

# Do Individuals Respond to Cost-Sharing Subsidies in their Selections of Marketplace Health Insurance Plans?

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*The Affordable Care Act (ACA) provides assistance to low-income consumers through both premium subsidies and cost-sharing reductions (CSRs). Some consumers, however, may lack the financial literacy to navigate the ACA financial assistance options. We use administrative data on 24 million health insurance plan choices of individuals from 2014 to 2016 to assess whether they behave in a manner consistent with being aware of the availability of CSRs. We take advantage of discontinuous changes in the CSR schedule and implement a sharp regression discontinuity design. The results show that consumers are highly sensitive to the level of CSRs when selecting plans.*

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## I. Introduction

The 2010 Affordable Care Act (ACA) established Marketplaces in which individuals and families can purchase affordable health insurance coverage. In order to make the purchase of health insurance affordable, the law made available two types of subsidies – premium subsidies and cost-sharing reductions (CSRs) – to eligible low-income individuals who purchase health insurance through these Marketplaces. The premium subsidies, only available in the Marketplaces, take the form of “Advanced Premium Tax Credits” (APTCs) and the amount of APTC available to an individual depends on the cost of the “benchmark” insurance plan available to that individual and varies with that person’s family income. APTCs can be used toward the purchase of a Marketplace plan from any metal level (which represent the actuarial value of a plan) except for Catastrophic plans. CSRs vary discontinuously with a person’s family income as a percentage of the federal poverty guideline (FPL) and are available only if a person chooses a health insurance plan in the “Silver” metal level.<sup>1</sup> Standard Silver plans have a 70% actuarial value (AV), but (for eligible consumers) CSRs raise the actuarial value of Silver plans to 73%, 87% or 94% depending upon the consumer’s family income as a percentage of FPL.

Both premium tax credits and CSRs reduce the cost of insurance to low-income individuals and families. Despite the fact that most Marketplace consumers are getting CSRs,<sup>2</sup> the cost-sharing subsidies have not received as much attention as APTCs as a means to make health insurance affordable for low-income individuals and families. This may be due, in part, to the value of CSRs being

<sup>1</sup> In addition to establishing income-based CSRs, the ACA makes special CSRs available to American Indians/Alaska Natives with incomes up to 300% FPL. The CSRs for American Indians/Alaska Natives can be applied toward a Marketplace plan of any metal level, not just Silver.

<sup>2</sup> As of March 31, 2016, 57% of consumers were receiving CSRs, according to the Centers for Medicare & Medicaid Services. See: <https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2016-Fact-sheets-items/2016-06-30.html>.

less obvious to consumers than APTCs when shopping for health insurance plans in the Marketplaces. It also is possible that consumers may find it relatively difficult to assess the value of CSRs, and therefore focus more on the after-subsidy premium when selecting health plans.

A sizable number of consumers who are potentially eligible to receive CSRs do not receive them because they do not select a Silver plan but instead select a Bronze, Gold, or Platinum plan. Overall, about 20% of Marketplace consumers with incomes in the CSR-eligible range do not choose a Silver plan and thus potentially forgo these subsidies. This fact has led some analysts to suggest that many consumers are unaware of the availability of CSRs or, if they are aware, do not value CSRs.<sup>3</sup>

While it is possible that consumers who are using their premium subsidies in order to purchase low-premium Bronze plans without CSRs would have had a lower expected out-of-pocket expenditure had they purchased a higher premium Silver plan that included CSRs, it is not possible to determine whether this is indeed the case without detailed information regarding expected health expenditures. Of potentially greater concern would be if individuals who are eligible for 87% AV Silver plans purchase Gold or Platinum plans without CSRs or if individuals eligible for 94% AV Silver plans purchase platinum plans without CSRs as these plans almost always are more expensive and have lower actuarial value than available Silver plans with CSRs.

An institutional feature of the CSR program is that only Silver plans offer CSRs to eligible Marketplace consumers. As a result, the CSR program might distort the metal level choice of consumers and could induce some to voluntarily forgo the purchase of higher AV plans. At the same time, this feature may induce other

<sup>3</sup> “Consumers are picking plans on exchanges based on premiums, rather than out-of-pocket costs” according to Dan Mendelson, CEO of Avalere Health. <http://avalere.com/expertise/managed-care/insights/more-than-2-million-exchange-enrollees-forgo-cost-sharing-assistance> accessed September 29, 2015.

consumers to purchase a Silver plan when they otherwise would have purchased a lower AV plan. To the extent that the CSR program partially “crowds out” the voluntary purchase of higher AV plans by low-income consumers, it will be somewhat less effective at increasing the AV of the plans selected by consumers. On the other hand, to the extent that the CSR program partially “crowds in” the purchase of higher AV plans, it will be somewhat more effective at increasing the AV of the plans selected by low-income consumers.

This paper addresses four interrelated questions. First, do Marketplace consumers behave in a manner that suggests that they are aware of the availability of and value of CSRs? Second, how sensitive are consumers to the higher monthly premium of more generous (higher AV) Marketplace plans? Third, is there evidence that consumers are mistakenly forgoing CSRs and instead are purchasing dominated plans, that is, plans that have both higher premiums and lower actuarial values? Fourth, to what extent do CSRs “crowd-out” versus “crowding-in” the purchase of higher AV plans by Marketplace consumers?

To address these questions, we use data on the 2014, 2015, and 2016 enrollment and plan choices of individuals who selected their plans via the HealthCare.gov portal in order to examine how individuals’ plan choices are affected by the amounts of CSRs for which they were eligible. The availability of higher CSRs is expected to lead consumers to be more likely to choose Silver plans. In order to identify the plausibly causal effects of CSRs on plan choice, we examine variation in plan choice around the points in the CSR schedule where the value of the CSRs change in a discontinuous manner using a sharp regression discontinuity design.

The paper proceeds as follows. In section 2, we describe how premium subsidies and CSRs are calculated and applied in the Marketplaces. In section 3, we discuss the administrative data and our regression discontinuity design that we use in our analysis. In section 4, we present the main results of our analysis. In

section 5, we interpret these results and discuss how they are used to address our research questions. In section 6, we provide some concluding remarks.

## **2. Background**

### *A. Premium Subsidies and Cost Sharing Reductions*

The Affordable Care Act (ACA) has created new coverage options by increasing the availability of coverage for child dependents, expanding Medicaid, and creating Health Insurance Marketplaces that offer Qualified Health Plans (QHPs). Although coverage in the Marketplaces is available to all eligible consumers, regardless of income level, the law includes programs that provide financial help to low- and moderate-income people for the purchase of health insurance coverage through the Marketplaces. Together, they are known as insurance affordability programs. These programs include Advanced Premium Tax Credits (APTCs) and Cost Sharing Reductions (CSRs).

APTCs are tax credits that serve to reduce premium costs for Marketplace enrollees. APTCs are generally available for people whose incomes are between 100% and 400% of the federal poverty level (FPL) and who don't have access to other affordable coverage (either affordable employer-sponsored coverage or public coverage such as Medicaid or Medicare). The amount of APTC a person qualifies for is determined by an IRS-mandated maximum amount the person must pay toward the purchase of a benchmark plan.

CSRs also represent a new federal program that helps reduce out-of-pocket costs for Marketplace enrollees with incomes 100% to 250% of the FPL. CSR payments are made directly to issuers to reduce deductibles, co-insurance, and/or copayments faced by enrollees in Silver plans.

Both CSRs and APTCs vary with family income (see Tables 1 and 2). The amounts of APTCs available to enrollees are determined using a formula that

depends upon the enrollee's family income as a percentage of FPL, level of family income, and benchmark premium. The amount of CSR available to an enrollee depends solely upon the enrollee's family income as a percentage of FPL. The CSR schedule is discontinuous and the discontinuities occur at 150% (where the AVs of Silver plans available to the consumer change from 93% to 87%), 200% (where the AVs of Silver plans change from 87% to 73%) and 250% FPL (where the AVs of Silver plans change from 73% to 70%). Importantly for this paper's research design, the APTC schedule does not have discontinuities at the same points as the CSR schedule (see Figure 1).

APTCs and CSRs vary in other important respects as well. First, income-based CSRs are only available to enrollees who select Silver plans. APTCs, on the other hand, can be applied to any Bronze, Silver, Gold, or Platinum plan even though the amount of APTC available is a function of the premium of the second lowest Silver plan. Second, if a consumer's realized annual family income differs from the projected family income provided in his or her application (for example, because a family member changes or begins employment during the year), the amount of premium tax credit the consumer is eligible for changes as well. However, if (based on projected family income from the application) a consumer is determined eligible for a particular amount of CSR, that eligibility does not change if the consumer's realized income differs from projected income during the course of the year. Third, and importantly for our paper, APTCs vary continuously with income over the eligible income range,<sup>4</sup> while CSRs vary discontinuously with income.

Under the ACA, insurers offering plans in Marketplaces are required to submit three plan variations with reduced cost sharing (one for each level of CSR) for each Silver level health plan an issuer offers through the Marketplace (CMS

<sup>4</sup> There is a small discontinuity in the value of APTCs at 133% FPL and a major discontinuity at 100% FPL (for a discussion see Schwartz and Wallace, 2014). Discontinuities in the value of APTCs can also occur at 400% FPL.

2016). These plan variations are required to have the same features (including benefits, networks, and premium) as the Standard Silver plan and thus differ only in terms of cost sharing. Issuers' additional direct costs of providing plan variants with reduced cost-sharing is paid by the Federal government. It is not possible for an issuer to offer, for example, a Silver plan with 73% AV (for enrollees between 200 and 250% FPL) but not offer a variant of that plan with even less cost sharing (94% AV) for enrollees between 100 and 150% FPL, even if it were strategically beneficial to the insurer to do so.

When shopping among health insurance plans on HealthCare.gov, a consumer first inputs his or her personal information (such as age, projected family income, family size, and zip code). The portal then lists the plans, their premiums, metal levels, as well as some key cost-sharing information: the plan's deductible, out-of-pocket maximum, and applicable co-payments and co-insurance rates. A consumer's applicable APTC is automatically factored into the premium displayed to the consumer. If a consumer is eligible for a particular level of CSR, only Silver plans corresponding with that CSR level (and the corresponding plan information, such as the deductible and out-of-pocket maximum) are displayed to the consumer. In this way, a consumer cannot select a Silver plan variation for which he or she is not eligible.

### *B. Previous Literature*

A large literature in economics has examined the factors – most notably the plan premium – that lead consumers to select health plans, particularly among employer-sponsored plans. Most of this work finds evidence of substantial consumer sensitivity to premiums when selecting plans (Dowd and Feldman 1994, Royalty and Solomon 1999, Buchmueller and Feldstein 1997, Atherly, Dowd, and Feldman 2004, Buchmueller 2006, Chan and Gruber 2010). However,

other studies have found a low rate of switching from plans, perhaps due to inertia (Samuelson and Zeckhauser 1988) or complexity (Frank and Lamiraud 2009).

A few papers have examined whether consumers select dominated health plans. Handel (2013) finds behavior that is consistent with substantial costs of switching plans, based on data from a firm that offered a plan that eventually became dominated for some workers. Heiss et al. (2013) found that the vast majority of enrollees into Medicare Part D select plans that are more expensive but not better than the lowest cost plan. Abaluck and Gruber (2011) also examine the plan choices of Part D enrollees and find that they focus too much on premiums and not enough on out-of-pocket costs. Sinaiko and Hirth (2011) find that one-third of employees of the University of Michigan selected a dominated plan. Bhargava, Lowenstein, and Sydnor (2015) examine the health insurance plan choices of employees in a single large U.S. firm and find that a majority makes dominated choices. Taken together, the literature to date suggests that consumers often select dominated insurance plans, but that the degree varies across program and employer.

A large and related literature has examined the degree of consumers' financial literacy and how consumers' decision making may respond to the information. For example, Barnes, Hanoch, and Rice (2015), via an online questionnaire and a hypothetical insurance marketplace, assessed whether health insurance comprehension, numeracy, choice consistency, and the number of plan choices were associated with participants' ability to choose a cost-minimizing plan. Also see related papers Sinaiko et al. (2013), and Barnes et al. (2016). Schmitz and Ziebarth (2017) examine how the salience of cost information provided affects consumers' choice of plans. These studies suggest that decision-making tools could improve consumers' abilities to select appropriate plans. However, because in the current study we use plan choices of consumers using the HealthCare.gov



portal, which did not vary substantially in its format between 2014 and 2016, and we do not explore these issues.

### **3. Method and Data**

#### *A. Method*

We examine variation in the metal level selected by consumers around discontinuities in the CSR schedule. Our approach in identifying the effect of eligibility for CSRs on plan selection is to employ a regression discontinuity design. Lee and Lemieux (2010) provide an overview and summary of recent applications of regression discontinuity. In essence, this approach involves comparing the plan choices of enrollees with incomes just below a CSR eligibility threshold with the plan choices of enrollees with incomes just above that CSR threshold. Because, as discussed above, all enrollees with incomes below CSR eligibility thresholds are determined to be eligible for that tier of CSR and no enrollees with income above that threshold are eligible for that tier of CSR, we use a “sharp” regression discontinuity design.

Because CSR eligibility depends upon income as a percentage of FPL, it is conceivable that enrollees manipulate their income in order to become eligible for more generous CSRs. In addition, the availability of CSRs may make participating in the Marketplace at all more attractive, which would mean that the composition of Marketplace enrollees might change as the CSR level changes. One standard check for either income manipulation or this type of selection is to examine whether the density of observations as a function of the assignment variable is continuous through the discontinuity threshold. While this check is neither necessary nor sufficient for a valid regression discontinuity design (McCrary 2008), it can be suggestive as to whether the identifying assumption is violated. Appendix Figure 1 displays the density of enrollment around the CSR

eligibility thresholds for the 2014 and 2015 plan years. Based on these figures, there appears to be no evidence that enrollees were manipulating their incomes.

The RD approach enjoys a distinct advantage over simple comparisons of enrollees by tier of CSR eligibility. Since the income thresholds used to determine CSR eligibility are somewhat arbitrary and since net premiums do not vary discontinuously over these income ranges, it is reasonable to assume that enrollees with incomes just below the eligibility thresholds are very similar to those with incomes just above the eligibility thresholds. The standard RD continuity assumption thus seems to apply in this context.

We implement our estimates using a local linear regression approach. We include robustness checks to various bandwidths as part of our analysis. The standard validity checks are included in the Appendix and are discussed in more detail in the results section.

In particular, we estimate the following:

For metal level choice  $Y_i$ , for individuals at FPL level  $X_i$ , FPL discontinuity  $x_0$ , and threshold indicator  $W_i$ :

$$(1) \quad Y_i = \alpha + \beta(X_i - x_0) + \tau W_i + \gamma(X_i - x_0)W_i + \varepsilon_i$$

where the triangular kernel weights are given by:

$$(2) \quad h - |X_i - x_0|$$

and where  $h$  is the bandwidth in terms of percentage points of FPL, and  $\tau$  is the treatment effect of interest.

## *B. Outcomes*

The main outcome we consider is the metal level of the plan chosen by a Marketplace enrollee: Catastrophic, Bronze, Silver, Gold, and Platinum.<sup>5</sup> In particular, we examine a set of five binary variables, one for each metal level and indicating whether the enrollee chose a plan at that metal level. The main outcome of interest is whether the enrollee chooses a Silver plan, since only Silver plans are eligible for CSRs.

In addition to the main analysis, we consider whether enrollees selected dominated plans. Dominated plans include Gold (AV 80%) and Platinum (AV 90%) plans for consumers with family incomes between 100% and 150% of FPL, who are eligible for CSRs that increase the AV of Silver plans to 94% and include Gold plans for consumers with family incomes between 150% and 200% of FPL, who are eligible for CSRs that increase the AV of Silver plans to 87%.

## *C. Data*

This paper uses administrative data from the Multidimensional Insurance Data Analytics System (MIDAS) of the Centers for Medicare & Medicaid Services (CMS) based on Marketplace enrollment data collected for the 39 states that used the HealthCare.gov eligibility and enrollment platform in any plan year.<sup>6</sup> Data on 2014 enrollment into Marketplace health plans were collected for all plans chosen during the 2014 Open Enrollment Period (10/1/2013 through 3/31/2014), as well

<sup>5</sup> Catastrophic plans are only available to consumers under the age of 30 or who qualify for certain hardship exemptions. APTCs cannot be used to purchase Catastrophic plans.

<sup>6</sup> States that used the HealthCare.gov portal sometime in 2014–2016 include: Alaska, Alabama, Arkansas, Arizona, Delaware, Florida, Georgia, Hawaii (2016 only), Iowa, Idaho (2014 only), Illinois, Indiana, Kansas, Louisiana, Maine, Michigan, Missouri, Mississippi, Montana, North Carolina, North Dakota, Nebraska, New Hampshire, New Jersey, New Mexico, Nevada (2015 and 2016 only), Ohio, Oklahoma, Oregon, (2015 and 2016 only), Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Wisconsin, West Virginia, and Wyoming.

as for plans chosen during any Special Enrollment Period (SEP) up to the start of the Open Enrollment Period for 2015 coverage. Data on 2015 enrollment into Marketplace health plans were collected for all plans chosen during the 2015 Open Enrollment Period (11/15/2014 through 2/15/2015, including SEP activity through 2/22/2015). Data on 2016 enrollment into Marketplace health plans were collected for all plans chosen during the 2016 Open Enrollment Period (11/1/2015 through 2/1/2016). For our main analysis, we exclude enrollees who were members of federally recognized tribes or Alaska Native Claims Settlement Act Corporation shareholders because these enrollees were eligible for different cost-sharing subsidies than were other enrollees.

The resulting dataset includes individual-level information on roughly 24 million plan choices, including metal level and premium, as well as individual-level demographic and income information including FPL, family income, state and county of residence, APTC amount, an indicator for receipt of CSRs, self-reported race and ethnicity, age, and gender.<sup>7</sup>

Appendix Tables 1a-1c report the means of selected characteristics for all enrollees and for enrollees stratified by FPL category for the populations of individuals who enrolled in Marketplace plans via the HealthCare.gov portal in the 2014 – 2016 plan years. Overall, a large majority of enrollees – roughly 71% in each year – selected Silver plans; the second most commonly selected metal level was Bronze (with roughly 16-20% of enrollees in each year). About 4-8% of enrollees selected Gold plans in each plan year and relatively few selected Platinum and Catastrophic plans. Enrollees in families with lower incomes as a percent of FPL are more likely to choose Silver plans. For example, 90% of enrollees with income between 100 and 150% FPL selected a Silver plan in 2014

<sup>7</sup> Race and ethnicity is missing for approximately 40% of enrollees.

compared with only 40% of enrollees with incomes between 250 and 400% of FPL.

## 4. Results

In this section, we report the results of our regression discontinuity analysis.

### *A. Main Results*

The main outcome of our analysis is the probability of selecting a Silver plan, as eligible enrollees only receive income-based CSRs if they select Silver plans. We report the RD estimates at a bandwidth of 20 FPL points in the first column of Table 3.<sup>8</sup> We focus our analysis on three points of discontinuity in the CSR schedule: 150%, 200% and 250% of FPL. We do not examine 100% FPL, the floor for income-based CSR eligibility because it coincides with the minimum for APTC eligibility and, as a result, a very small percentage of enrollees have incomes below 100% FPL.

At 150% FPL (the maximum eligibility threshold for 94% AV CSRs), the point estimate is a difference of 3.2 percentage points in 2014, 3.0 percentage points in 2015, and 3.6 percentage points in 2016. That is, 2014 enrollees who are just eligible for 94% AV CSRs are about 3.2 percentage points more likely to select a Silver plan than enrollees who are just ineligible for 94% AV CSRs and thus are eligible for 87% AV CSRs. All three estimates are statistically different from zero at the 1% level.

At 200% FPL (the threshold between being eligible for 87% AV CSRs and 73% AV CSRs), the RD estimates are -20.1, -16.2, and -13.5 percentage points in

<sup>8</sup> Results for all bandwidths from 10 to 25 are displayed in Appendix Figure 2.

2014, 2015, and 2016 respectively and are again statistically significant at the 1% level. Again, these estimates mean that enrollees who are just eligible for 87% AV CSRs are 14 to 20 percentage points more likely to choose a silver plan than enrollees who are just ineligible for 87% AV CSR plans (and are eligible for 73% AV CSRs). This greater increase in the probability of selecting a silver plan for enrollees just qualifying for 87% AV CSRs over those just qualifying for 94% AV CSRs aligns with the greater increase in actuarial value associated with shifting from 73% AV to 87% AV CSRs compared to shifting from 87% AV CSRs to 94% AV CSRs.

At 250% FPL, (the threshold for 73% AV CSRs), the point estimates are -10.9, -9.2, and -9.8 percentage points respectively for each plan year and are again statistically significant.

Figure 2 illustrates the results of our local linear RD specification for the probability of selecting a Silver plan in each plan year.<sup>9</sup> We plot the assignment variable (income as a percent of FPL) on the x-axis and the outcome variable (fraction of enrollees selecting a Silver plan) on the y-axis. Each observation is the average of the outcome for all enrollees at that income/FPL percentage point and the lines are the estimated local linear regression functions. This plot represents our preferred specification, which as described uses a bandwidth of 20 and does not include controls. From the left, income as a percentage of FPL begins at 100 and goes through 400 percent on the right. In each plan year, there are noticeable differences in the fraction of enrollees that select a Silver plan at each of the eligibility thresholds – 150, 200, and 250% of FPL – consistent with the results presented in Table 3.

Appendix Figure 2 presents a bandwidth robustness illustration for the outcome of selecting a Silver plan in 2014. This figure shows the effect of changing the

<sup>9</sup> Figures 2 through 6 were created using a 2% random sample of Marketplace enrollees in each respective plan year.

FPL range around the FPL threshold that is included in the local linear estimation.<sup>10</sup> Because of the tradeoff between higher variability at lower bandwidths and potential bias from including data too far from the relevant eligibility threshold at higher bandwidths, we show the results as a function of this parameter to assure the reader that the results are not overly dependent on the choice of this interval. In this figure, the x-axis is the bandwidth at which the specification was estimated, while the y-axis is the size of the estimate. The solid dark line represents the estimate itself, and the lighter dashed lines represent the 95% confidence interval for the estimate.<sup>11</sup> While there is some very slight variability in the estimate at the smallest bandwidths, the point estimates are robust to changing the exact bandwidth used for estimation. Increasing the bandwidth decreases the standard error on the estimate but does not change the point estimate in a meaningful way.

While knowing that consumers are responsive to CSR eligibility in their decision to select a Silver plan is important for assessing the effectiveness of these subsidies, knowing which metal level consumers would have chosen in place of the Silver plans is also important. In Table 3, we also report the results of RD analyses of the probability of selecting a Bronze plan, a Gold plan, a Platinum plan, and a Catastrophic plan. The changes in probability across each metal level, by construction, add up to zero as our data comprise the population of Marketplace enrollees in states that used the HealthCare.gov platform. Again, we report the RD estimates at a bandwidth of 20 FPL for each of these outcomes. At 150% FPL in 2014 (the upper eligibility threshold for 94% AV CSRs), consumers are 1.2 percentage points more likely to choose a Bronze plan, 0.9 percentage points more likely to choose a Gold plan, and 1.1 percentage points more likely to

<sup>10</sup> The bandwidth robustness results for 2015 and 2016 are available upon request.

<sup>11</sup> We estimated the bandwidth robustness results using a 2% random sample of our 2014 Marketplace enrollees, which is why the 95% confidence interval is wider than what one would expect based on the standard errors reported in Table 3.

choose a Platinum plan. There is no evidence of a statistically different probability of choosing a Catastrophic plan. At the 200% FPL threshold in 2014, consumers are 8.6 percentage points more likely to choose a Bronze plan, 8.5 percentage points more likely to choose a Gold plan, and 2.9 percentage points more likely to choose a Platinum plan. At the 250% FPL threshold in 2014, consumers are 5.1 percentage points more likely to choose a Bronze plan, 5.1 percentage points more likely to choose a Gold plan, and 0.9 percentage points more likely to choose a Platinum plan.

Thus, in 2014, of the increase in Silver plan enrollment at each CSR discontinuity, almost one-half came from people who would have enrolled in Bronze plans and roughly one-quarter each came from people who would have enrolled in Gold and Platinum plans. This pattern appears to also in 2015 – about one-half of the increase in Silver plan enrollment comes from Bronze plans and the remainder is split roughly equally from Gold and Platinum plans. In 2016, however, consumers are relatively more likely to switch to Silver plans from Bronze plans rather than from Gold or Platinum plans. These outcomes are also represented in Figures 3 through 6.

### *B. Regression Discontinuity Specification Tests*

The potential for bias in the RD design exists if unobserved characteristics such as preferences for health insurance generosity differs discontinuously between enrollees just above and enrollees just below the income thresholds for CSRs. We are unable to test for violations of the RD identification assumption directly, but we do provide several validity checks in this section.

One check, already discussed above, is to test whether the density of observations as a function of the assignment variable (income as a percentage of FPL) is continuous through the discontinuity threshold. The density of



observations in our data (shown in Appendix Figure 1) appears to be continuous through each of the FPL thresholds (150% FPL, 200% FPL, and 250% FPL), which is suggestive that our specification is valid.

We also test whether observable characteristics of Marketplace enrollees in each plan year were continuous through the assignment variable. We find no evidence of important differences at any of the eligibility thresholds in the enrollees' ages, the proportion of enrollees that were male, proportion that were white, black, and Asian as indicated in Appendix Figures 3 through 7 and in Appendix Table 2.<sup>12</sup>

Finally, we present the results of a falsification test using enrollees who were members of federally recognized tribes or Alaska Native Claims Settlement Act Corporation shareholders. These American Indian/Alaska Native (AIAN) enrollees were eligible for a different cost-sharing subsidy schedule than were other enrollees. In particular, AIANs were eligible for either zero-cost sharing plans (for those with family incomes below 300% of FPL) or limited-cost-sharing plans (for those with incomes greater than or equal to 300% FPL). Importantly and unlike for other enrollees, eligibility for zero cost-sharing and limited-cost sharing is not contingent on the enrollee selecting a Silver plan.

Because of these incentives, relatively few AIANs select Gold, Platinum, or Catastrophic plans. For example, of the roughly 18,000 AIAN enrollees in 2014, almost 30% selected Silver and almost 70% selected Bronze plans, and fewer than 5% selected Gold, Platinum, and Catastrophic plans combined. Figure 7 shows the responsiveness of AIANs to CSR thresholds in 2014 in the selection of Silver and Bronze plans.<sup>13</sup> Because few AIANs select Gold, Platinum, or Catastrophic plans, we do not report on the responsiveness to changes in the subsidy schedule

<sup>12</sup> While the estimates reported in Appendix Table 2 use the full populations of enrollees in each plan year, Appendix Figures 3 through 7 were created using a 2% random sample of Marketplace enrollees in each respective plan year.

<sup>13</sup> Results for other plan years are available upon request.

for those metal levels. Notable in the figures is the lack of a discontinuity in the metal level of the selected plan at 150%, 200%, or 250% FPL (the discontinuity in the CSR schedule for non-AIANs) and the presence of a discontinuity at 300% FPL (the cut-off point between AIAN eligibility for zero-cost sharing plans and limited-cost sharing plans).

## 5. Discussion

In this section, we provide a discussion on how these results can be interpreted so as to assess the functioning of the Marketplace CSRs. First, we use these empirical results to calculate consumer's responsiveness to the price of insurance generosity by calculating the price elasticity of insurance generosity. Second, we assess the degree to which CSR-eligible consumers may be making suboptimal choices when not selecting Silver plans by selecting dominated plans. Third, we assess the degree of crowd-out (and of crowd-in) induced by the availability of CSRs.

### *A. Price Elasticity of Insurance Generosity*

CSRs have the effect of lowering the cost to consumers of obtaining a high AV insurance plan. In the absence of CSRs, a consumer would have to have the difference in premium between a Silver plan and, for example, a Platinum plan in order to obtain a 90% AV plan in place of a 70% AV plan. However, if this person were eligible for a 94% Silver plan because of CSRs, he or she could obtain a 94% AV plan by purchasing the lower-cost Silver plan.

One way to think about this choice is to assess how CSRs affect the price per unit of AV faced by the consumer—that is, the price of insurance generosity. A natural measure of the generosity of an insurance plan is its actuarial value

(AV). We measure the price of insurance generosity to an individual as the premium net of APTC per AV of a plan, or:

$$(3) \quad pAV_{ij} = \frac{NP_{ij}}{AV_j}.$$

CSRs affect the price per unit of AV because, with each subsequent level of CSR (that is, with each change in AV at the CSR discontinuity thresholds), AV increases but premiums do not.

To obtain a measure of consumer responsiveness, we calculate the elasticity as:

$$(4) \quad \eta = \frac{\Delta AV}{\Delta pAV} \times \frac{pAV}{AV}.$$

In order to calculate this quantity, we estimate an additional set of RD models where the dependent variable is the AV of the plans.<sup>14</sup> Thus, we estimate the change in AV at each discontinuity point in the CSR schedule. We also calculate the implied change in the price of AV at each discontinuity point. Estimates for 2014 are reported in Table 4.<sup>15</sup> We find the consumers elasticity of demand for insurance generosity (AV) to be near unit elastic, with estimates of -0.90 at 150% FPL, -0.86 at 200% FPL, and -1.3 at 250% FPL.

### *B. Do Enrollees Choose Dominated Plans?*

As mentioned above, there is concern that CSR-eligible consumers may mistakenly forgo these cost-sharing subsidies. We calculate the fraction of consumers that choose dominated plans, which we consider to be plans that have

<sup>14</sup> The results of these analyses are available upon request.

<sup>15</sup> These results are reported for all three plan years in Appendix Table 3 and in Appendix Figure 8.

both a higher premium and a lower AV than Silver plans.<sup>16</sup> We recognize that consumers may also make suboptimal choices when choosing Bronze plans, which have lower premiums and lower AVs, in place of Silver plans but these plans are not strictly dominated in that this choice could also be driven by a desire to save on premiums or minimize total cost for a relatively healthy consumer, as well as personal risk-taking preferences.

Choice of a dominated plan can occur for 94% and 87% AV CSR eligible consumers. Silver plans with 94% AV CSRs dominate both Platinum plans (90% AV) and Gold Plans (80% AV) because generally have lower premiums than either Gold or Platinum plans. CSRs for 87% AV dominate Gold plans but not Platinum plans.

In Table 5, we report the fractions of consumers with incomes in the range eligible for 94% and 87% AV CSRs that select Gold and Platinum plans. Among consumers potentially eligible for 94% AV CSRs, 1.6% chose a Platinum plan and 2.1% chose a Gold plan in 2014, while in 2015 these percentages were 0.8% and 1.2%, and in 2016 these percentages were 0.2% and 0.8%. Among consumers potentially eligible for 87% AV, 3.5% chose Gold plans in 2014, 2.5% chose Gold plans in 2015, and 1.7% chose Gold plans in 2016. Thus, in 2014 only 2.4% of consumers who appear eligible for the two most generous types of CSRs chose a dominated plan. In 2015 this percentage was even lower, only 1.5%, and in 2016 the percentage was even smaller at 0.8%, suggesting that the benefits and availability of CSRs may be increasingly understood by consumers.

<sup>16</sup> These plans may not be strictly dominated if they have different networks or secure in-network access to a specific provider. Our estimates of the fraction of consumers choosing dominated plans therefore should be considered upper bounds.

*C. Do CSRs Crowd-out or Crowd-in the Purchase of More Generous Insurance?*

The CSR program exists to improve affordability of care for low-income consumers over and above reducing the cost of premiums (achieved by APTCs). It does this, as explained above, by increasing the AV of Silver plans for low-income consumers. However, some low-income consumers may have voluntarily purchased high AV Gold or Platinum plans in the absence of CSRs, but in fact purchase actuarially comparable Silver plans because of the availability of generous CSRs. Thus, the CSR subsidy may have crowded-out some private purchase of AV. Crowd-out, to the extent it exists, arguably makes the CSR program less effective in achieving its goal of providing sufficiently generous insurance to low-income Marketplace enrollees who would have been otherwise under-insured.

At the same time, some low-income consumers would have chosen low AV Bronze plans in the absence of the CSR program, but instead purchase Silver plans because of the availability of CSRs. In this way, the CSR program can “crowd-in” the voluntary purchase of higher AV plans than the consumer otherwise would purchase, increasing the effectiveness of the program.

We explore the extent to which the CSR program led to the crowd-out and crowd-in of AV. At the 150% FPL discontinuity, the threshold between 94% and 87% AV CSRs, our RD results inform us on what plans enrollees with incomes at or around 150% FPL would have chosen if 94% AV CSRs were unavailable and were replaced with 87% AV CSRs. The “direct effect” of having 94% AV Silver plans in place of 87% AV Silver plans is 7 AV points. Consumers who would have chosen a Platinum plan (90% AV) only gain 4 AV points and thus 3 AV points from the direct effect are “crowded-out.” On the other hand, consumers who would have chosen a Gold plan (80% AV) gain 14 AV points and consumers

who would have chosen a Bronze plan (60% AV) gain 34 AV points, thus an additional; 7 and 27 AV points respectively are “crowded-in.”

Similarly, at the 200% FPL discontinuity, the threshold between 87% and 73% AV CSRs, the RD results say what plans enrollees with incomes at or around 200% FPL would have chosen if 87% AV CSRs were replaced with 73% AV CSRs. The “direct effect” of CSRs in this case is again the difference between 87% and 73% AV, which is 14 AV points. Consumers who would have chosen a Platinum plan (90% AV) lose 3 AV points and those who would have chosen a Gold Plan (80% AV) only gain 7 AV points; thus, 17 and 7 AV points respectively from the direct effect are “crowded-out.” Again, consumers who would have chosen a Bronze plan gain 27 AV points, thus an additional 13 AV points are “crowded-in.”

At the 250% FPL discontinuity, the threshold between the 73% AV CSRs and 70% AV, the “direct effect” of CSRs is 3 AV points. Consumers who would have chosen a Platinum plan (90% AV) lose 17 AV points and those who would have chosen a Gold Plan (80% AV) lose 7 AV points, crowding-out 20 and 10 AV points respectively. Consumers who would have chosen a Bronze plan gain 13 AV points, thus an additional 10 AV points are “crowded-in.”

The total amount of crowd-out versus crowd-in depends upon the shares of consumers would have chosen Bronze, Gold, or Platinum plans instead of Silver plans at each point in the CSR discontinuity schedule. These shares – estimated in our RD analysis – can be used to weight the amounts of crowd-out and crowd-in relative to the direct effects of CSRs.

Table 6 reports these results. Among enrollees receiving 94% CSRs in 2014, there is more crowd-in than crowd-out, so that the net effect on AV is greater than the direct effect – 7.5 AV points rather than 7. Among enrollees receiving 87% CSRs, the amount of crowd-in is roughly equal to the amount of crowd-out so that the net effect is only slightly larger than the direct effect. Among enrollees

receiving 73% CSRs, there is more crowd-out than crowd-in, so that the net effect on AV is only 2.6 AV points rather than 3 AV points. Since a greater number of CSR eligible enrollees are eligible for 94% AV CSRs, compared with 87% AV CSRs and 73% AV CSRs, overall, the amount of crowd-in exceeds the amount of crowd-out in 2014. In 2015 and 2016, once again, there is more crowd-in than crowd-out.

Thus, the structure of the CSR program that requires the purchase of Silver plans increases the effectiveness of the program in increasing the AV of the plans chosen by low-income enrollees.

*D. Is Consumer Responsiveness to CSRs Concentrated Among those Receiving Application Assistance?*

Approximately 45% of Marketplace consumers received enrollment assistance from someone who was an official Marketplace “navigator” or “assistor” or who was a private broker. An unknown additional percentage may have contacted the HealthCare.gov call center or received informal help from family members or friends. To shed some light on whether the responsiveness of consumers to the availability of CSRs may have been due to the availability of assistance, we stratify our main results by whether there is an indication on the application that the individual received help from an “assistor/navigator/broker”. There is no evidence that there is a differential responsiveness to the availability of CSRs among those receiving assistance from those not receiving assistance (see Appendix Figures 9 and 10).

Because receipt of assistance from an “assistor/navigator/broker” is potentially related to a consumers’ financial and insurance literacy, we also stratify our main results by states according to whether they supported the use of navigators. As of

2013, 16 states had passed or were seriously considering laws that would regulate the use of navigators in helping enrollees sign up for coverage through the Federal or state-based Marketplaces.<sup>17</sup>

Similarly, we find no difference in our estimated consumer responsiveness to CSRs in states that chose to expand Medicaid and states that chose not to expand Medicaid (see Appendix Figure 11).

## 6. Conclusions

In this study, we use administrative data on over 24 million health insurance plan choices of individuals who purchased a health insurance plan in either 2014, 2015, or 2016 through the HealthCare.gov in order to assess whether Marketplace consumers behave in a manner that suggests that they are aware of the availability of CSRs. Our RD analysis shows that consumers are highly sensitive to the availability of CSRs when selecting plans. Therefore, we believe that consumers act as though they are both aware of and value the benefits provided by the CSR program. Our estimate of the price elasticity of demand with respect to the generosity of insurance ranges from -0.9 to -1.3.

In addition, we find little evidence that CSR eligible consumers are making suboptimal choices and choosing dominated insurance plans instead of enhanced Silver plans. Moreover, the fraction of enrollees choosing dominated plans – already tiny in 2014 – was even smaller in 2015 and 2016, suggestive of learning or better communication.

Finally, while we do find evidence that the availability of CSRs crowds-out some voluntary purchases of more generous plans, we find overall an equal or

<sup>17</sup> These states included Arkansas, Georgia, Illinois, Indiana, Maine, Michigan, Missouri, Montana, North Carolina, Nebraska, New Mexico, Ohio, Pennsylvania, Texas, Utah, and Virginia (see Ollove, 2013).



greater amount of “crowd-in” of the voluntary purchase of more generous plans. Our results suggest that consumers are aware of and value Marketplace CSRs and that these subsidies are providing more comprehensive coverage to low-income consumers in an effective manner.

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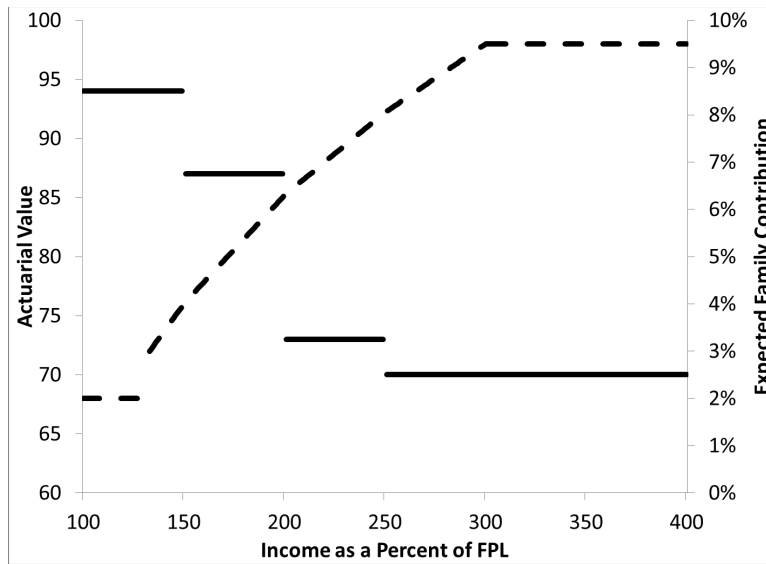


FIGURE 1. COST-SHARING REDUCTIONS AND EXPECTED FAMILY CONTRIBUTIONS BY FAMILY INCOME AS A PERCENT OF FPL FOR THE 2014 PLAN YEAR

Sources: IRS Instructions for Form 8962 and <https://www.gpo.gov/fdsys/pkg/FR-2013-03-11/pdf/2013-04902.pdf>.

Notes: Solid line represents the actuarial value of a Silver plan at different levels of family income as a percent of FPL. Dashed line represents the share of family income that is expected to be contributed toward premiums at different levels of family income as a percent of FPL.

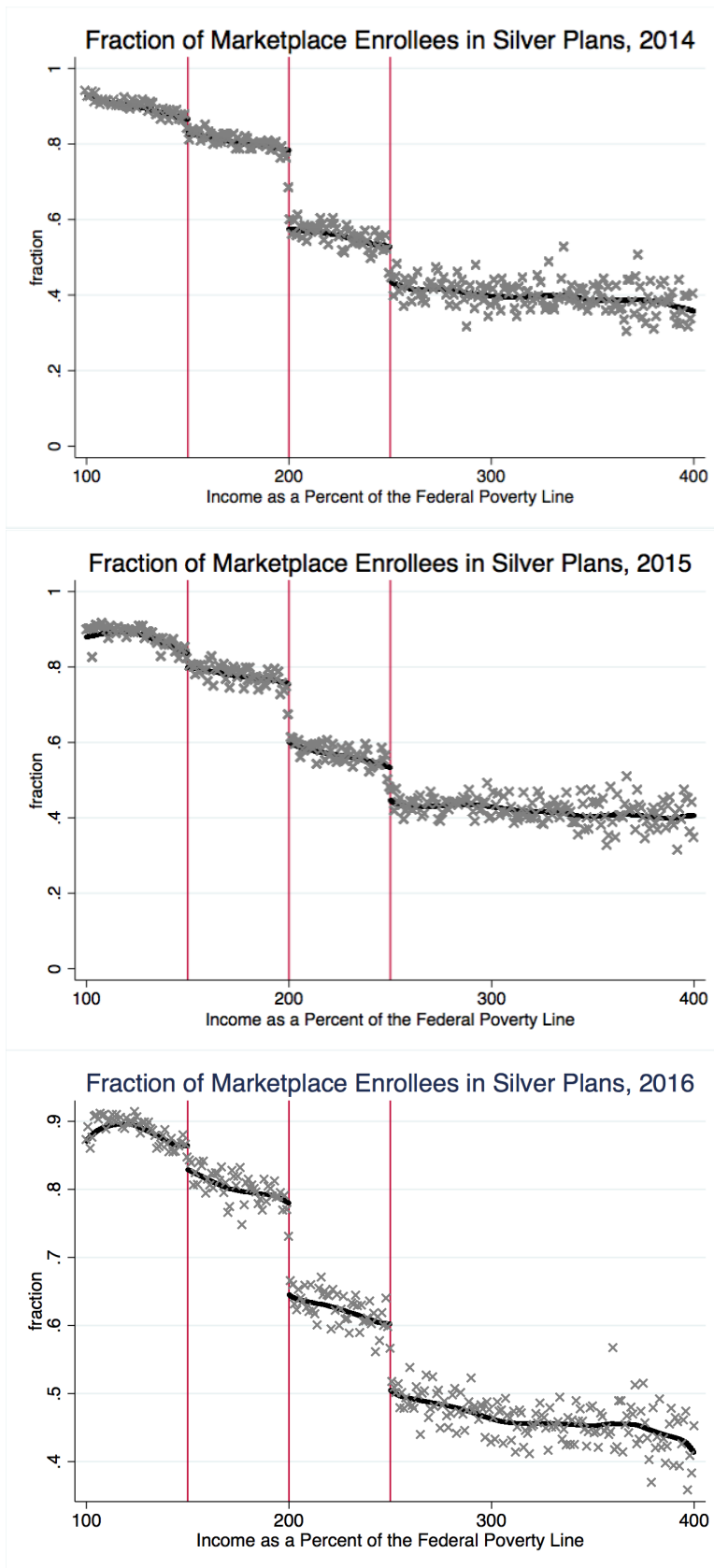


FIGURE 2. FRACTION OF MARKETPLACE ENROLLEES IN SILVER PLANS

*Notes:* Individual-level administrative data on Marketplace enrollment choices in states using HealthCare.gov platform. Fractions of enrollees with Silver plans in a one-percentage point FPL cell are reported. The regression lines are four separate local linear regressions fitted on individual enrollment decisions between 100 and 149% FPL, 150 and 199% FPL, 200 and 249% FPL, and 250 and 400% FPL at a bandwidth of 20 percentage points.

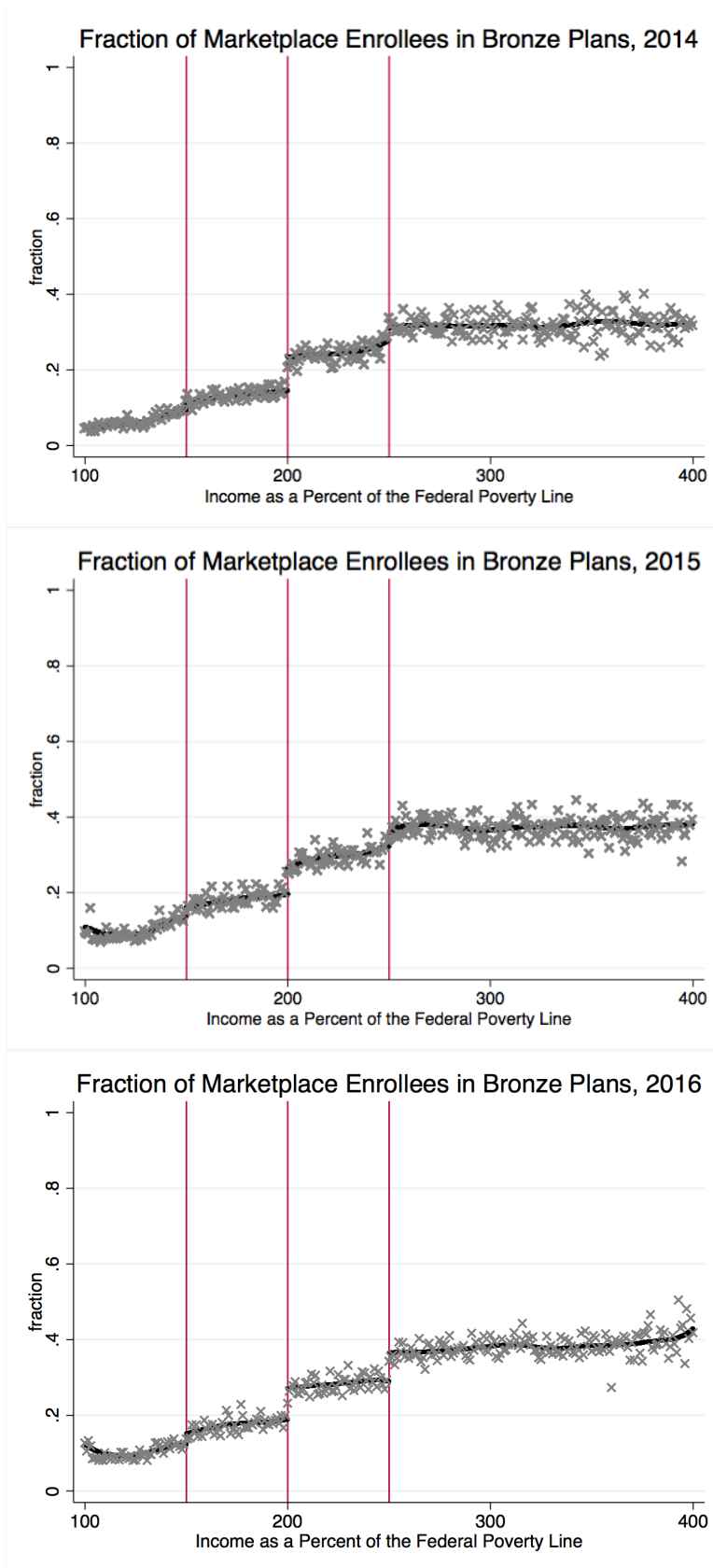


FIGURE 3. FRACTION OF MARKETPLACE ENROLLEES IN BRONZE PLANS

Notes: See notes for Figure 2.

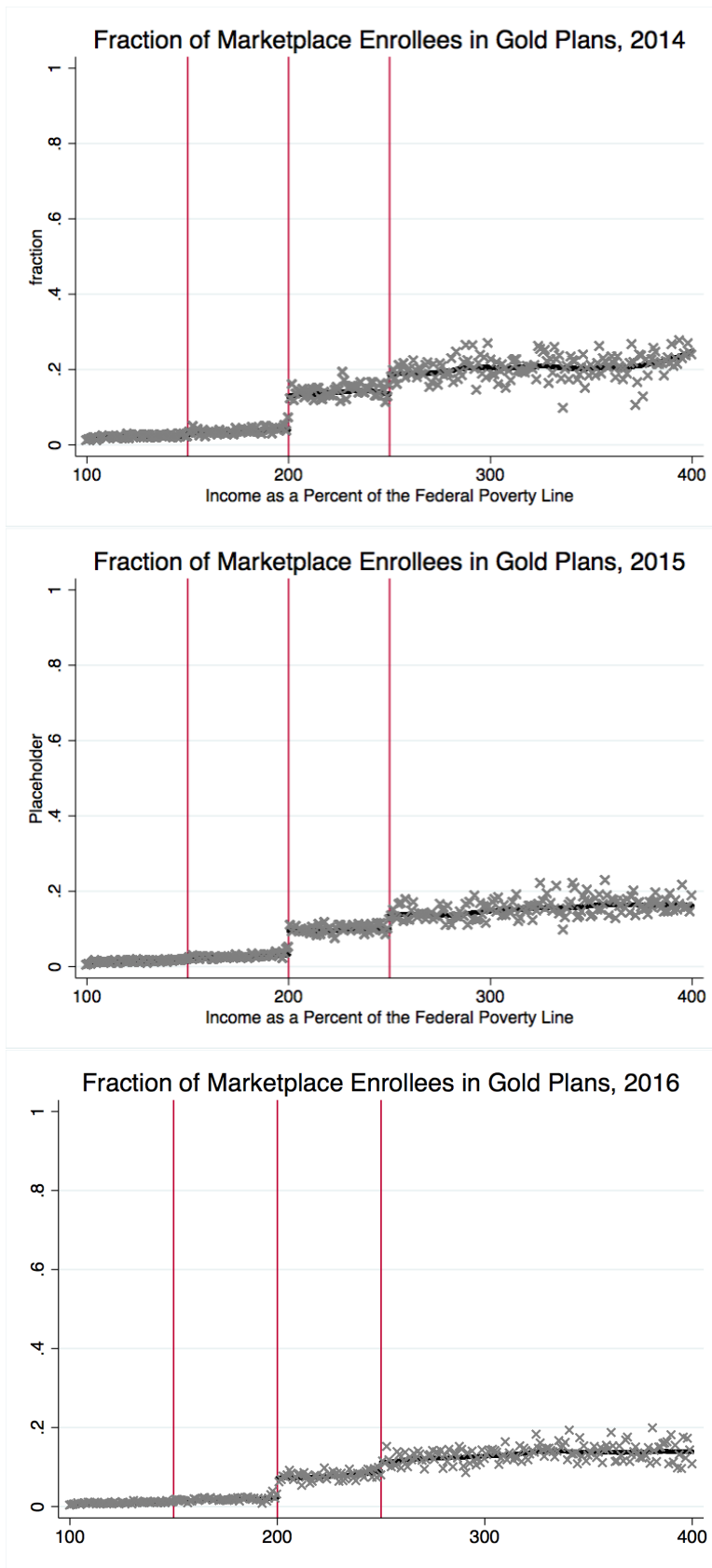


FIGURE 4. FRACTION OF MARKETPLACE ENROLLEES IN GOLD PLANS

Notes: See notes for Figure 2.

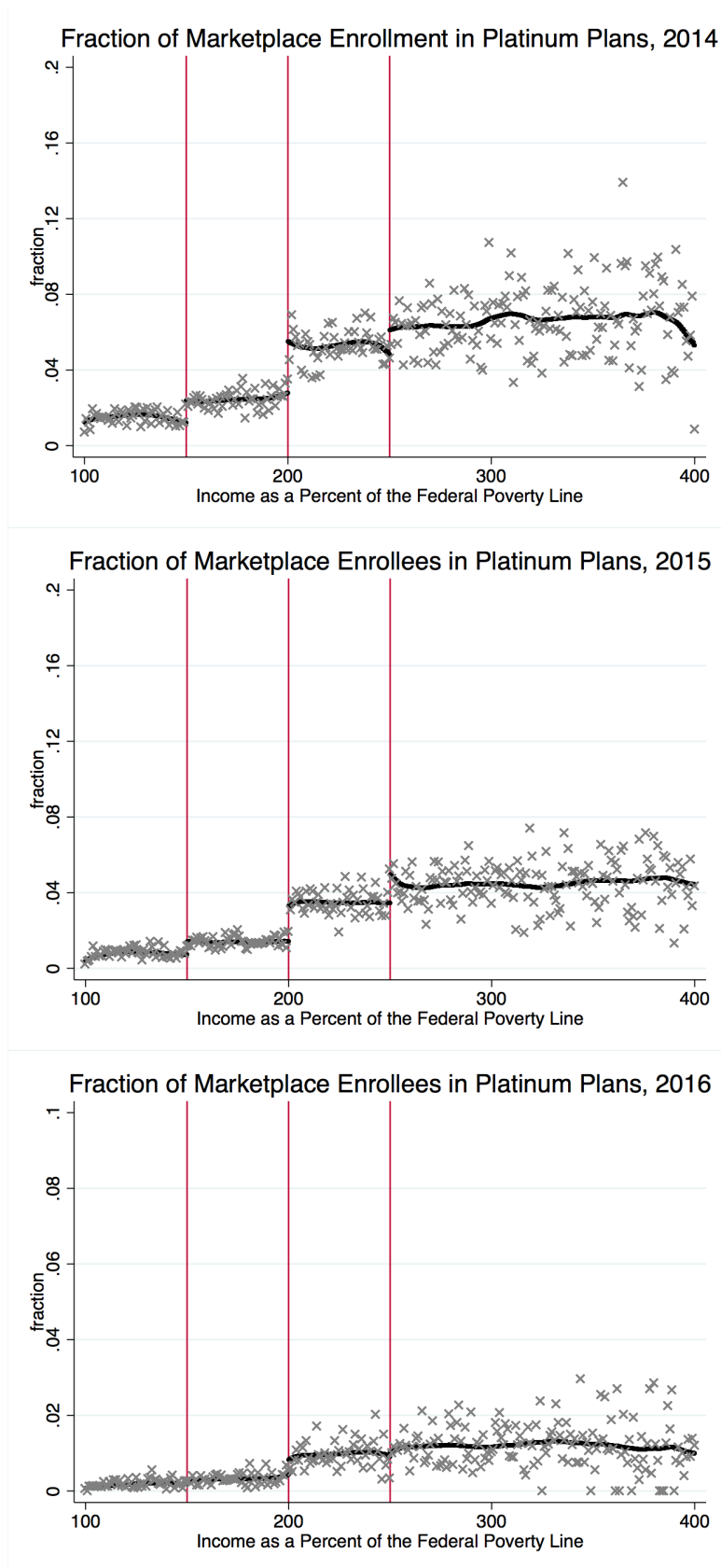


FIGURE 5. FRACTION OF MARKETPLACE ENROLLEES IN PLATINUM PLANS

Notes: The scale of the y-axis runs from 0 to 0.2 in 2014 and 2015 and from 0 to 0.1 in 2016. See notes for Figure 2.



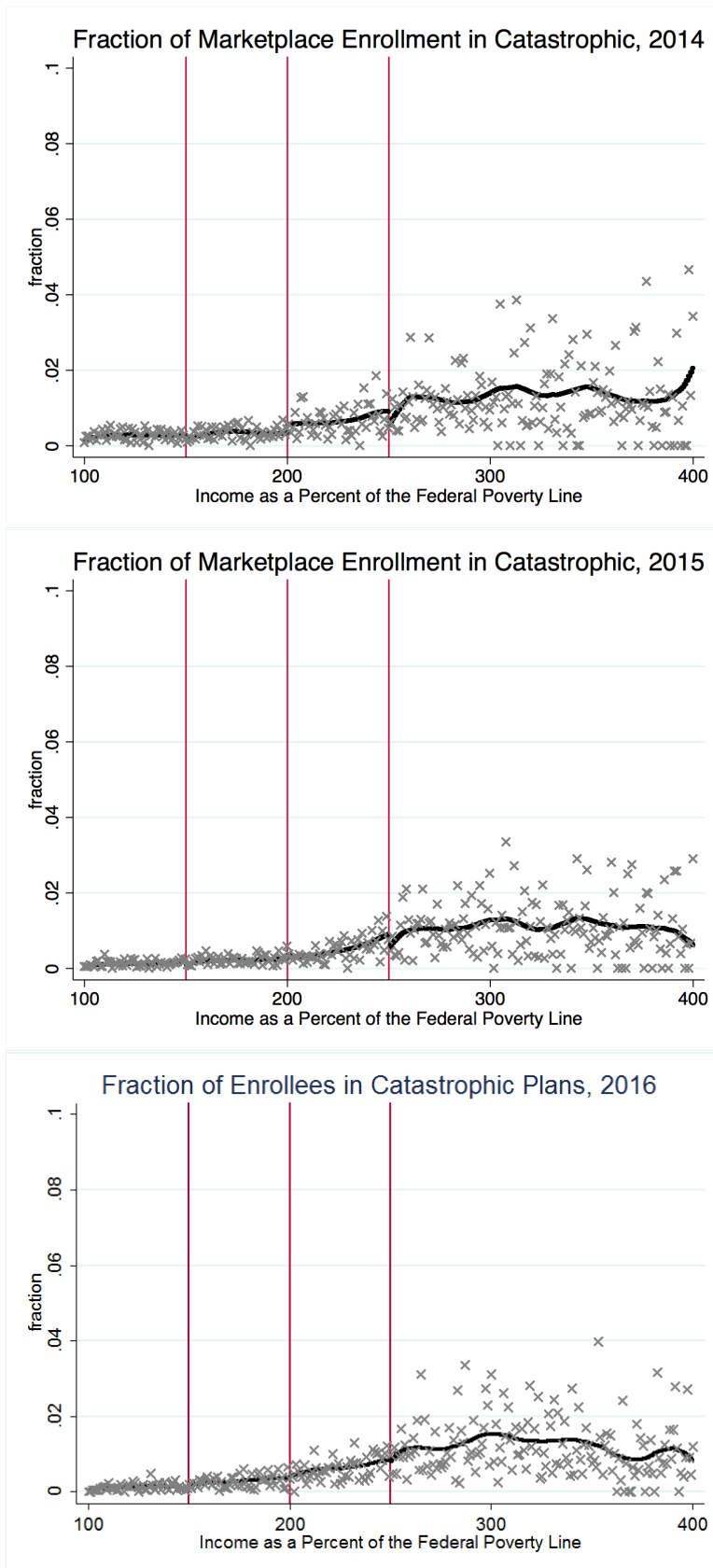


FIGURE 6. FRACTION OF MARKETPLACE ENROLLEES IN CATASTROPHIC PLANS

Notes: The scale of the y-axis runs from 0 to 0.1. See notes for Figure 2.

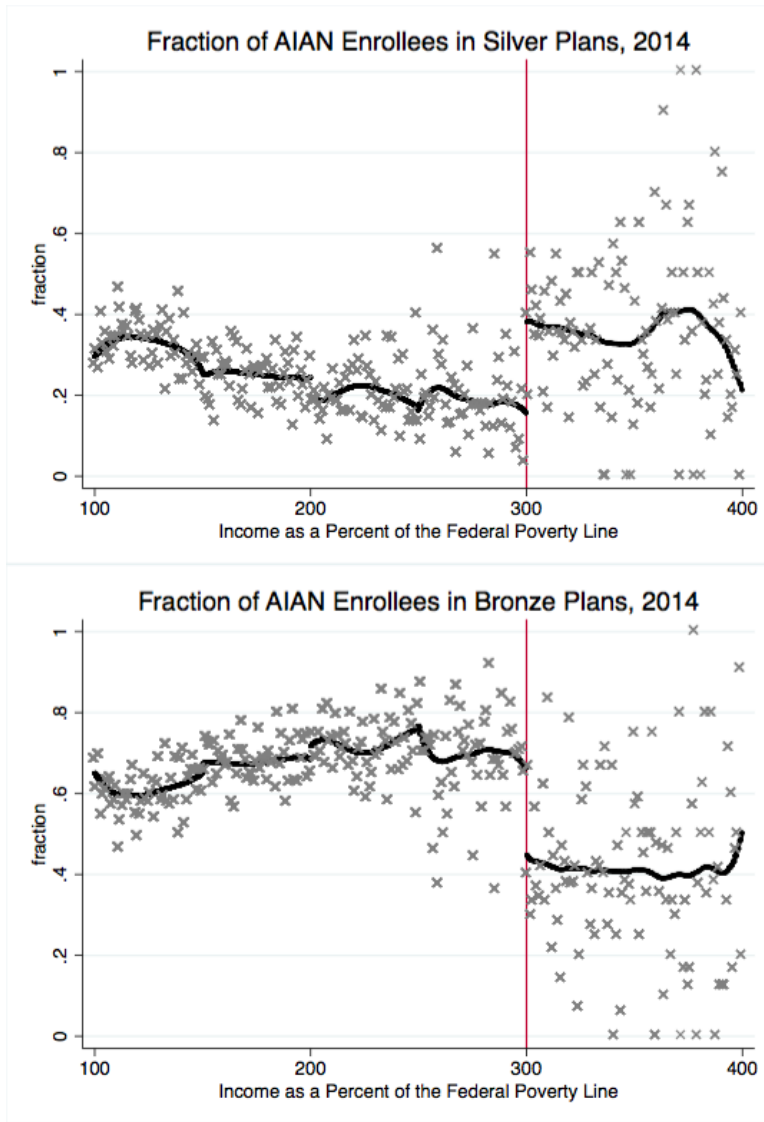


FIGURE 7. FRACTION OF AMERICAN INDIAN/ALASKA NATIVE (AIAN) MARKETPLACE ENROLLEES IN SILVER AND BRONZE PLANS IN 2014

*Notes:* Individual-level administrative data on Marketplace enrollment choices in states using HealthCare.gov platform. Fractions of enrollees with Silver or Bronze plans in a one-percentage point FPL cell are reported. The regression lines are five separate local linear regressions fitted on individual enrollment decisions between 100 and 149% FPL, 150 and 199% FPL, 200 and 249% FPL, 250 and 299% FPL, and 300 and 400% FPL at a bandwidth of 20 percentage points.

TABLE 1—DETERMINATION OF PREMIUM TAX CREDITS IN 2014

Income as a % of FPL	Expected Family Contribution		Premium Tax Credit per month (assuming a Benchmark monthly premium of \$300)
	annually as a percentage of family income	in dollars per month (for family size 1)	
100-133%	2%	\$19-\$25	\$275-\$281
133-150%	3%-4%	\$38-\$57	\$243-\$262
150-200%	4%-6.3%	\$57-\$121	\$179-\$243
200-250%	6.3%-8.05%	\$121-\$193	\$107-\$179
250-300%	8.05%-9.5%	\$193-\$273	\$27-\$107
300-400%	9.5%	\$273-\$364	\$0-\$27
>400%	9.5%	\$364	\$0

*Notes:* The expected family contribution as a percentage of family income is indexed and increased slightly for the 2015 and 2016 plan years.

*Source:* IRS Instructions for Form 8962.

TABLE 2—ELIGIBILITY FOR COST-SHARING REDUCTION

Income as a % of FPL	Actuarial Value of Silver Plans
100-150%	94%
150-200%	87%
200-250%	73%
>250%	70%

*Source:* “Patient Protection and Affordable Care Act; HHS Notice of Benefit and Payment Parameters for 2014,” *Federal Register*, <https://www.gpo.gov/fdsys/pkg/FR-2013-03-11/pdf/2013-04902.pdf>

TABLE 3—REGRESSION DISCONTINUITY RESULTS ON THE METAL LEVEL CHOICE OF MARKETPLACE ENROLLEES

	(1)	(2)	(3)	(4)	(5)
	Silver	Bronze	Gold	Platinum	Catastrophic
2014 Marketplace Enrollees					
Over 150% FPL	-0.032 (0.001)	0.012 (0.001)	0.009 (0.001)	0.011 (0.001)	-0.0002 (0.0002)
Over 200% FPL	-0.201 (0.002)	0.086 (0.002)	0.085 (0.001)	0.029 (0.001)	0.002 (0.0003)
Over 250% FPL	-0.109 (0.003)	0.051 (0.003)	0.051 (0.002)	0.009 (0.001)	-0.002 (0.001)
2015 Marketplace Enrollees					
Over 150% FPL	-0.030 (0.001)	0.019 (0.001)	0.006 (0.0004)	0.005 (0.0003)	-0.0002 (0.0001)
Over 200% FPL	-0.162 (0.002)	0.082 (0.002)	0.060 (0.001)	0.019 (0.001)	0.0005 (0.0002)
Over 250% FPL	-0.092 (0.002)	0.045 (0.002)	0.042 (0.002)	0.011 (0.001)	-0.0045 (0.0004)
2016 Marketplace Enrollees					
Over 150% FPL	-0.036 (0.005)	0.029 (0.004)	0.005 (0.001)	0.001 (0.001)	0.0008 (0.001)
Over 200% FPL	-0.135 (0.008)	0.081 (0.007)	0.049 (0.004)	0.004 (0.001)	0.0005 (0.001)
Over 250% FPL	-0.098 (0.010)	0.075 (0.009)	0.022 (0.006)	0.001 (0.002)	-0.0004 (0.002)

*Notes:* Robust standard errors are in parentheses. Estimates based on a 100% sample of Marketplace Enrollees in states using the HealthCare.gov portal in the respective plan year. Please see Appendix Table 1 for the numbers of enrollees in each plan year. For each outcome and plan year, estimates are based on three local linear regression models with a triangular kernel and a bandwidth of 20. Please see the Appendix Figure 2a-2c for results at other bandwidths. The coefficient on the "Over 150% FPL" indicator yields an estimate of the discontinuous change in the probability of selecting a particular metal level at 150% FPL, and the coefficients on the "Over 200% FPL" and "Over 250% FPL" indicators can be interpreted similarly.

TABLE 4—OWN-PRICE DEMAND ELASTICITIES FOR AV, 2014

	(1)	(2)	(3)	(4)	(5)	(6)
	Average Net Premium at CSR Threshold	Average Actuarial Value at CSR Threshold	RD Estimate of Change Actuarial Value	Price per Unit of AV	Change in the Price per Unit of AV at the CSR Threshold	Own-price Elasticity of Demand for Actuarial Value of Insurance
150% FPL	\$75	92	-6.431 (0.034)	0.815	0.063	-0.904
200% FPL	\$110	84	-11.000 (0.042)	1.310	0.200	-0.858
250% FPL	\$150	72	-1.382 (0.054)	2.083	0.031	-1.290

*Notes:* Column (3) reports the results of three local linear regression models with a triangular kernel and a bandwidth of 20 where the dependent variable is the actuarial value of the plan chosen (robust standard errors in parentheses). Please see Appendix Figures 10 for a graphical representation of these estimates. Column (4) is Column (1) divided by Column (2) and Column (5) is Column (1) / (Column (2) + Column (3)) - Column (4). Column (6) is (Column (3) / Column (5)) \* (Column (4) / Column (2)).

TABLE 5—WHAT PERCENTAGE OF MARKETPLACE ENROLLEES CHOOSE DOMINATED PLANS?

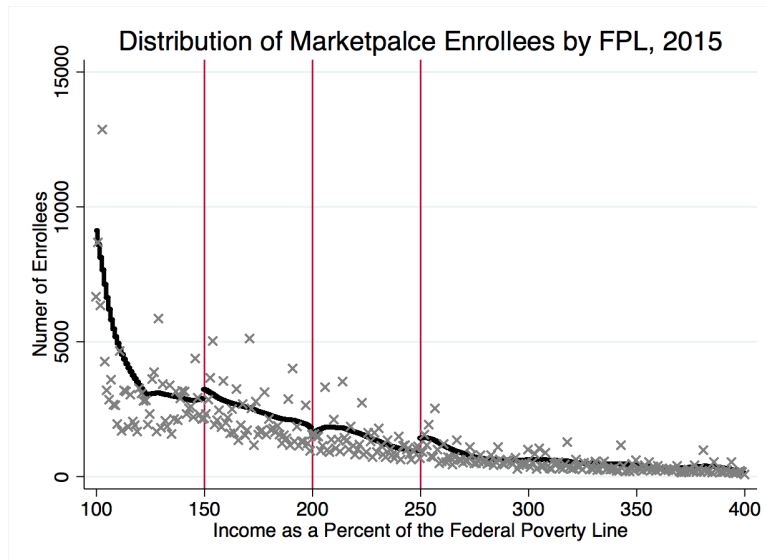
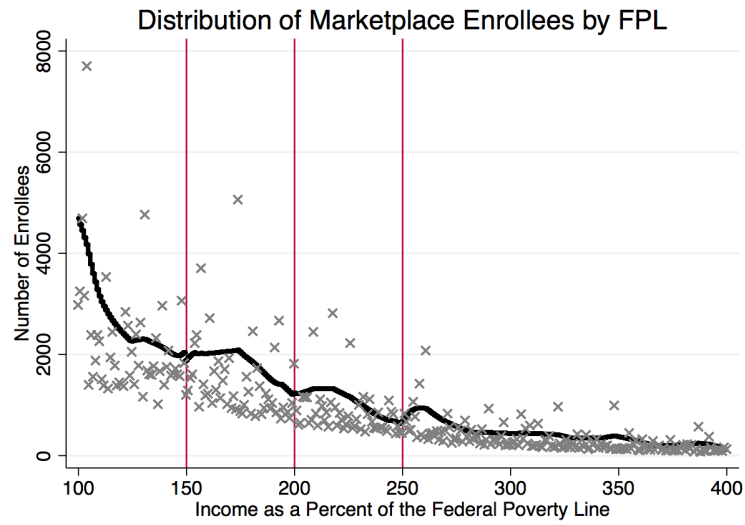
	Number of Enrollees	Percent that Choose Platinum (AV is 90)	Percent that Choose Gold (AV is 80)	Percent Choosing Dominated Plans
2014 Marketplace Enrollees				
100-150% FPL (eligible for 94% AV Silver Plan)	2,188,597	1.6%	2.1%	3.6%
150-200% FPL (eligible for 87% AV Silver Plan)	1,447,203	2.4%	3.5%	3.5%
200-250% FPL (eligible for 73% AV Silver Plan)	849,280	5.3%	13.6%	0.0%
250-400% FPL (not CSR eligible)	913,212	6.6%	19.8%	0.0%
All Enrollees	5,398,371	3.2%	7.3%	2.4%
2015 Marketplace Enrollees				
100-150% FPL (eligible for 94% AV Silver Plan)	3,252,423	0.8%	1.2%	2.0%
150-200% FPL (eligible for 87% AV Silver Plan)	2,103,663	1.4%	2.5%	2.5%
200-250% FPL (eligible for 73% AV Silver Plan)	1,232,640	3.4%	9.8%	0.0%
250-400% FPL (not CSR eligible)	1,385,749	4.4%	14.8%	0.0%
All Enrollees	7,974,586	2.0%	5.2%	1.5%
2016 Marketplace Enrollees				
100-150% FPL (eligible for 94% AV Silver Plan)	3,413,360	0.2%	0.8%	0.9%
150-200% FPL (eligible for 87% AV Silver Plan)	2,181,343	0.3%	1.7%	1.7%
200-250% FPL (eligible for 73% AV Silver Plan)	1,324,879	0.9%	7.7%	0.0%
250-400% FPL (not CSR eligible)	1,494,531	1.2%	12.6%	0.0%
All Enrollees	8,877,869	0.6%	4.7%	0.8%

*Notes:* Dominated plans are defined as Platinum and Gold plans for individuals with incomes between 100% and 150% FPL, and Gold plans for individuals between 150 and 200% FPL.

TABLE 6—ESTIMATES OF CROWD-OUT AND CROWD-IN FROM THE AVAILABILITY OF CSRS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Direct Effect of CSRs	CSR Effect of Choosing Silver instead of Platinum	CSR Effect of Choosing Silver instead of Gold	CSR Effect of Choosing Silver instead of Bronze	Net Effect of CSRs	Crowd- Out as a % of Net Effect	Crowd -In as a % of Net Effect
2014 Marketplace Enrollees							
94% v. 87% AV	7	-3	7	27	7.49	-0.47%	7.05%
RD Estimate		0.012	0.010	0.017			
87% v. 73% AV	14	-17	-7	13	14.08	-7.69%	8.29%
RD Estimate		0.027	0.089	0.090			
73% v. 70% AV	3	-20	-10	10	2.56	-29.50%	12.42%
RD Estimate		0.013	0.050	0.032			
2015 Marketplace Enrollees							
94% v. 87% AV	7	-3	7	27	7.70	-0.27%	9.39%
RD Estimate		0.007	0.006	0.025			
87% v. 73% AV	14	-17	-7	13	14.15	-5.40%	6.47%
RD Estimate		0.019	0.064	0.070			
73% v. 70% AV	3	-20	-10	10	2.67	-25.88%	13.68%
RD Estimate		0.015	0.039	0.037			
2016 Marketplace Enrollees							
94% v. 87% AV	7	-3	7	27	7.82	-0.03%	10.50%
RD Estimate		0.000675	0.00471	0.0292			
87% v. 73% AV	14	-17	-7	13	14.64	-2.81%	7.20%
RD Estimate		0.0039	0.0494	0.0811			
73% v. 70% AV	3	-20	-10	10	3.50	-7.00%	21.35%
RD Estimate		0.00126	0.022	0.0748			

Notes: The RD estimates are those reported in Table 3. The net effect of CSRs reported in Column (5) is the direct effect reported in Column (1) less the sum of the products of the CSR Effects and the RD Estimates. For the counterfactual of 94% versus 87% AV Silver plans, the CSR effects for Platinum and the represent crowd-out while the CSR effects for Gold and Bronze represent crowd-in. For the counterfactuals of 87% versus 73% AV and 73% versus 70% AV Silver plans, the CSR effects for Platinum and Gold represent crowd-out while the CSR effects for Bronze represent crowd-in.

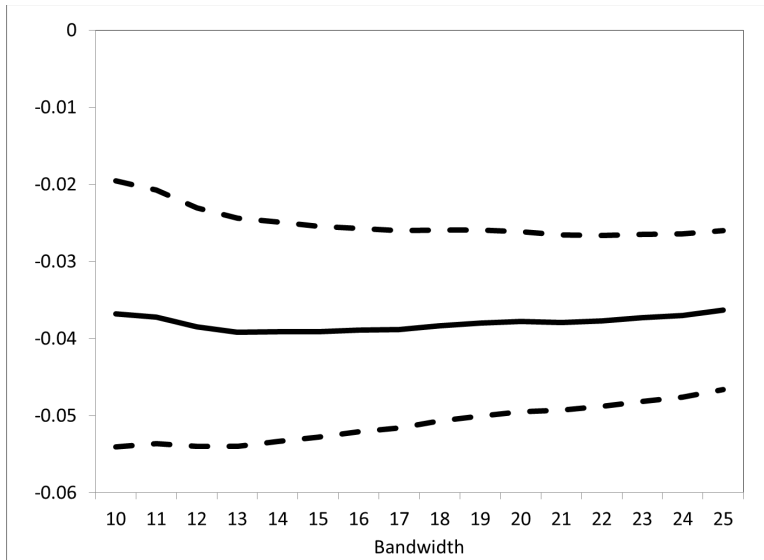


APPENDIX FIGURE 1. DISTRIBUTION OF MARKETPLACE ENROLLEES, BY FPL

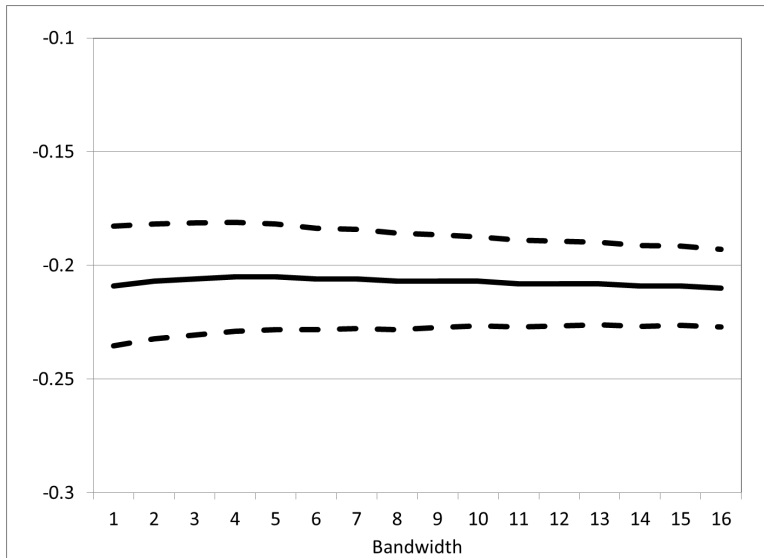
Notes: Individual-level administrative data on marketplace enrollment in states using Healthcare.gov platform. Number of enrollees in Marketplace plans in a one-percentage point FPL cell is reported. The regression lines are four separate local linear regressions fitted on individual enrollment decisions between 100 and 149% FPL, 150 and 199% FPL, 200 and 249% FPL, and 250 and 400% FPL with a bandwidth of 20 percentage points.



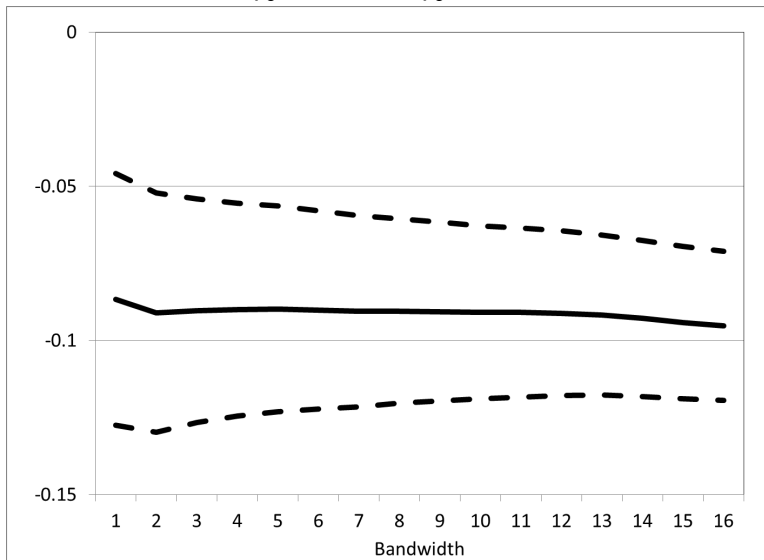
94% versus 87% AV CSRs



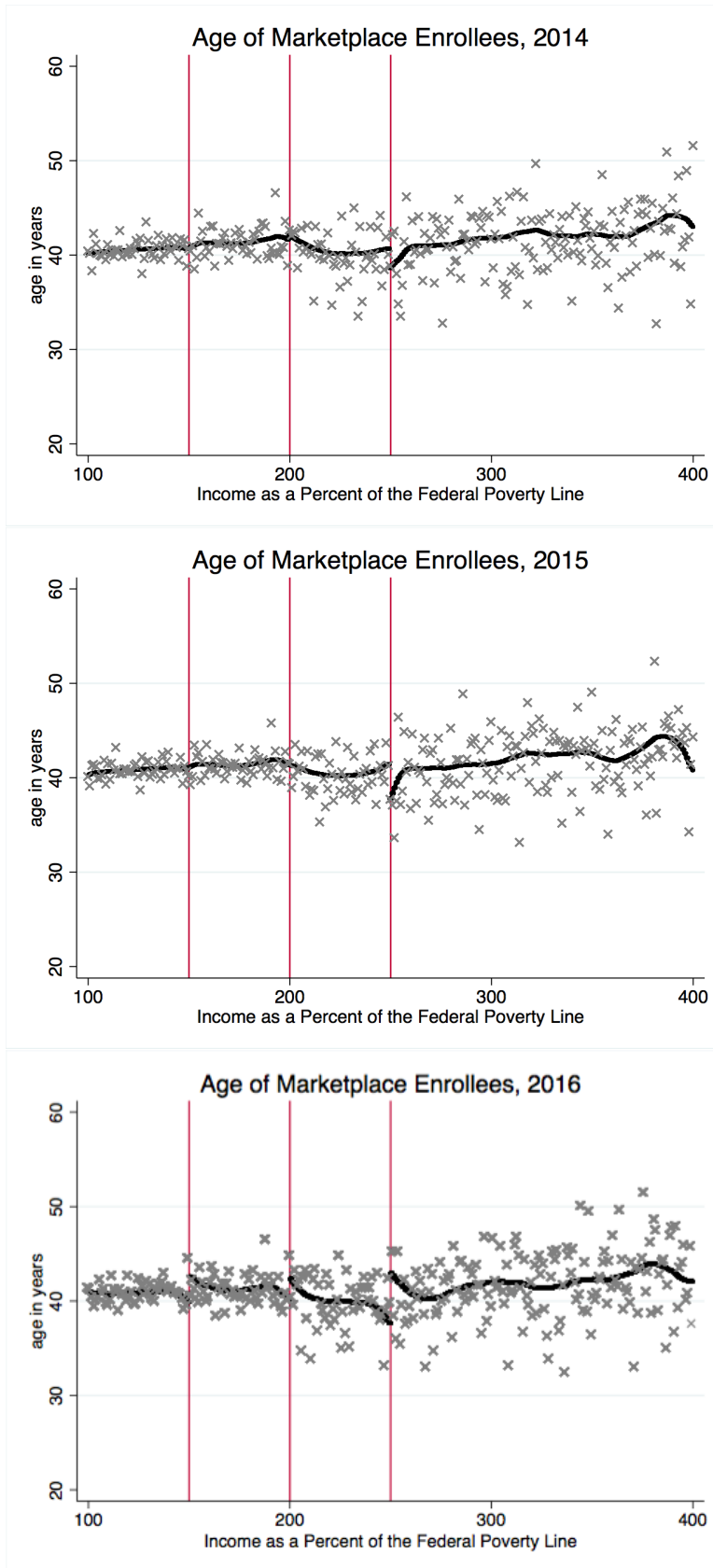
87% versus 73% AV CSRs



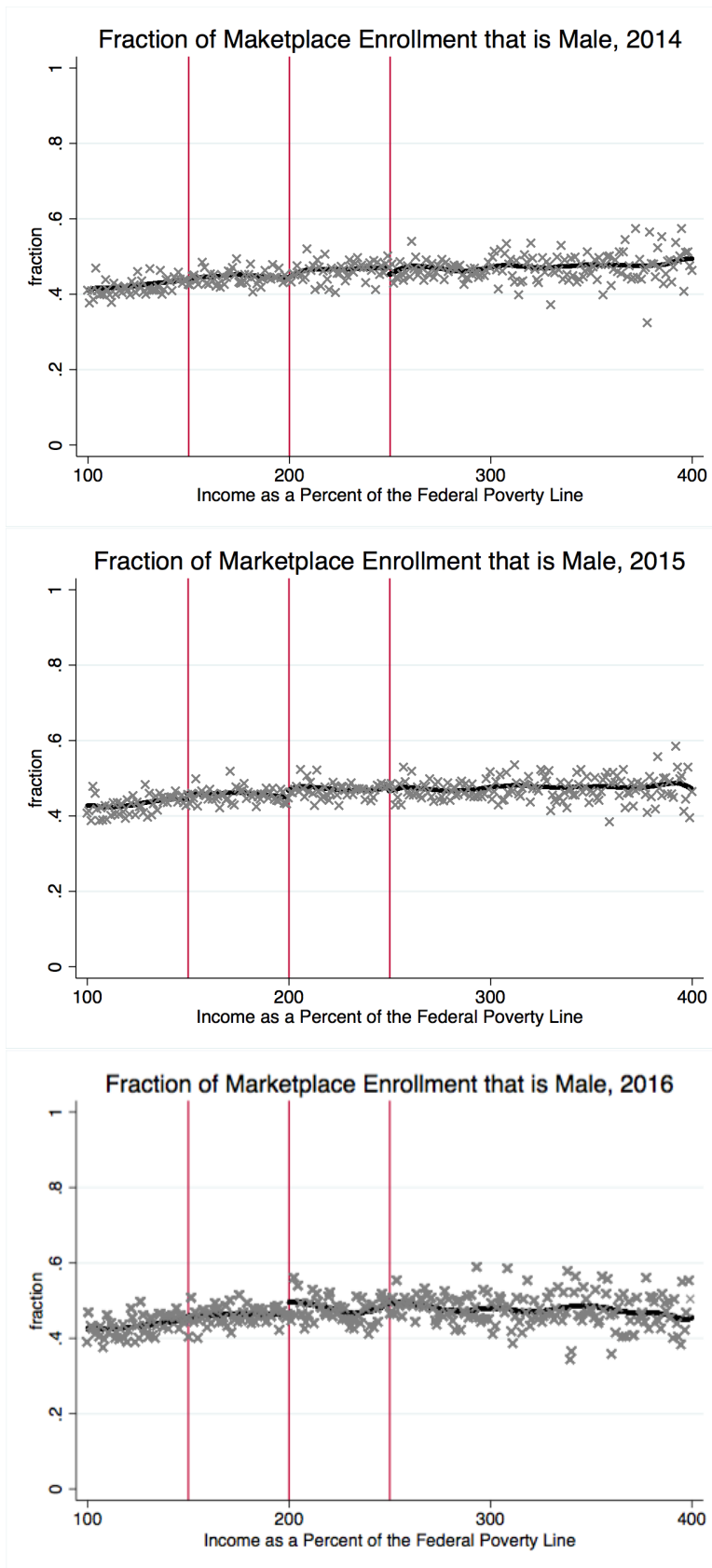
73% versus 70% AV CSRs



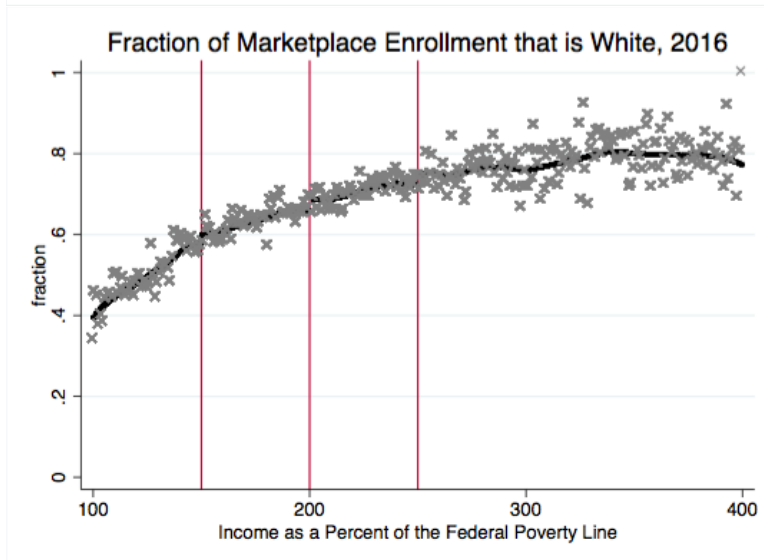
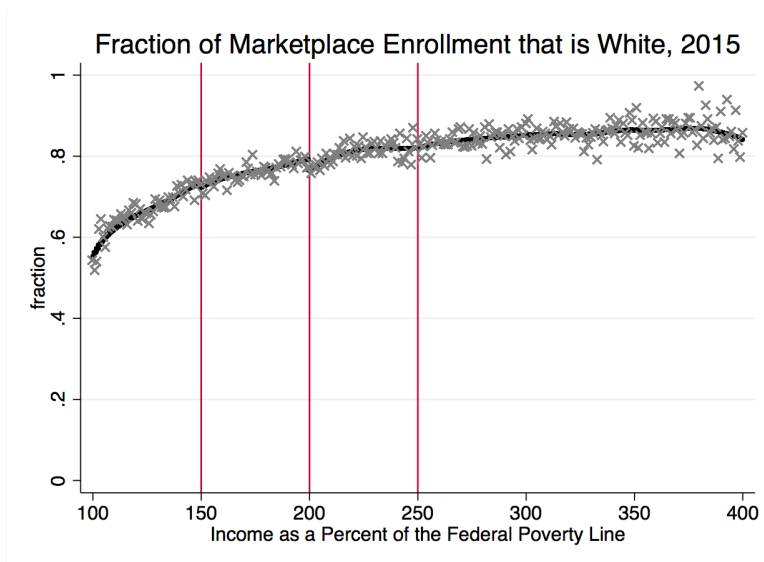
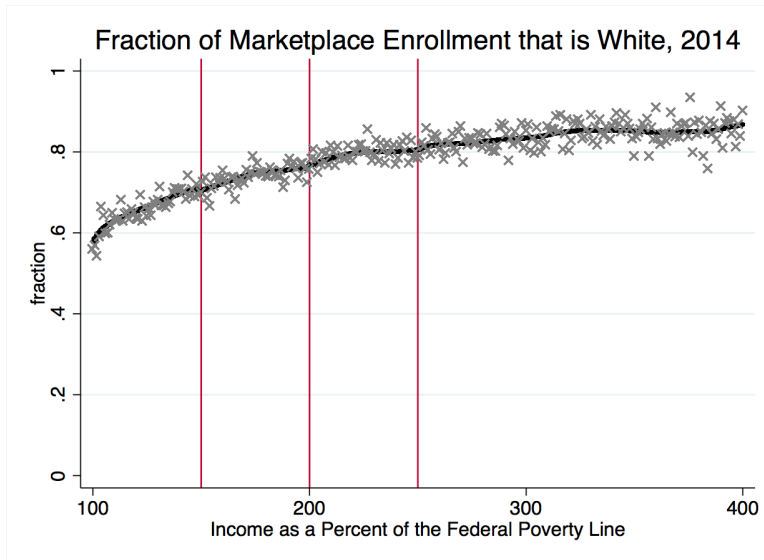
APPENDIX FIGURE 2. REGRESSION DISCONTINUITY ESTIMATES OF THE EFFECT OF CSRS ON THE FRACTION OF MARKETPLACE ENROLLEES SELECTING SILVER PLANS AT VARIOUS BANDWIDTHS, 2014



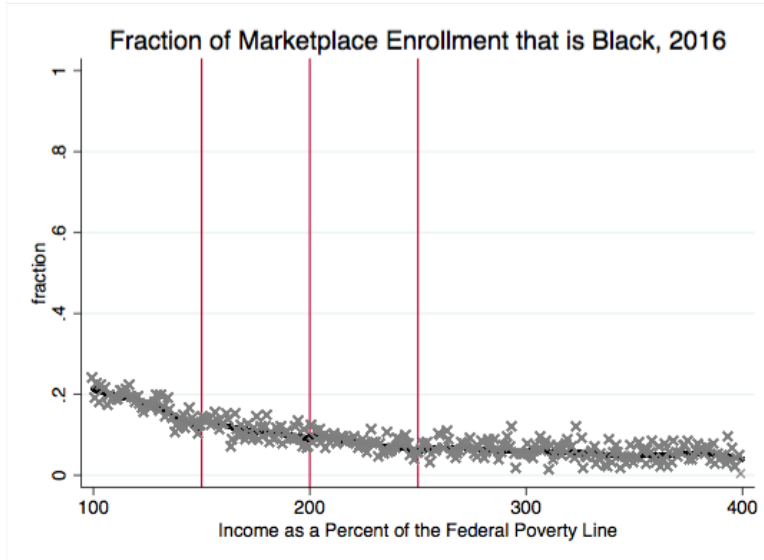
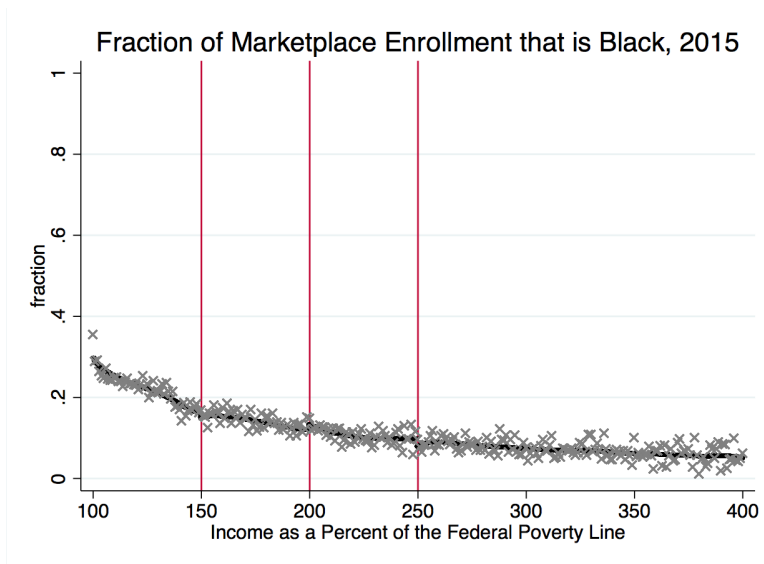
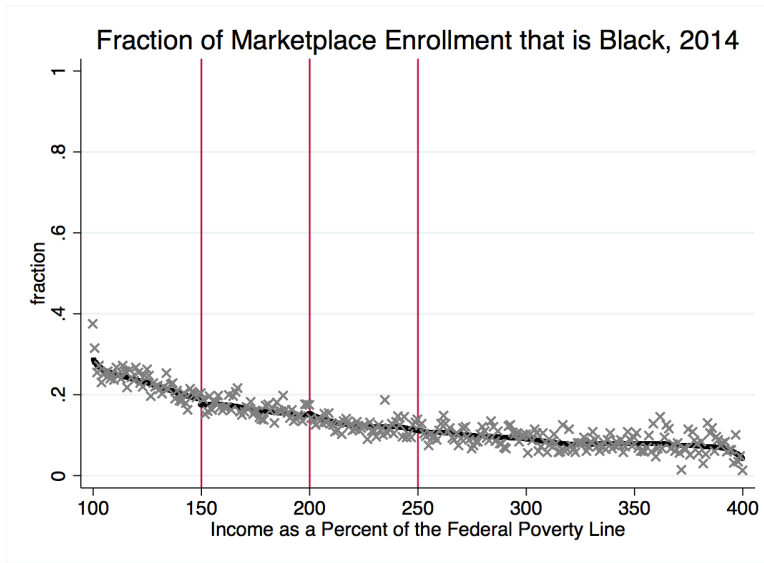
APPENDIX FIGURE 3. COVARIATE TESTS: AGE OF MARKETPLACE ENROLLEES



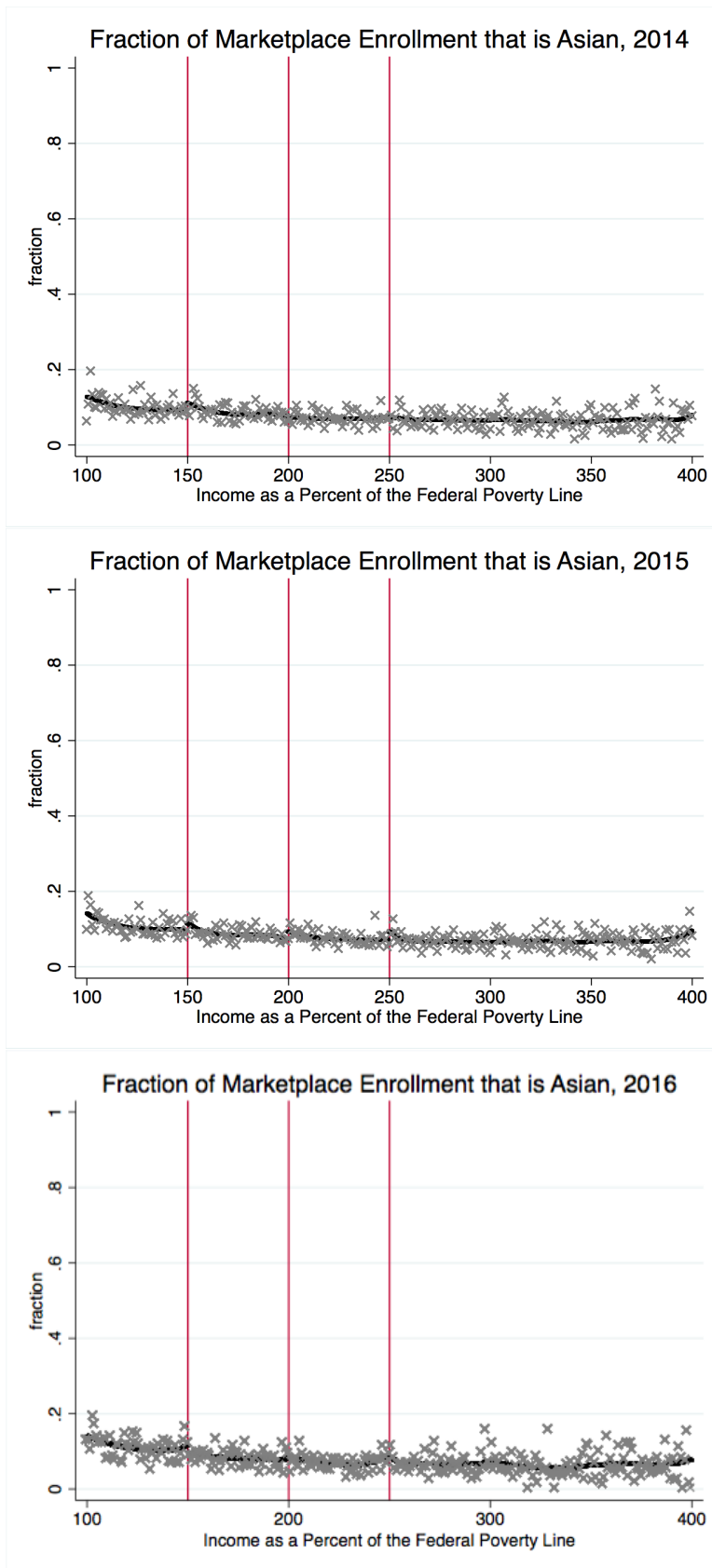
APPENDIX FIGURE 4. COVARIATE TESTS: FRACTION OF MARKETPLACE ENROLLEES THAT IS MALE



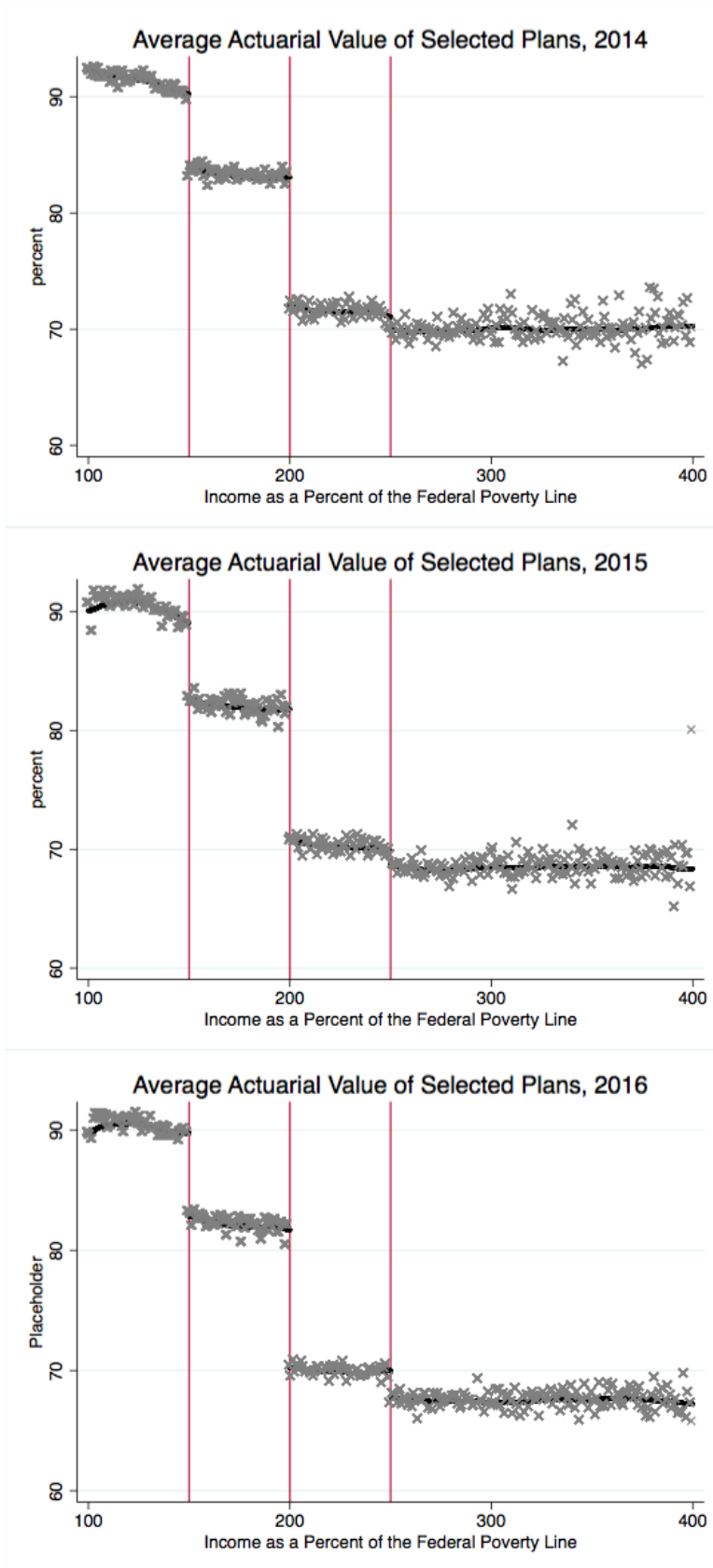
APPENDIX FIGURE 5. COVARIATE TESTS: FRACTION OF MARKETPLACE ENROLLEES THAT IS WHITE



APPENDIX FIGURE 6. COVARIATE TESTS: FRACTION OF MARKETPLACE ENROLLEES THAT IS BLACK



APPENDIX FIGURE 7. COVARIATE TESTS: FRACTION OF MARKETPLACE ENROLLEES THAT IS ASIAN

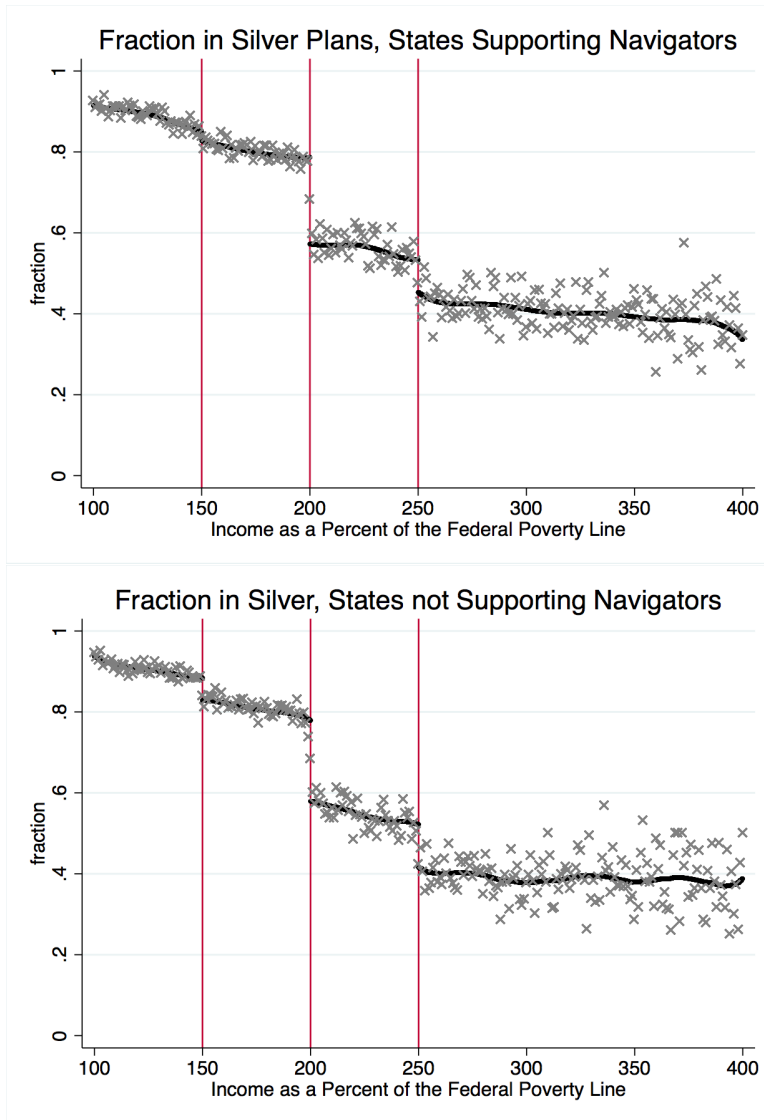


APPENDIX FIGURE 8. AVERAGE ACTUARIAL VALUE OF SELECTED MARKETPLACE PLANS



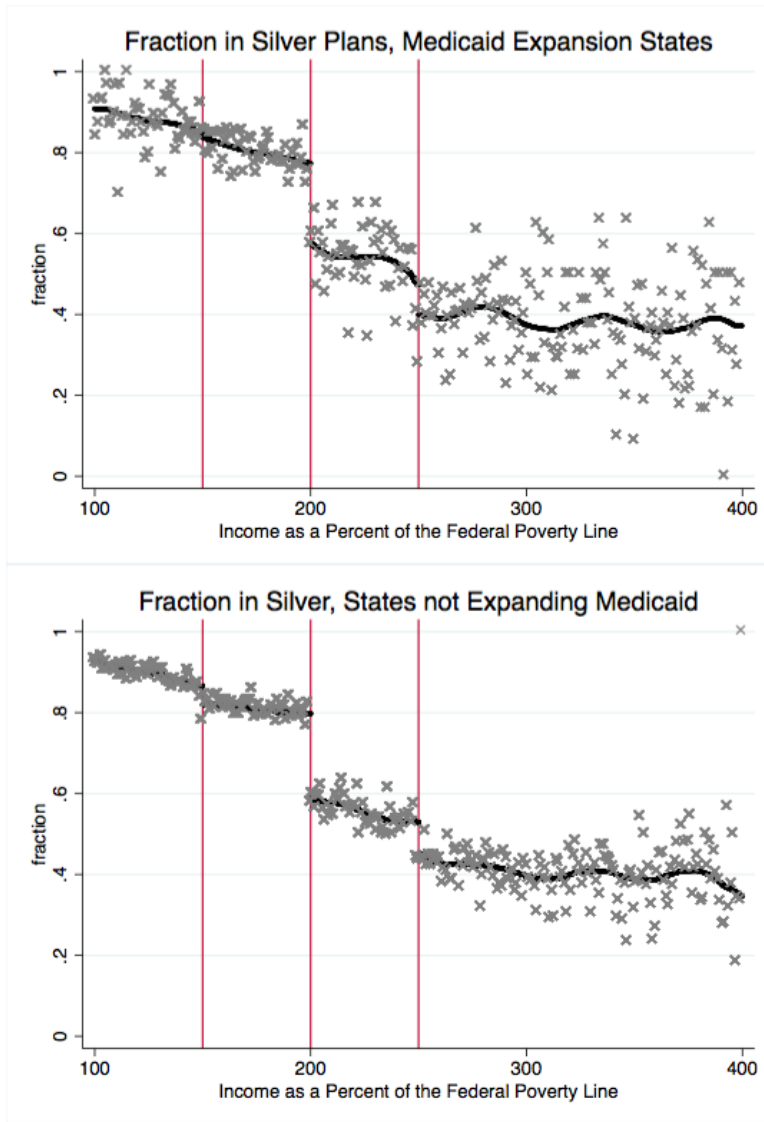
APPENDIX FIGURE 9. FRACTION OF MARKETPLACE ENROLLEES IN SILVER PLANS, BY ENROLLMENT ASSISTANCE RECEIPT, 2014  
*Notes:* Enrollment assistance includes assistance from assistor, navigator, or broker.





APPENDIX FIGURE 10. FRACTION OF MARKETPLACE ENROLLEES IN SILVER PLANS, BY WHETHER STATE OF RESIDENCE SUPPORTED THE USE OF NAVIGATORS, 2014

*Notes:* States that did not support navigators include Arkansas, Georgia, Illinois, Indiana, Maine, Michigan, Missouri, Montana, North Carolina, Nebraska, New Mexico, Ohio, Pennsylvania, Texas, Utah, and Virginia.



APPENDIX FIGURE 11. FRACTION OF MARKETPLACE ENROLLEES IN SILVER PLANS, BY MEDICAID EXPANSION STATUS, 2014

Notes: States that used the HealthCare.gov portal in 2014 and expanded Medicaid include Arkansas, Arizona, Delaware, Iowa, Illinois, Indiana, Michigan, North Dakota, New Hampshire, New Jersey, New Mexico, Ohio, Pennsylvania, and West Virginia. States that used the HealthCare.gov portal in 2014 but did not expand Medicaid include Alaska, Alabama, Florida, Georgia, Idaho, Kansas, Louisiana, Maine, Missouri, Mississippi, Montana, North Carolina, Nebraska, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Wisconsin, and Wyoming.

APPENDIX TABLE 1A—SELECT CHARACTERISTICS OF 2014 MARKETPLACE ENROLLMENT

	Enrollees with Family Income as a Percentage of the Federal Poverty Level that is between:				
	All Enrollees	100 to 149% FPL	150 to 199% FPL	200 to 249% FPL	250 to 400% FPL
<i>Selected Characteristics of Chosen Plan</i>					
Catastrophic Plan	0.014	0.002	0.003	0.007	0.014
Bronze Plan	0.160	0.061	0.132	0.245	0.319
Silver Plan	0.712	0.900	0.806	0.559	0.403
Gold Plan	0.079	0.021	0.035	0.136	0.198
Platinum Plan	0.036	0.016	0.024	0.053	0.066
<i>Selected Characteristics of Enrollee</i>					
Income as a Percentage of FPL:					
< 100% FPL	0.047	0	0	0	0
> 100% FPL and < 150% FPL	0.377	1	0	0	0
> 150% FPL and < 200% FPL	0.249	0	1	0	0
> 200% FPL and < 250% FPL	0.146	0	0	1	0
> 250% FPL and < 400% FPL	0.157	0	0	0	1
> 400% FPL	0.023	0	0	0	0
Male	0.444	0.420	0.448	0.464	0.474
Age	41.7	40.6	41.4	40.4	41.8
Age < 20	0.099	0.062	0.086	0.150	0.162
Age 20 - 39	0.326	0.376	0.323	0.265	0.213
Age 40 - 64	0.557	0.539	0.574	0.572	0.614
Age >= 65	0.003	0.004	0.003	0.002	0.002
White	0.730	0.655	0.741	0.790	0.834
Black	0.176	0.233	0.165	0.128	0.093
Asian	0.085	0.102	0.085	0.072	0.064
Native American	0.001	0.001	0.001	0.001	0.001
Other Race	0.008	0.008	0.008	0.008	0.008
Hispanic	0.072	0.083	0.076	0.064	0.046
Family size	2.39	2.33	2.37	2.51	2.51
Assistor/Navigator/Broker	0.391	0.456	0.383	0.381	0.362
Medicaid expansion state	0.292	0.200	0.340	0.344	0.373
Number of enrollees	5,805,337	2,188,597	1,447,203	849,280	913,291

Notes: Race and ethnicity codes are missing for approximately 40 percent of enrollees.

Source: Individual-level CMS administrative data on Marketplace enrollment in states using the HealthCare.gov platform in 2014

APPENDIX TABLE 1B—SELECT CHARACTERISTICS OF 2015 MARKETPLACE ENROLLEES

	Enrollees with Family Income as a Percentage of the Federal Poverty Level that is between:				
	All Enrollees	100 to 149% FPL	150 to 199% FPL	200 to 249% FPL	250 to 400% FPL
<i>Selected characteristics of Chosen Plan</i>					
Catastrophic Plan	0.007	0.001	0.002	0.005	0.010
Bronze Plan	0.204	0.100	0.179	0.298	0.376
Silver Plan	0.710	0.879	0.780	0.566	0.421
Gold Plan	0.057	0.012	0.025	0.098	0.148
Platinum Plan	0.022	0.008	0.014	0.034	0.044
<i>Selected Characteristics of Enrollee</i>					
Income as a Percentage of FPL:					
< 100% FPL	0.031	0	0	0	0
> 100% FPL and < 150% FPL	0.385	1	0	0	0
> 150% FPL and < 200% FPL	0.249	0	1	0	0
> 200% FPL and < 250% FPL	0.146	0	0	1	0
> 250% FPL and < 400% FPL	0.164	0	0	0	1
> 400% FPL	0.025	0	0	0	0
Male	0.453	0.431	0.458	0.471	0.487
Age	41.0	40.8	41.5	40.4	41.7
Age < 20	0.099	0.056	0.086	0.153	0.168
Age 20 - 39	0.322	0.378	0.325	0.267	0.211
Age 40 - 64	0.557	0.538	0.569	0.563	0.607
Age >= 65	0.006	0.007	0.005	0.005	0.004
White	0.744	0.655	0.758	0.807	0.848
Black	0.155	0.225	0.144	0.106	0.075
Asian	0.091	0.110	0.088	0.077	0.068
Native American	0.001	0.002	0.002	0.001	0.001
Other Race	0.008	0.008	0.008	0.009	0.008
Hispanic	0.070	0.082	0.075	0.063	0.044
Family size	2.41	2.31	2.39	2.56	2.59
Assistor/Navigator/Broker	0.473	0.545	0.446	0.441	0.430
Medicaid expansion state	0.273	0.153	0.340	0.348	0.373
Number of enrollees	8,444,763	3,252,423	2,103,663	1,232,640	1,385,860

Notes: Race and ethnicity codes are missing for approximately 40 percent of enrollees.

Source: Individual-level CMS administrative data on Marketplace enrollment in states using the HealthCare.gov platform in 2014

APPENDIX TABLE 1C—SELECT CHARACTERISTICS OF 2016 MARKETPLACE ENROLLEES

	Enrollees with Family Income as a Percentage of the Federal Poverty Level that is between:				
	All Enrollees	100 to 149% FPL	150 to 199% FPL	200 to 249% FPL	250 to 400% FPL
<i>Selected characteristics of Chosen Plan</i>					
Catastrophic Plan	0.009	0.001	0.003	0.006	0.013
Bronze Plan	0.205	0.106	0.175	0.286	0.381
Silver Plan	0.734	0.883	0.802	0.623	0.468
Gold Plan	0.047	0.008	0.017	0.077	0.126
Platinum Plan	0.006	0.002	0.003	0.009	0.012
<i>Selected Characteristics of Enrollee</i>					
Income as a Percentage of FPL:					
< 100% FPL	0.028	0	0	0	0
> 100% FPL and < 150% FPL	0.384	1	0	0	0
> 150% FPL and < 200% FPL	0.246	0	1	0	0
> 200% FPL and < 250% FPL	0.149	0	0	1	0
> 250% FPL and < 400% FPL	0.168	0	0	0	1
> 400% FPL	0.024	0	0	0	0
Male	0.455				
Age	40.9	40.9	41.4	40.0	41.9
Age < 20	0.105	0.063	0.090	0.162	0.167
Age 20 - 39	0.321	0.371	0.327	0.272	0.217
Age 40 - 64	0.552	0.537	0.563	0.549	0.603
Age >= 65	0.007	0.009	0.006	0.005	0.004
White	0.616	0.490	0.629	0.699	0.773
Black	0.112	0.174	0.111	0.082	0.057
Asian	0.088	0.110	0.082	0.072	0.063
Native American	0.004	0.003	0.004	0.005	0.004
Other Race	0.023	0.014	0.015	0.016	0.016
Hispanic	0.157	0.209	0.159	0.126	0.087
Family size	2.41	2.33	2.36	2.57	2.54
Assistor/Navigator/Broker	0.435	0.526	0.395	0.389	0.388
Medicaid expansion state	0.252	0.121	0.321	0.336	0.366
Number of enrollees	8,877,869	3,413,360	2,181,343	1,324,879	1,494,998

Notes: Race and ethnicity codes are missing for approximately 40 percent of enrollees.

Source: Individual-level CMS administrative data on Marketplace enrollment in states using the HealthCare.gov platform in 2014

APPENDIX TABLE 2—COVARIATE TESTS

	(1)	(2)	(3)	(4)	(5)
	Age	Male	White	Black	Asian
2014 Marketplace Enrollees					
Over 150% FPL	-0.217 (0.056)	0.003 (0.001)	-0.006 (0.002)	-0.012 (0.002)	0.016 (0.0014)
Over 200% FPL	-0.139 (0.078)	-0.005 (0.002)	-0.004 (0.003)	0.010 (0.002)	-0.007 (0.002)
Over 250% FPL	-2.013 (0.116)	-0.002 (0.003)	-0.002 (0.003)	-0.003 (0.002)	0.006 (0.002)
2015 Marketplace Enrollees					
Over 150% FPL	-0.362 (0.047)	0.012 (0.002)	-0.016 (0.002)	-0.009 (0.001)	0.024 (0.001)
Over 200% FPL	-0.711 (0.067)	0.015 (0.002)	-0.014 (0.002)	-0.006 (0.002)	0.020 (0.001)
Over 250% FPL	-3.540 (0.091)	0.008 (0.002)	-0.007 (0.002)	-0.018 (0.002)	0.027 (0.002)
2016 Marketplace Enrollees					
Over 150% FPL	2.347 (0.045)	0.007 (0.001)	0.013 (0.001)	0.011 (0.001)	-0.015 (0.001)
Over 200% FPL	2.079 (0.065)	0.013 (0.002)	0.016 (0.002)	0.004 (0.001)	-0.004 (0.001)
Over 250% FPL	5.776 (0.084)	0.009 (0.002)	0.004 (0.002)	0.002 (0.001)	-0.015 (0.001)

*Notes:* Robust standard errors are in parentheses. Estimates based on the population of Marketplace enrollees in states using the HealthCare.gov portal in the respective plan year. Please see Appendix Table 1 for the numbers of enrollees in each plan year. For each outcome and plan year, estimates are based on three local linear regression models with a triangular kernel and a bandwidth of 20. The coefficient on the "Over 150% FPL" indicator yields an estimate of the discontinuous change in the probability of selecting a particular metal level at 150% FPL, and the coefficients on the "Over 200% FPL" and "Over 250% FPL" indicators can be interpreted similarly.

APPENDIX TABLE 3—REGRESSION DISCONTINUITY RESULTS ON THE ACTUARIAL VALUE OF THE PLAN CHOICE OF MARKETPLACE ENROLLEES

	(1)	(2)	(3)
	2014 Marketplace Enrollees	2015 Marketplace Enrollees	2016 Marketplace Enrollees
Over 150% FPL	-6.431 (0.034)	-11.000 (0.042)	-1.382 (0.054)
Over 200% FPL	-6.404 (0.032)	-10.86 (0.038)	-1.332 (0.040)
Over 250% FPL	-6.958 (0.010)	-11.660 (0.034)	-2.366 0(.032)

*Notes:* Robust standard errors are in parentheses. Estimates based on a 100% sample of Marketplace Enrollees in states using the HealthCare.gov portal in the respective plan year. Please see Appendix Table 1 for the numbers of enrollees in each plan year. For each outcome and plan year, estimates are based on three local linear regression models with a triangular kernel and a bandwidth of 20. The coefficient on the "Over 150% FPL" indicator yields an estimate of the discontinuous change in the probability of selecting a particular metal level at 150% FPL, and the coefficients on the "Over 200% FPL" and "Over 250% FPL" indicators can be interpreted similarly.