduced statistical significance.[6] In the end, we selected the lagged premium log-log model

[5] The health plan Herfindahl-Hirschman Index regression coefficients' p values had the same statistical significance as our primary models for California and New York ($p < 0.10$ and $p < 0.01$, respectively).

[6] The health plan Herfindahl-Hirschman Index regression coefficient p value was approaching statistical significance in California ($p = 0.21$) and had the same statistical significance as our primary model in New York ($p < 0.01$).

because it accounts for a non-linear impact of our concentration measures and is less sensitive to outliers.

5. Limitations

In our regression model we were not able to separate the impact of adjusting 2015 premiums for actuarial reasons versus exercising market power. Some health plans in 2014 may have underpriced relative to the health risk of the actual enrollees – above and beyond the risk compensated by risk adjustment, reinsurance, and risk corridors – causing them to raise premiums. However, we do not think these adjustments necessarily impact our results, because they likely occurred across rating areas, including rating areas with a low, moderate, or high health plan HHI.

Our health plan concentration measures are based only on Marketplace enrollment, but a plan's market power is derived from all lines of business, including the individual market outside the Marketplaces, the employer-sponsored market, Medicare Advantage, and Medicaid managed care. For the major health plans in California, Marketplace enrollment shares generally reflect the shares across the commercial insurance market. Based on this measure in 2013, the top four health plans (percent of total commercial enrollment) were as follows: Kaiser Permanente (42%), Anthem (20%), Blue Shield (15%), and Health Net (6%), for a combined share of 83% (Cothran 2015). These four health plans also had the largest shares of enrollment in the California ACA Marketplace; their combined share was 95% in 2015 (see Exhibit A1 in the Appendix).

In contrast, New York Marketplace enrollment shares are less closely linked to enrollment shares over the entire private insurance market, partly because Health Republic Insurance New York and Fidelis Care, the two health plans with the most Marketplace

enrollment, do not offer employer-sponsored insurance. Therefore, as a sensitivity analysis, we estimated additional regression models excluding Health Republic Insurance New York and Fidelis Care plans in New York and found results similar to those derived from the model when all plans were included (the latter is shown in the Appendix, Exhibit A2).

Another limitation could be endogeneity in the form of premiums influencing concentration measures (i.e., reverse causation) could bias our parameter estimates. For example, plans may choose to enter rating areas where premiums are already excessive, and thus influence the health plan HHI measure. If the rating areas charging excessive premiums were correlated with health plan HHI, then health plan entry would result in reverse causation (expected premiums influencing concentration). We have reduced the potential impact of this issue by lagging our concentration measures so that they are measured at points in time prior to when premiums are set.

Our provider concentration data are from 2010 for hospitals and from 2011 for medical groups. Therefore, our data do not capture the effects of numerous more recent hospital and medical group mergers, which introduces measurement error (biasing the parameter estimates toward zero) and understates our provider HHI measures (biasing the parameter estimates upward). Notably, however, this timing does capture the effects of New York State's statewide hospital restructuring between 2005 and 2008, when one-fourth of all hospitals in the state were reconfigured – closed, merged, or reduced in size (New York State Department of Health 2015). Due to data limitations, our study does not explore the effects of vertical integration – when hospitals and medical groups or other types of providers merge, which have become increasingly common (Kane 2015).

D. Study Results

Exhibit 1 includes a California and New York panel that reports 2014 and 2015 silver plan premium means as well as health plan, hospital, and medical group HHIs for each rating area. In California, the mean premium across rating areas increased from $335 to $348 (or 3.9%) between 2014 and 2015, with the increase ranging from 1.2% to 6.3% by rating area. In New York, the parallel increase was from $423 to $431 (or 1.9%), with the change ranging from -4.9% to 7.7% by rating area.

In 2014, the health plan markets in California and New York were highly concentrated with mean HHIs of 3,763 and 2,750, respectively, and with the HHI ranging by rating area from 2,228 to 8,319 in California and from 1,171 to 3,598 in New York. For health plan-level detail, Exhibit A1 in the appendix reports each health plan's statewide Marketplace enrollment share for 2014 and 2015 (see Appendix).

The hospital and medical group HHIs also significantly varied across rating areas in each state (see Exhibit 1). The hospital markets in California and New York were moderately to highly concentrated with mean HHIs of 2,259 and 3,708, respectively. The rating area mean medical group HHIs in California and New York were 776 and 423, respectively, well below the Horizontal Merger Guidelines' moderately concentrated HHI threshold of 1,500 (U.S. Department of Justice and the Federal Trade Commission 2010).

The full results of our premium growth regression model for California and New York are shown in the online Appendix, Exhibit A2. In both California and New York, hospital HHI is positively associated with 2015 premiums ($p=0.04$ and $p<0.01$, respectively). Because the regression model controls for 2014 baseline premiums, these results can be interpreted as hospital HHI being positively associated with 2014 to 2015

premium growth. We find a positive, but not statistically significant, association between medical group HHI and 2015 premiums in both California and New York.

We find a differing impact of health plan HHI on premium growth in the two states. In California, health plan HHI is statistically significant and negatively associated with 2014 to 2015 premium growth ($p=0.06$). The regression model for California predicts a 3.3% growth in the mean premium ($324 to $334) from 2014 to 2015.[7] Based on the model's results, a 10% increase in health plan HHI would have reduced this growth rate to 3.0%; and a 10% increase in hospital HHI would have increased the original growth rate of 3.3% growth rate to 3.4%. The method used to compute these growth rates is outlined in the online Appendix.

In New York, we observe a positive and significant association between health plan HHI and premium growth ($p<0.01$). The regression for New York predicts a 2.1% growth in premiums ($426 to $435) from 2014 to 2015. According to our regression model's results, a 10% increase in health plan HHI would have increased this growth rate to 3.0%; and a 10% increase in hospital HHI would have increased the original 2.1% growth rate to 2.7%.

Exhibit 2 graphs the premium growth rate predictions for California based on our premium growth regression model (see Exhibit A2 in the online Appendix). In order to calculate the growth rate from our regression results, the 2015 premium that our model predicts is compared to the 2014 premium mean that we are holding fixed. The 2014 premium mean of our California product-level observations is $324. At health plan HHI=2,500, our regression model predicts a 2015 monthly premium of $334. This implies a

[7] As our model was estimated at the product level, the mean premiums discussed here were computed at that level and hence differ from the rating area-level mean premiums presented in Exhibit 1.

premium growth rate of [(334-324)/324]*100=3.1%. At health plan HHI=5,000, our model predicts a 2015 premium of $326. Hence, we predict the growth rate at health plan HHI=5,000 to be [(326-324)/324]*100=0.6%.

Exhibit 3 is the New York version of Exhibit 2. The 2014 premium mean of our New York product-level observations is $426. Hence, at health plan HHI=2,500 we predict a premium growth rate of [(428-426)/426]*100=0.5%. At health plan=3,500 we predict a premium growth rate of [(442-426)/426]*100=3.8%.

E. Discussion

In Covered California and New York State of Health, two large Affordable Care Act state-based Marketplaces, we found that health plan premium growth between 2014 and 2015 was associated with hospital market concentration. In both states, more concentrated hospital markets were associated with higher premium growth. This result aligns with the broad literature on hospital concentration and premiums/prices (Gaynor and Town 2012). We also found a positive, but not statistically significant, association between medical group concentration and premium growth.

Interestingly, we found more concentrated health plan markets were associated with lower premium growth in California, yet higher premium growth in New York. The differences in California and New York may be due to differences in health plan goals as well as regulatory authority and enforcement in these states. In New York, we find higher health plan concentration being associated with higher premium growth. This finding is consistent with the empirical evidence that increased health plan market power will lead to higher premiums (Dafny, Duggan, and Ramanarayanan 2012, Starc 2014, Ericson and Starc

2015, Guardado, Emmons, and Kane 2013, Trish and Herring 2015). In particular, our finding in New York is consistent with the findings of Gabel et al. who -- in a national study of the ACA Marketplaces -- found that the addition of a health plan in a rating area was associated with an average decline in premiums of about 2% from 2014 to 2015 (Gabel et al. 2015). It should be noted at this point that the premium increases in New York could have been larger. Although New York State of Health does not directly negotiate premiums, the state has prior approval authority over health insurance rates, potentially reducing some of the premium growth (Karaca-Mandic et al. 2015).

In contrast, for California we find that higher health plan concentration is associated with lower premium growth. One possibility is that health plans in rating areas with a higher market concentration may have focused on maintaining or growing market share versus profits in the short run, leading to lower premium growth.

Another possibility stems from Covered California's authority to selectively contract and directly negotiate with plans. Although the two insurance regulators in the state – California Department of Managed Health Care and California Department of Insurance – do not have prior approval authority over rates, one could argue that Covered California's negotiations with plans has the force of prior approval authority. Health plan profits may have been higher in markets that were more concentrated, due to their stronger negotiating position with providers. Covered California may have been able to use its regulatory authority to obtain a larger reduction in profits in these markets, leading to lower premiums. Both of these possibilities are consistent with the positive correlation between health plan concentration and premium growth.

1. Policy Implications

Our results have a number of policy implications regarding providers and health plans. According to a recent report, hospital mergers and acquisitions increased by 44% from 2010 to 2014 (Benoit 2015). On the one hand, provider consolidation has the potential to reduce costs through economies of scale. However, there is very little evidence that horizontal mergers between hospitals generate efficiency or quality (Gaynor and Town 2012). Hence, it is important for regulators to monitor hospital consolidation trends and to prevent mergers that harm competition.

With respect to health plan concentration, our differing results in California and New York make a one-size-fits-all policy recommendation more nuanced, but we see promise in two policy tools: (1) selective contracting/direct premium negotiation with health plans, and (2) prior approval authority for health insurance rates. Besides California, only Massachusetts, Rhode Island, and Vermont operate Marketplaces that selectively contract with health plans (Dash et al. 2013). Our results from California lend support to the idea that selective contracting/direct premium negotiation leads to lower growth in premiums. Covered California officials directly negotiated premiums with health plans and were selective in which health plans they allowed to enter the Marketplace. The threat of being excluded from the Marketplace was a significant source of leverage for Covered California during health plan negotiations. We see direct premium negotiation as a promising path forward for the Marketplaces, especially for Marketplaces in states that lack prior approval authority over rates.

Currently, over half the states (including New York, but excluding California) have prior approval authority over health insurance rates (Karaca-Mandic et al. 2015). For

example, in 2015, health plans in New York requested a 13% average increase in individual market premiums, but prior approval authority enabled New York officials to reduce the average increase to 6% (New York Department of Financial Services 2015). However, our results suggest that health plans may have still been able to exercise market power, but prior approval authority may have partially mitigated their ability. State officials could not be overly stringent with rate reductions in the early years of the New York Marketplace, because it may have hindered health plan Marketplace entry and continuity. A recent federal bill introduced by Sen. Dianne Feinstein (CA) and Rep. Jan Schakowsky (IL) seeks to give the U.S. Secretary of Health and Human Services the power to block premium increases determined to be unreasonable in the states that lack prior approval authority (California Healthline 2015).

Ultimately, there may be a "tipping point" to health plan consolidation. Health plan consolidation may enable insurers to reduce costs through economies of scale and serve as a counterweight to provider market power. However, there is likely a point where increasing an insurer's size further leads to no meaningful efficiency gains and gives the insurer a level of market power that translates to higher-priced, lower-quality products for consumers. The insurer size that begins to tip this scale is an important empirical question that deserves further study.

The ACA Marketplaces provide a natural laboratory for studying the effects of competition and market power. The Marketplaces' structured competition among health plans, product standardization, and data transparency are valuable in enabling this research effort. We foresee further research of the Marketplaces providing important insights into whether competition is operating effectively in the market for health insurance.

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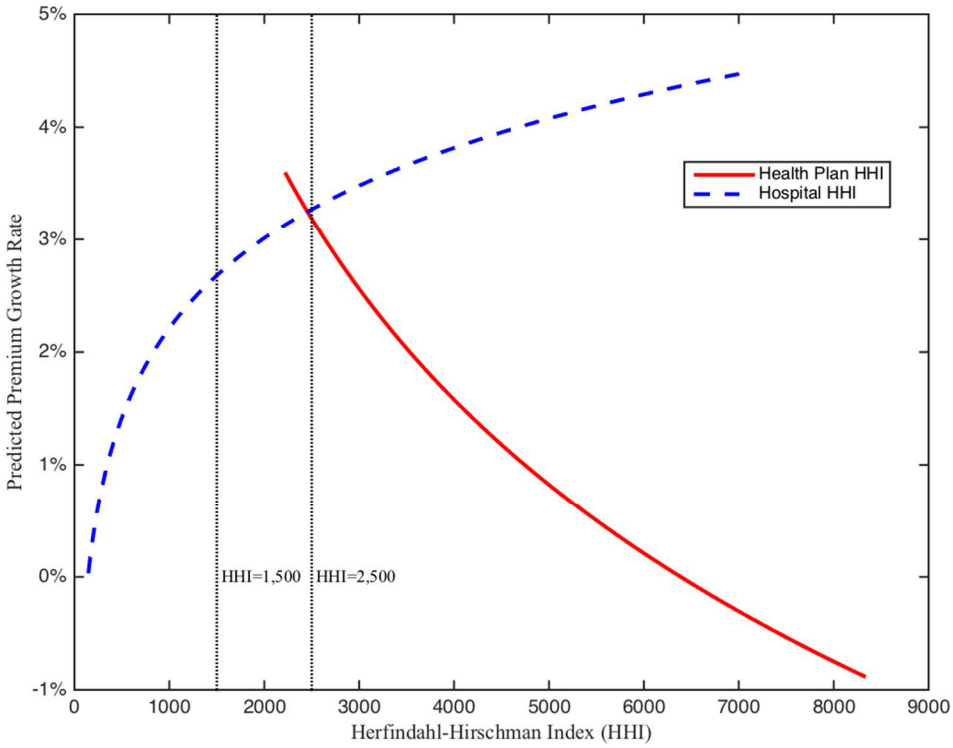
G. Exhibits

Exhibit 1: Covered California and New York State of Health Monthly Premiums and Market Concentration by Rating Area (Rank Ordered by Percent Change of Average Premium)

California						
Rating Area (Number – Name)	2014 Average Standard Silver Plan Premium (40-year-old)	2015 Average Standard Silver Plan Premium (40-year-old)	% Change in Premium	Health Plan HHI	Hospital HHI	Medical Group HHI
4 – San Francisco County	$379	$403	6.3 %	2,321	1,398	1,306
5 – Contra Costa County	$361	$381	5.5 %	4,004	1,334	426
8 – San Mateo County	$394	$412	4.6 %	3,029	1,881	440
3 – Greater Sacramento	$382	$399	4.5 %	3,280	2,651	821
18 – Orange County	$292	$305	4.5 %	2,963	485	169
9 – Central Coast	$382	$398	4.2 %	4,786	5,247	1,609
1 – Northern Counties	$328	$341	4.0 %	8,319	5,574	669
12 – Central Coast	$327	$340	4.0 %	4,336	2,606	190
2 – North Bay Counties	$368	$382	3.8 %	3,173	3,560	553
19 – San Diego County	$317	$329	3.8 %	2,228	481	332
14 – Central Valley	$299	$310	3.7 %	3,713	1,446	306
17 – Inland Empire	$273	$283	3.7 %	2,433	1,020	524
6 – Alameda County	$350	$361	3.1 %	3,429	965	613
13 – Eastern Region	$376	$386	2.7 %	4,919	7,013	4,632
7 – Santa Clara County	$362	$371	2.5 %	4,244	1,164	745
15 – Los Angeles County	$260	$266	2.3 %	2,853	149	155
16 – Los Angeles County	$279	$285	2.2 %	2,284	149	155
11 – Central Valley	$311	$316	1.6 %	3,941	2,437	159
10 – Central Valley	$334	$338	1.2 %	5,250	3,353	947
Rating Area Average	$335	$348	3.9 %	3,763	2,259	776
New York						
Rating Area (Number – Name)	2014 Average Standard Silver Plan Premium	2015 Average Standard Silver Plan Premium	% Change in Premium	Health Plan HHI	Hospital HHI	Medical Group HHI
7 – Utica Area	$452	$487	7.7 %	3,091	5,984	865
1 – Albany Area	$424	$447	5.4 %	2,831	5,881	452
6 – Syracuse Area	$413	$428	3.6 %	2,850	4,797	943
3 – Mid-Hudson Area	$461	$474	2.8 %	2,907	3,441	421
2 – Buffalo Area	$392	$401	2.3 %	2,703	3,598	191
5 – Rochester Area	$352	$358	1.7 %	3,598	3,836	302
8 – Long Island Area	$442	$430	-2.7 %	2,302	994	104
4 – New York City Area	$448	$426	-4.9 %	1,717	1,131	102
Rating Area Average	$423	$431	1.9 %	2,750	3,708	423

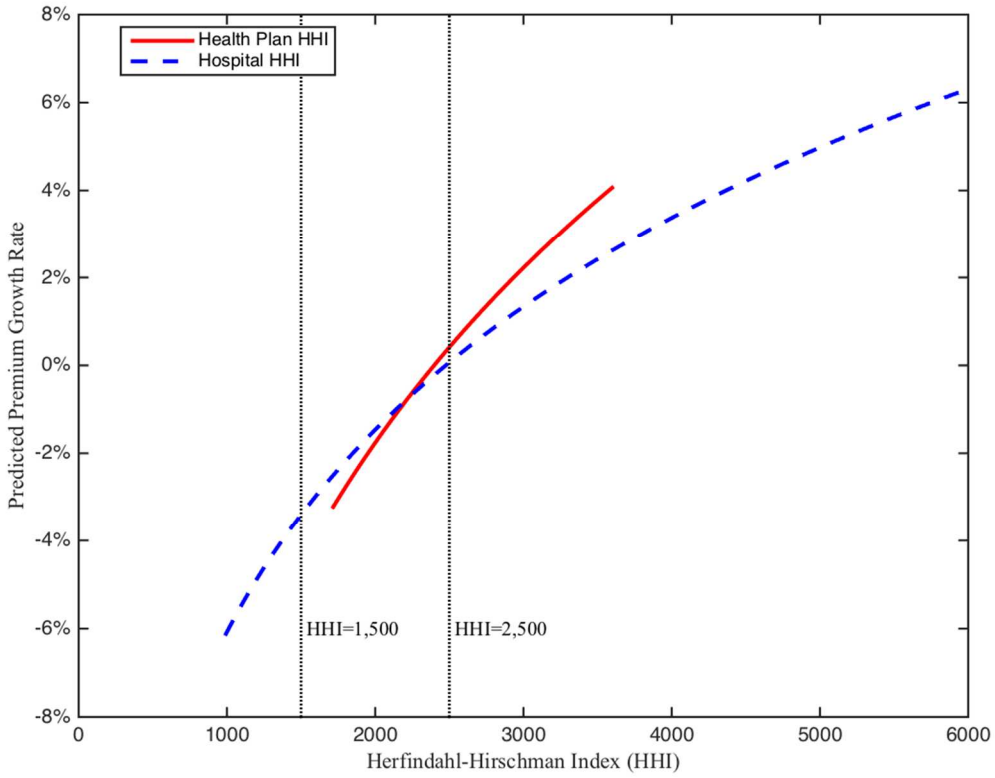
Sources: Premium data from Covered California and New York State of Health. HHIs are based on authors' calculations using 2014 enrollment data from these Marketplaces, hospital data from the American Hospital Association's 2010 Annual Hospital Survey, and physician data from the 2011 IMS Physician Insights database. Note: HHI = Herfindahl-Hirschman Index.

Exhibit 2: Predicted Change in Covered California Premiums between 2014 and 2015, by Health Plan and Hospital Market Concentration



Source: Authors' analysis based on regression coefficient estimates in Exhibit 2.
Notes: Independent variables not plotted in the exhibit are set to their sample means. Similarly, the predicted premium growth rate is based on the growth rate from the 2014 mean premium of $324. Plotted points extend through the range of Herfindahl-Hirschman Index levels observed in the data.

Exhibit 3: Predicted Change in New York State of Health Premiums between 2014 and 2015, by Health Plan and Hospital Market Concentration



Source: Authors' analysis based on regression coefficient estimates in Exhibit 2.
Notes: Independent variables not plotted in the exhibit are set to their sample means. Similarly, the predicted premium growth rate is based on the growth rate from the 2014 mean premium of $426. Plotted points extend through the range of Herfindahl-Hirschman Index levels observed in the data.

H. Appendix

Exhibit A1: Affordable Care Act Marketplace Health Plan Statewide Enrollment Shares in California and New York, 2014 and 2015

California		
Health Plan	2014 Enrollment Share	2015 Enrollment Share
Anthem Blue Cross of California	30%	28%
Blue Shield of California	27%	25%
Health Net	19%	18%
Kaiser Permanente	17%	24%
L.A. Care Health Plan	3%	1%
Chinese Community Health Plan	1%	1%
Sharp Health Plan	<1%	1%
Molina Healthcare	<1%	2%
Western Health Advantage	<1%	<1%
Valley Health Plan	<1%	<1%
Contra Costa Health Plan	<1%	Did Not Participate

New York		
Health Plan	2014 Enrollment Share	2015 Enrollment Share
Health Republic Insurance of New York	19%	19%
Fidelis Care	17%	20%
MetroPlus Health Plan	15%	7%
Empire Blue Cross Blue Shield (Downstate)	14%	10%
Emblem Health	9%	6%
MVP Health Care	8%	6%
Excellus BlueCross BlueShield	4%	4%
Oscar	3%	5%
Healthfirst	3%	10%
UnitedHealthcare	2%	2%
North Shore-LIJ Insurance CareConnect Insurance Company, Inc.	1%	2%
BlueCross BlueShield of Western New York	1%	1%
Independent Health	1%	1%
Affinity Health Plan	1%	5%
CDPHP	1%	1%
Univera Healthcare	<1%	<1%
Empire Blue Cross (Upstate)	<1%	<1%
Today's Options of New York	<1%	Did Not Participate
Blue Shield of Northeastern New York	<1%	<1%
Wellcare of New York	Did Not Participate	<1%

Sources: Covered California. "Covered California's Historic First Open Enrollment Finishes with Projections Exceeded." http://news.coveredca.com/2014/04/covered-californias-historic-first-open.html Covered California. "Health Insurance Companies and Plan Rates for 2016." http://www.coveredca.com/PDFs/7-27-CoveredCA-2016PlanRates-prelim.pdf New York State of Health. "2014 Open Enrollment Report." http://info.nystateofhealth.ny.gov/sites/default/files/NYSOH%202014%20Open%20Enrollment%20Report_0.pdf New York State of Health. "2015 Open Enrollment Report." http://info.nystateofhealth.ny.gov/sites/default/files/2015%20NYSOH%20Open%20Enrollment%20Report.pdf
Note: The market share sums may not equal 100% due to rounding

Exhibit A2: Premium Growth Regression Results for California and New York, 2014-2015

	California ln(2015 Premium)	New York ln(2015 Premium)
ln(2014 Premium)	0.906 [0.000]	0.768 [0.000]
ln(2014 Health Plan HHI)	-0.0334 [0.058]	0.0981 [0.003]
ln(Hospital HHI)	0.0112 [0.040]	0.0691 [0.008]
ln(Medical Group HHI)	0.00228 [0.669]	0.00914 [0.573]
ln(Medicare Area Wage Index)	0.0510 [0.049]	0.233 [0.010]
Observations	82	57
R^2	0.923	0.817

Sources: Authors' calculations based on premium and product data from Covered California and New York State of Health, hospital data from the American Hospital Association's 2010 Annual Hospital Survey, physician data from the 2011 IMS Physician Insights database, and Medicare area wage index data from CMS.
Notes:
ln: natural log
HHI: Herfindahl-Hirschman Index
p-values in brackets
Standard errors were estimated by clustering on the rating area.
Two-tailed t-test.

Growth rate calculation example

The sample mean of 2014 California monthly premiums was $323.63. Our model predicts $334.10 as the 2015 mean premium. This implies the premium growth rate from 2014 to 2015 is ($334.10-$323.63)/$323.63 · 100 = 3.2%. We multipled the 2015 predicted mean premium by exp(0.5· s^2) (where s^2 is a consistent estimate of σ^2) to account for any retransformation bias that could result from exponentiating a log dependent variable. This results is the slightly higher growth rate of 3.3% that is reported in the main section of the paper (for more details, see Cameron AC, Trivedi P. Microeconometrics using Stata. Stata Press. 2009). In order to estimate how the premium growth rate changes when an HHI variable increases, we begin with the equation $\ln(y(x_2)/y(x_1)) = \beta(\ln(x_2/x_1))$, where ln is the natural log, x_1 and x_2 are two values of the variable HHI, and y(x) is the prediction of the monthly premium variable y at the specified value of HHI. This allows us to calculate the new predicted premium as we change the level of the HHI. In Exhibit 2, the β coefficient for health plan HHI in California is -0.0334. Hence, if we increase health plan HHI by 10% in California, the ratio of premiums at the two HHI levels would be $y(1.1x_1)/y(x_1) = \exp(-0.0334 \cdot \ln(1.1x_1/x_1)) = \exp(-0.0334 \cdot \ln(1.1)) = 0.9968$. This implies the new 2015 predicted premium is .9968 · $y(x_1)$=.9968 · $334.10 = $333.03. The growth rate corresponding to this 2015 predicted mean premium is ($333.03-$323.63)/$323.63 · 100 = 2.9%. When multiplied by exp(0.5· s^2), it resulted in a slightly higher growth rate of 3.0%.

I. Addendum

The following section serves as an addendum to Scheffler, Richard M., Daniel R. Arnold, Brent D. Fulton, and Sherry A. Glied. "Differing Impacts Of Market Concentration On Affordable Care Act Marketplace Premiums." Health Affairs 35, no. 5 (2016): 880-888. This section was not published along with the original article and all views expressed here are my own and do not necessarily represent the views of my co-authors.

The purpose of this addendum is to more fully discuss the additional factors that could account for the differing effects of health plan market concentration on premium growth in California and New York. In California, we found health plan concentration to be negatively associated with premium growth, while in New York we found health plan concentration to be positively associated with premium growth.

There are undoubtedly differences across the California and New York Marketplaces. California requires every plan in a coverage tier to have the same benefit design, whereas New York allows insurers to vary their benefit designs within coverage tiers. California allows premiums to vary by age, whereas New York does not. These are just a couple of the differences between the California and New York Marketplaces.

But these differences are true across every rating area within each state. A credible alternative explanation for our results needs to explain differences in premium growth among the rating areas *within* each state. What besides market power could explain why premiums grow faster in highly concentrated health plan markets in New York, but slower in highly concentrated health plan markets in California?

Different insurer compositions across the rating areas within each state could be one alternative explanation. In California, the rating areas with the highest health plan concentration were typically rural and were typically served by some combination of Anthem Blue Cross of California, Blue Shield of California, and Kaiser Permanente – plans that have operated for a long time in the California and presumably know the market well. The rating areas with relatively low health plan concentration in California were typically served by all three of these insurers, Health Net, and one to two small, local insurers. If the small insurers in California were more likely to err by underpricing their policies in the first year of the Marketplaces than Anthem, Blue Shield, and Kaiser, then the rating areas with the small insurers (i.e. the rating areas with low health plan concentration) would see greater premium growth between year one and year two of the Marketplaces as a result of the small insurers correcting their previous underpricing. A lack of actuarial expertise has been advanced as a possible reason for why health care co-ops, nonprofit insurers given seed capital by the federal government to offer Marketplace coverage, often priced their Marketplace prices lower than their competitors. None of the small California insurers in the study were co-ops, but it is still possible that they were more likely to underprice in 2014 by way of having less actuarial expertise than the big California insurers. In New York, there wasn't the same clear pattern of big insurers serving alone in the more highly concentrated health plan rating areas and small insurers serving alongside the big insurers in the less highly concentrated health plan rating areas.[1]

[1] NY State of Health. "2014 Open Enrollment Report." June 2014. Available from: https://info.nystateofhealth.ny.gov/sites/default/files/NYSOH%202014%20Open%20Enrollment%20Report_0.pdf (accessed July 28, 2017) pp. 27-38.

While an alternative explanation that recognizes the fact that insurers likely made mistakes in pricing their products in the initial year of the Marketplaces seems most plausible, it is also possible that the costs of medical care increased differently across the rating areas in California and New York. Insurers raise premiums as their costs increase. Costs rising faster in the more highly concentrated health plan markets in New York and the less highly concentrated health plan markets in California could account for the differing the effect of market concentration that we observe. While there is no a priori reason to believe medical costs would increase faster in the more highly concentrated health plan markets of one state and the less highly concentrated health plan markets of another, it is still possible.

Given the limitations of the analysis outlined in the main text of chapter and the uncertainty of the pricing in the first year of the Marketplaces highlighted in this addendum, another analysis of the impact of market concentration on Marketplace premium growth would be useful. With four years of Marketplace premiums now available and the considerable changes in health plan market concentration brought about by the exodus of many Marketplace insurers, a new study could provide convincing evidence of just how big an impact market concentration has on Marketplace premium growth.

III. Consumers Buy Lower-Cost Plans On Covered California, Suggesting Exposure To Premium Increases Is Less Than Commonly Reported

A. Introduction

Six years after its passage, the Affordable Care Act (ACA) remains a focal point of political controversy in the United States. The announced 22 percent increase in Marketplace premiums in October 2016 likely played a role in the election of Donald Trump as the forty-fifth president of the United States. In pledging to “repeal and replace” the ACA, President-elect Trump cited increase more than double the 22 percent figure in speeches and debates.

The 2016 presidential election illustrates how the political debate surrounding the ACA has been based largely on partisanship and ideology. In contrast, analysts, when debating the merits of the ACA, often turn to three metrics: the number of people enrolled

on the individual Marketplaces; trends in the number of uninsured Americans; and trends in Marketplace premiums.

With regard to the first metric, an estimated 12.7 million people enrolled in Marketplace coverage for 2016 (Centers for Medicare and Medicaid Services 2016).[1] With regard to the second, the Department of Health and Human Services (HHS) estimates that twenty million people have gained coverage as a result of the ACA, primarily through the use of subsidized Marketplace premiums and Medicaid expansion (Uberoi, Finegold, and Gee 2016)

The third metric, trends in Marketplace premiums, is the focus of this article. The spike in average premiums in 2017 of 22 percent nationwide and 14 percent in California contrast with modest 2016 estimates reported by multiple organizations (Holahan, Blumberg, and Wengle 2015, McKinsey Center for US Health System Reform 2014). For states using the federally funded Marketplace, HHS calculated the average premium increase at 7.5 percent (Centers for Medicare and Medicaid Services 2015). The Robert Wood Johnson Foundation reports from all states that premiums increased 11 percent during 2015-16 (O'Donnell 2015). In previous work on the 2016 plan year, I and my colleagues at

[1] Marketplace health plans are offered at four levels – bronze silver, gold and platinum – with bronze plans being the least generous and platinum plans the most. A fifth option, the catastrophic level, is a minimum coverage plan that is generally only available to individuals under age thirty. For eligible individuals, premium subsidies are based on the cost of the second-least-expensive silver plan in their region, referred to as a "benchmark" plan. Reductions in cost-sharing amounts are also available to those earning up to 250 percent of the federal poverty level ($29,425 for an individual and $60,625 for a family of four), but only if they enroll in a silver plan. Households earning 100-200 percent of poverty receive cost-sharing reductions that give the plan a value comparable to that of a gold or platinum plan.

NORC at the University of Chicago estimated premium increase at 6 percent (Gabel et al. 2016).

However, these estimates have a major shortcoming. Because enrollment data in Marketplace plans are not publicly available, researchers have calculated premium changes for plans offered rather than plans purchased. The one exception is a recent study by the HHS Office of the Assistant Secretary for Planning and Evaluation of federally facilitated Marketplaces (Office of the Assistant Secretary for Planning and Evaluation 2016), which found that after shopping[2] was taken into account, premiums increased 8 percent in 2015-16. The authors of the study note that 43 percent of consumers who returned to the Marketplace in a subsequent year switched plans.

The objective of our study was to determine differences in premiums for *offered* versus *purchased* plans. To better understand consumers' behavior, we examined the percentage of plan enrollment accounted for by the lowest- or second-lowest-cost plans in coverage tiers. Through multivariate analysis, we estimated, for new enrollees, the effect on probability of selection when a plan or carrier raises annual premiums by $100.

The ACA sets the subsidy for Marketplace plans based on the cost of the second-lowest-cost silver plan in the consumer's locality. The consumer pays the full cost of the difference in the premium between the more expensive plan and the base silver plan. This incentive structure encourages consumers to choose lower-cost plans and helps them become price-sensitive.

The study context is Covered California, the California insurance Marketplace, with its nineteen rating regions and twelve insurers competing in the state. Based on the

[2] Presumably, "shopping" means purchased rather than offered price.

behavioral economics finding that too much choice overloads and immobilizes consumers, Covered California has implemented a number of policies intended to make comparisons of different plans easier for consumers (Schwartz 2004). Covered California requires standardized benefits and cost sharing for each tier, and it restricts the number of plans an insurer can offer on a metal tier in a rating region. California uses an active purchaser model, in which premiums are negotiated and competitive bidding is used to limit market entry.

The Covered California market structure grew out of legislation enacted by the state legislature, as well as administrative decisions by Covered California.

B. Study Data and Methods

1. Data

We obtained individual-level plan enrollment data from Covered California via a Public Records Act request. Our analytic data set contains over 3.6 million enrollees: 872,844 from 2014, 1,311,444 from 2015 and 1,445,908 from 2016. These totals represent all active enrollment as of April 1, 2016, for each of Covered California's first three years. Additionally, we used plan premium data that are publicly available on the Covered California website. All premiums reported in the article correspond to the monthly premium faced by an unsubsidized forty-year-old, which we used as a standard measure of the full premium cost.

In our descriptive analysis, we use the universe of persons enrolled in Covered California, so with the use of a finite multiplier, standard errors equal 0.[3] Hence, all differences among categories are statistically significant.

In California, carriers can vary Marketplace plan premiums by age, geographic rating region, product type, and coverage tier. California instituted a standard benefit design for each coverage tier, meaning that carriers are restricted to offering one plan per tier, unless they offer multiple product types (for example, a health maintenance organization and a preferred provider organization). The detail of our enrollment data allowed us to match posted premiums to the plans enrollees selected. Plans are defined by a carrier, tier, product type (health maintenance organization, preferred provider organization, or exclusive provider organization), and rating region. Eleven insurance carriers offered coverage through the California Marketplace in 2014, ten in 2015, and twelve in 2016. Carriers were required to offer plans across all five coverage tiers in the rating regions in which they participated. The names and actuarial values of the coverage tiers are as follows (percentage of medical expenses covered by the plan for an average individual): catastrophic (less than 60 percent), bronze (60 percent), silver (70 percent), gold (80 percent), and platinum (90 percent). Covered California has nineteen rating regions statewide, each made up of one or more counties. The lone exception is Los Angeles County, which was split by ZIP code into two rating regions. There were 429 plans offered in 2014, 428 in 2015, and 476 in 2016.

[3] Because of the effect of the finite multiplier, standard errors become 0 when analyzing the universe of enrollees. The finite multiplier is (1-n/N). So if n=N, then the product of the finite multiplier and the standard error becomes 0. See Hansen, Morris H., William N. Hurwitz, and William G. Madow. 1953. *Sample Survey Methods and Theory, Volume 1: Methods and Applications*. New York, NY: John Wiley and Sons Inc. p. 123.

We report averages for both offered and purchased premiums. Offered premium averages are calculated by taking a simple average of premiums across available plans. Purchased premium average weight premiums by enrollment. Hence, if the plans with lower premiums receive a higher share of enrollment – which is expected because enrollees are price-sensitive – average purchased premiums will be lower than average offered premiums.

2. Multivariate Analysis

To address the question of how much market share is lost when a carrier raises premiums, we conducted a conditional logit analysis. This logit model examined how changes in a plan's premium, deductible, out-of-pocket maximum, and brand affect the plan's probability of being selected. The dependent variable is equal to 1 if a person chooses plan X and 0 if that person chooses another plan.

We restricted our analysis to 2016 plan choices made by 139,497 new single exchange enrollees ages 31-64 for the following reasons. First, this allowed us to exclusively analyze "active" plan choices (as opposed to automatic reenrollment). Studies have shown that enrollees tend to display inertia such that their choices after the initial enrollment decision do not reflect their underlying preferences (Handel 2013, Ericson 2014). Examining enrollees older than age thirty removes catastrophic plans from the choice set of potential enrollees, as catastrophic plans are generally available only to people younger than thirty. We restricted the analysis to single enrollees so there would be one-to-one matching of age, income, and out-of-pocket payments for premiums.

We defined plans by carrier-metal tier combinations (for example, Kaiser-silver). Plan characteristics can vary by individual. Our data show us each enrollee's federal poverty level income bracket (for example, 150-200 percent of poverty) and the rating area in which

he or she resides. Thus, we know the menu of the plans available to each enrollee. This is particularly important for the menu of silver plans. For example, an enrollee with income of 150-200 percent of poverty is eligible for the "Enhance Silver 87" version of the silver plans (Covered California 2016a). This means that all of the silver plans in this enrollee's choice set will have an annual deductible of $550 and an annual out-of-pocket maximum of $2,250, instead of the annual deductible of $2,250 and annual out-of-pocket maximum of $6,250 that come along with standard silver plans. For non-silver plans, these financial characteristics do not vary by the enrollee's income.

Premiums are age-adjusted and net of advance premium tax credits. Knowing the income bracket of enrollees and the second-lowest-cost silver plan in the enrollee's rating area allows us to compute premiums net of advance premium tax credits. Enrollees in each income bracket were assumed to receive the tax credit that a person in the middle of the bracket would receive (for example, individuals in the 150-200 percent of poverty bracket were assumed to receive the subsidy of an individual with income of 175 percent of poverty).

3. Limitations

This analysis is limited to one state. California, unlike most states, requires standardized benefits and cost sharing, and it limits the number of plans an insurer can offer on a tier within a rating region. Twelve carriers compete statewide, although with most rating regions there are four to six. With greater transparency and more insurers in the marketplace, it is possible that there is more shopping in California than in most other states. A study by Avalere found that only one-third of returning enrollees in states using a federally facilitated Marketplace purchased the same plan in 2016 that they did in 2015

(Pearson 2016). Nonetheless, a similar analysis of such states is necessary to clarify whether the difference between the average purchased price and the average offered price would be as great in other states.

C. Study Results

In 2016, enrollment by metal tier in Covered California was 64 percent silver, 27 percent bronze, 5 percent gold, 4 percent platinum, and 1 percent catastrophic. Three carriers – Blue Shield, Anthem, and Kaiser Permanente – accounted for 78 percent of total enrollment with Blue Shield the leader at 29 percent (Appendix 1). Health Net (13 percent) and Molina (5 percent) were the only other insurers with enrollment above 2 percent.

For every metal tier for the years 2014-16, the average purchased prices weighted by enrolment in the purchased plans were lower than average offered prices (Exhibit 1). In 2014 the average purchased price for all plans was 11.6 percent less than the average offered price; in 2015 the difference was 13.2 percent less, and in 2016 it was 15.2 percent less. For all study years, the average purchased price for silver plans was at least 9 percent less than the averaged offered price.

In all study years and for all tiers, premium growth measured as average purchased prices was less than the average offered price (Exhibit 1). For 2014-15, premium increases were 3.9 percent when measured as average offered price and 2.0 percent when measured as average purchased price. Corresponding figures for 2015-16 were 5.4 percent and 3.0 percent. With one exception (gold, 2015-16), premium growth by tier measured by average purchased prices was less than premium growth using average offered price.

Readers will note in Exhibit 1 that the overall rate of increase of 2 percent for 2014-15 in "purchased" premiums is lower than the figure for any tier. This implies an enrollment shift to lower-cost bronze and silver plans in 2015. To verify this shift, we constructed a fixed market basket price index using constant 2015 enrollment weights for each tier for all years. With fixed weights, the 2014-15 growth of offered premiums was 4.1 percent rather than 3.9 percent; purchased premiums rose by 3.1 percent rather than 2.0 percent (Appendix 2). Using the same fixed weights, in 2015-16, "offered" premiums increased by 4.2 percent rather than 5.4 percent., and "purchased" premiums rose by 3.6 percent rather than 3.0 percent.

Looking at the Covered California rating regions, the average purchased price in 2015 and 2016 was lower than the average offered price for these corresponding years in all nineteen rating regions (Exhibit 2). The change in premiums from 2015 to 2016 was lower in all but two of the nineteen rating regions when average purchased price was used instead of average offered price. The two exceptions were Central Valley and Los Angeles District 16.

One reason that purchased prices are lower than offered prices is that consumers buy the lowest- or second-lowest-price plan (not shown). In 2014 and 2015, purchasers of platinum plans were the least likely to buy one of the two lowest-price plans on the tier.

For each tier and for each rating region, we ranked plans from the lowest to the highest premium. We then constructed state averages, weighted by enrollment. In general, the lower the premium rank of the plan, the larger the market share (Exhibit 4).[4] For

[4] A hypothetical histogram for offered premiums and market share would show a flat horizontal line.

example, 33 percent of bronze plans had premiums in premium rank 1 (lowest). Bronze plans' market share fell continuously with rank, whereas other plan tier in general showed a falling market share with some deviations. The second-lowest-price silver plan (32 percent) had a higher percentage of enrollment than the lowest-price plan (28 percent), probably because the second-lowest-price silver plan is the benchmark plan on which the federal premium tax credit is based.

1. Multivariate Results

We present the estimates of our model as odds ratios in Appendix 3. (Appendix 4 presents the untransformed coefficient estimates.) The odds ratio associated with premiums implies that a $100 increase in a plan's annual premium would reduce its odds of selection by 0.879 times what it had been previously. Hence, if a plan had a probability of selection of 0.7 and it raised its annual premium by $100, its probability of selection would fall to 0.67.[5] A plan with 40 percent market share would see its probability of selection fall to 0.37. We not that the average net premium in California in 2016 is $1,866 annually, so a $100 annual increase represents a 5.4 percent increase. The implication is that small increases in premiums lead to significant declines in the probability of selections, and thus market share.

The odds ratios (Appendix 3) also show that increases in plan deductibles or out-of-pocket maximums will lead to a reduction in market share. However, the implied reduction in market share from an increase in a plan's deductible or out-of-pocket maximum is less than the reduction in market share from an equal-size increase in premiums. This can be

[5] The 0.879 is an odds ratio – basically a person is 12 percent less likely to choose the plan with a $100 increase in premium.

seen from the odds ratios of deductibles and out-of-pocket maximums being closer to 1 than the odds ratio for premiums.

The odds ratios for brand effects show that there is generally a preference for the state's larger, more well-known insurers. An insurer odds ratio above 1 implies that the insurer is preferred over Anthem (the reference insurer) when both are available. Anthem, Blue Shield, Health Net, Kaiser plans are offered in the majority of Covered California's rating areas. The other eight insurers are smaller, more locally focused plans. Sharp, an insurer that offered coverage to people in the San Diego rating area only, stands out from the group of smaller plans: Its odds ratio above 1 implies that it is preferred over Anthem.

D. Discussion

With remarkable consistency, for virtually every year and metal tier, as well as geographic area, the average purchased price – the average price that enrollees actually paid – is less than the average offered price, which does not account for the fact that enrollment is higher in lower-price plans. In 2016 the average purchased prices was 15.2 percent lower than the average offered price. Premiums increases were also consistently less when measured as purchased than as offered price. In 2016 the figures were 5.4 percent versus 3.0 percent.

This is not to say that premium changes for plans offered is not a useful statistic. It represents changes in prices that consumers face. When consumers switch to lower-price plans, they may have to switch providers because their previous provider was not in the network, thereby impairing continuity of care. There may be different preferred brand drugs

in the old and new plans that may force consumers to switch medications. Consumers may also endure the inconvenience of learning the ways of filing claims with a new insurer.

Much of the discrepancy between purchased and offered price is attributable to more enrollees buying lower-cost bronze and silver plans and fewer gold and platinum plans. However, the shift to lower-cost plans is traceable in part to platinum plans having the largest offered premium increase in 2014-15 and 2015-16. Gold plans had the second-highest offered premium increase in 2016.

Some may wonder why so much attention is paid to 2 percentage points – roughly the difference in premium increase between offered and purchased plans. Two percentage points represents 50 percent of the increase in premiums during the study years. Premium growth of 2 or 3 percentage points exceeds the rate of overall inflation in recent years. Moreover, 2 percentage points compounded over ten years is the difference between a 48 percent increase and a 22 percent increase.

Our conditional logit analysis shows new Marketplace enrollees' sensitivity to differences in net premiums – after tax credits. We find that a $100 increase in net premiums – a 5.4 percent increase in 2016 premiums to enrollees – would reduce the probability of selection to a hypothetical plan with a 70 percent market share to 0.67.

Covered California demonstrates – straight out of Economics 101 – that if consumers have easy-to-understand, transparent information without being overwhelmed by too many choices, they will buy lower-premium products available on their tier. In 2016, 62 percent of new enrollees purchased the lowest- or second-lowest plan on the tier, and 56 percent of returning customers did so.

The major question is, to paraphrase F. Scott Fitzgerald, "Is California different?" Is there greater plan substitution and price competition with standardized benefits and cost sharing and limits on the number of plans offered on a tier in California? Economic theory would say so, but without enrollment data from other states, we cannot confirm this. But it is also highly likely that states without standardized benefits and cost sharing are also experiencing a shirt to lower-price plans.

E. Policy Implications

We note three policy implications from our findings. First, the average premium growth of purchased plans on the exchanges is lower than common reports of premium growth of offered plans, which suggests that the Marketplaces are helping consumers moderate cost growth. We suspect that when enrollment data become available for 2017, premium growth measured in plans purchased will be substantially less than the 14 percent figure in California for plans offered. Covered California has stated that "nearly 80 percent of consumers will pay less or see a rate bump of no more than 5 percent if they switch plans" (Covered California 2016b). Shopping can be particularly effective in California, where 93 percent of consumers can choose from three or more insurers and all consumers can select from at least two insurers.

Second, with consumers being so price-sensitive, market entry may be easier, while maintaining a loyal consumer base is more difficult. Third, if a structure similar to that in California were adopted for Medicare/Medicare Advantage plans and employer-based insurance, more intense price competition among insurers would result, and likely lower premium growth as well.

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G. Exhibits

Exhibit 1: Average Premiums of Covered California Plans Offered and Purchased, by Tier and Year

Category	2014			2015			Change 2014-15	
	Offered Average Premium	Purchased Average Premium	% Lower (Purchased relative to Offered)	Offered Average Premium	Purchased Average Premium	% Lower (Purchased relative to Offered)	Offered Premiums	Purchased Premiums
All Plans	$336	$297	11.6 %	$349	$303	13.2 %	3.9 %	2.0 %
Bronze	255	244	4.3 %	266	252	5.3 %	4.3 %	3.3 %
Silver	330	300	9.1 %	342	310	9.4 %	3.6 %	3.3 %
Gold	395	358	9.4 %	412	373	9.5 %	4.3 %	4.2 %
Platinum	449	413	8.0 %	470	425	9.6 %	4.7 %	2.9 %
Category	**2015**			**2016**			**Change 2015-16**	
	Offered Average Premium	Purchased Average Premium	% Lower (Purchased relative to Offered)	Offered Average Premium	Purchased Average Premium	% Lower (Purchased relative to Offered)	Offered Premiums	Purchased Premiums
All Plans	$349	$303	13.2 %	$368	$312	15.2 %	5.4 %	3.0 %
Bronze	266	252	5.3 %	279	262	6.1 %	4.9 %	4.0 %
Silver	342	310	9.4 %	354	319	9.9 %	3.5 %	2.9 %
Gold	412	373	9.5 %	434	394	9.2 %	5.3 %	5.6 %
Platinum	470	425	9.6 %	509	455	10.6 %	8.3 %	7.1 %

Source: Authors' analysis of data provided by Covered California http://hbex.coveredca.com/data-research/
Notes: 429, 428, and 476 plans were offered in 2014, 2015, and 2016, respectively. Unique carrier-metal tier-product type-rating area combinations define a plan. All Plans includes Catastrophic, Bronze, Silver, Gold, and Platinum plans. Premiums correspond to the monthly rate for an unsubsidized 40-year-old.

Exhibit 2: Offered versus purchased plan premiums in Covered California, all plans, 2015 and 2016

Rating Area	2015 Average Offered Premium	2016 Average Offered Premium	Change	2015 Average Purchased Premium	2016 Average Purchased Premium	Change
1 – Northern counties	$344	$397	15.3%	$304	$334	8.9%
2 – North Bay counties	380	403	5.9%	352	372	5.4%
3 – Greater Sacramento	404	437	8.1%	335	358	6.5%
4 – San Francisco County	407	424	4.1%	368	373	1.6%
5 – Contra Costa County	381	400	4.8%	344	358	3.9%
6 – Alameda County	365	397	8.8%	345	359	3.9%
7 – Santa Clara County	380	408	7.4%	337	357	5.7%
8 – San Mateo County	423	452	7.0%	382	400	4.5%
9 – Central Coast	400	443	10.7%	356	393	9.4%
10 – Central Valley	339	372	9.7%	291	315	7.8%
11 – Central Valley	329	347	5.4%	287	291	1.4%
12 – Central Coast	344	376	9.3%	323	333	3.0%
13 – Eastern Region	395	391	-1.1%	367	339	-8.4%
14 – Central Valley	311	312	0.4%	285	291	2.1%
15 – Los Angeles (partial)	276	276	-0.3%	255	252	-1.3%
16 – Los Angeles (partial)	297	299	0.5%	277	282	1.8%
17 – Inland Empire	293	300	2.2%	273	273	-0.1%
18 – Orange County	317	326	2.9%	296	298	0.5%
19 – San Diego County	334	343	2.6%	309	311	0.7%
STATEWIDE	349	368	5.4%	303	312	2.7%

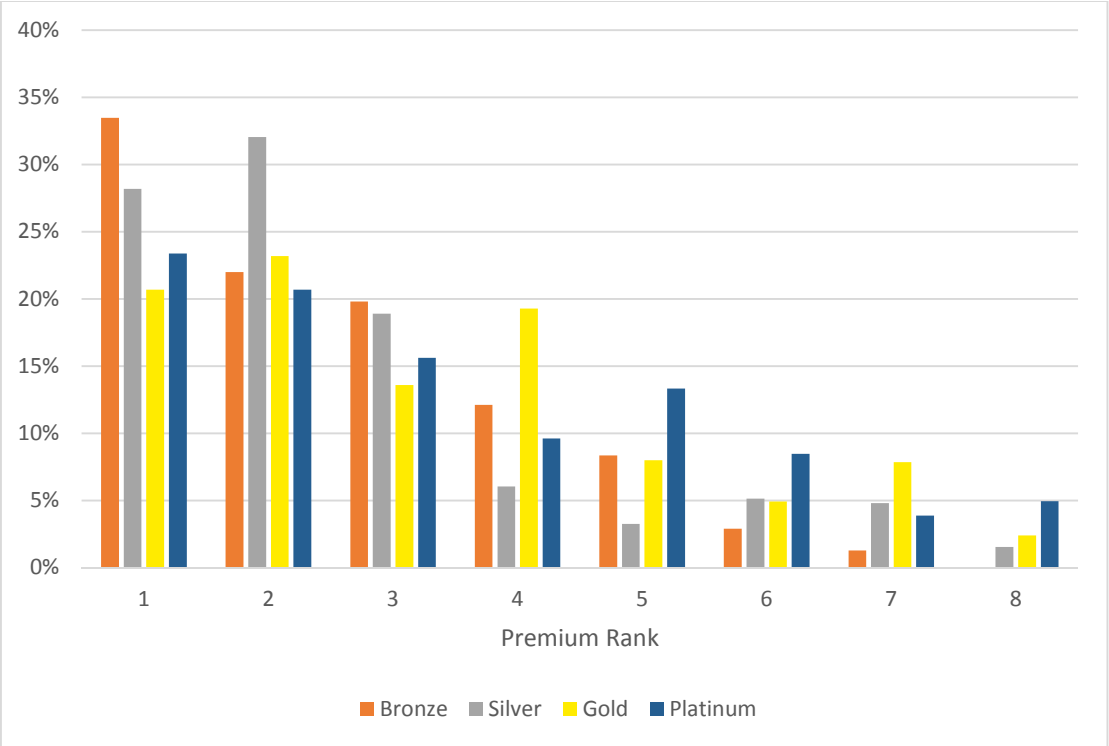
Source: Authors' analysis of data provided by Covered California http://hbex.coveredca.com/data-research/
Notes: Premiums correspond to the monthly rate for an unsubsidized forty-year-old.

Exhibit 3: Percent of Covered California Enrollees Buying the Lowest- or Second-Lowest-Price Plan on Each Plan Tier, 2014-2016

Tier	**2014**	**2015**	**Percentage-point Change 2014-2015**
Bronze	59.4 %	66.0 %	6.6 %
Silver	57.2 %	57.7 %	0.5 %
Gold	55.4 %	53.4 %	-2.0 %
Platinum	46.3 %	50.2 %	3.9 %
All Plans	57.1 %	59.2 %	2.1 %
Tier	**2015**	**2016**	**Percentage-point Change 2015-2016**
Bronze	66.0 %	55.5 %	-10.5 %
Silver	57.7 %	60.3 %	2.6 %
Gold	53.4 %	43.9 %	-9.5 %
Platinum	50.2 %	44.1 %	-6.1 %
All Plans	59.2 %	57.5 %	-1.7 %

Source: Authors' analysis of data provided by Covered California http://hbex.coveredca.com/data-research/
Note: "All plans" includes catastrophic, bronze, silver, gold, and platinum plans.

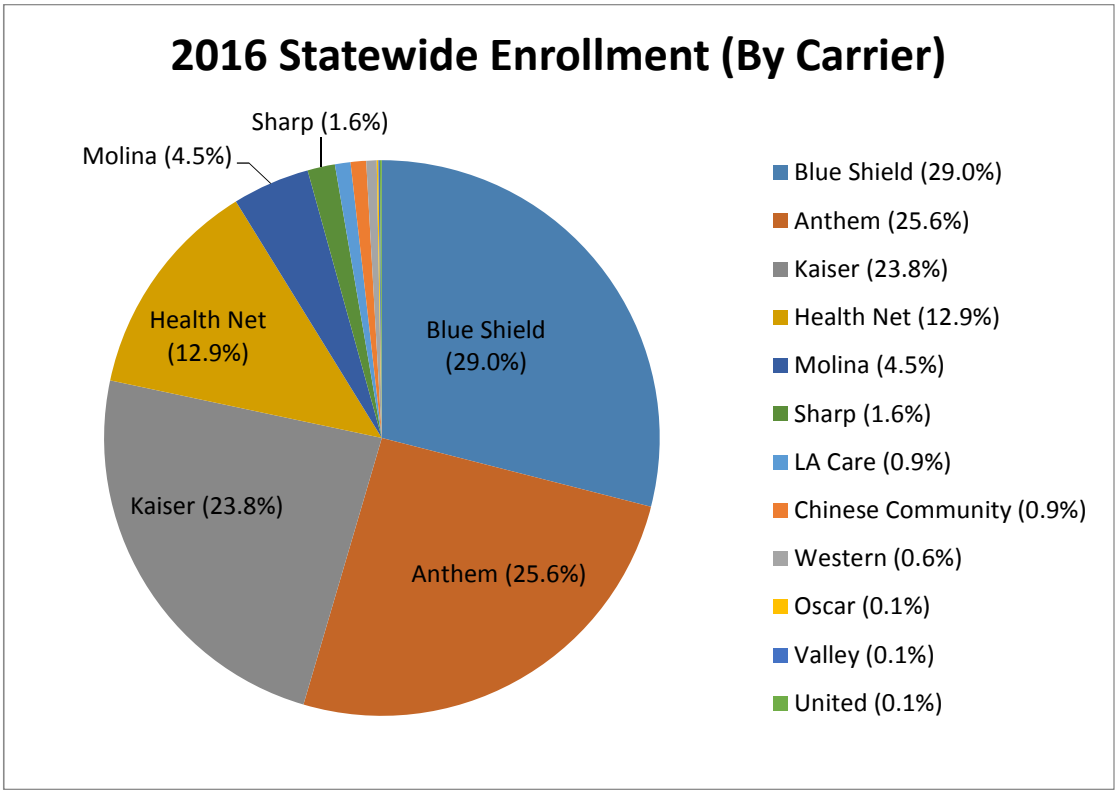
Exhibit 4: Market Share of Covered California Plain in Four Tiers, by Lowest to Highest Premiums



Source: Authors' analysis of data provided by Covered California http://hbex.coveredca.com/data-research/
Notes: The number of plans available in a tier varies by rating area (from three to eight). Premium rank 1 has the lowest premium in the tier; premium rank 8, the highest.

H. Appendix

Figure A1



Source: Authors' analysis of data provided by Covered California.

Table A1

Average Change in Premium, Offered and Purchased, by Tier and Year When Using 2015 Enrollment Weights for All Years

Category	**Change 2014-15**	
	Offered Premiums	Purchased Premiums
All Plans	4.1 %	3.1 %
Bronze	4.3 %	3.3 %
Silver	3.6 %	3.3 %
Gold	4.3 %	4.2 %
Platinum	4.7 %	2.9 %
	Change 2015-2016	
All Plans	4.2 %	3.6 %
Bronze	4.9 %	4.0 %
Silver	3.5 %	2.9 %
Gold	5.3 %	5.6 %
Platinum	8.3 %	7.1 %

Source: Authors' analysis of data provided by Covered California.
Notes: 429, 428, and 476 plans were offered in 2014, 2015, and 2016, respectively. Unique carrier-metal tier-product type-rating area combinations define a plan. "All Plans" includes catastrophic, bronze, silver, gold, and platinum plans. "All Plans" average offered premiums are weighted by the tier distribution of purchased plans. Premiums correspond to the monthly rate for an unsubsidized 40-year-old.

Table A2

Conditional Logit Results: Odds Ratios

Variable	Means	Odds ratios
Annual Premium ($100s)	$1,866 ($156 per month)	0.879*** (0.000)
Annual Deductible ($100s)	$2,643	0.984*** (0.000)
Maximum Out-of-Pocket ($100s)	$4,577	0.963*** (0.000)
Brand Effects (%)		
Anthem	23.93	Reference
Blue Shield	26.33	1.214*** (0.000)
Chinese Community	.087	0.260*** (0.000)
Health Net	9.35	0.337*** (0.000)
Kaiser	26.17	1.182*** (0.000)
LA Care	0.74	0.0808*** (0.000)
Molina	9.28	0.334*** (0.000)
Oscar	0.36	0.0645*** (0.000)
Sharp	1.99	1.131*** (0.000)
United	0.21	0.0886*** (0.000)
Valley	0.01	0.00301*** (0.000)
Western	0.77	0.246*** (0.000)
Observations		**139,497**

Exponentiated coefficients; p-values in parentheses

$^{*}\ p < 0.10,\ ^{**}\ p < 0.05,\ ^{***}\ p < 0.01$

Source: Authors' analysis of data provided by Covered California.
Note: This logit model examined how changes in a plan's premium, deductible, out-of-pocket maximum, and brand affect the plan's probability of being selected. The dependent variable is equal to 1 if a person chooses plan X and 0 if that person chooses another plan.

Interpretation of Odds Ratios

The 0.879 is an odds ratio – basically, a person is 12% less likely to choose the plan with a $100 increase in premium. Thus,

X = End Probability

Y = Start Probability = 70%

This means that $0.879 = (X / (1 - X)) / (Y / (1 - Y))$

$= (X / (1 - X)) / (70\% / 30\%)$

$= (X / (1 - X)) / 2.3333$

This leads to $X / (1 - X) = 2.051$

$X = 2.051 - 2.051X$

$X = 2.051 / 3.051 = 67\%$

Table A3

Conditional Logit Results

Variable	Means	Parameter Estimates
Annual Premium ($100s)	$1,866 ($156 per month)	-0.129*** (0.000)
Annual Deductible ($100s)	$2,643	-0.0162*** (0.000)
Maximum Out-of-Pocket ($100s)	$4,577	-0.0378*** (0.000)
Brand Effects (%)		
Anthem	23.93	Reference
Blue Shield	26.33	1.214*** (0.000)
Chinese Community	.087	0.260*** (0.000)
Health Net	9.35	0.337*** (0.000)
Kaiser	26.17	1.182*** (0.000)
LA Care	0.74	0.0808*** (0.000)
Molina	9.28	0.334*** (0.000)
Oscar	0.36	0.0645*** (0.000)
Sharp	1.99	1.131*** (0.000)
United	0.21	0.0886*** (0.000)
Valley	0.01	0.00301*** (0.000)
Western	0.77	0.246*** (0.000)
Observations		**139,497**

$^{*}\ p < 0.10,\ ^{**}\ p < 0.05,\ ^{***}\ p < 0.01$

Source: Authors' analysis of data provided by Covered California.
Note: This logit model examined how changes in a plan's premium, deductible, out-of-pocket maximum, and brand affect the plan's probability of being selected. The dependent variable is equal to 1 if a person chooses plan X and 0 if that person chooses another plan.