Spillover Effects of Medicaid Expansion on Private Premiums: Evidence from Cost-Sharing Subsidy Thresholds

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Abstract

The Affordable Care Act is one of the most debated and dividing pieces of legislation in recent memory. One of the main elements of the ACA is the optional expansion of Medicaid eligibility from the poverty line to 138% of the poverty line and inclusion of non-disabled, childless adults. Nearly all of the debate has focused on the direct effects of the newly covered, but there are also important other spillover effects to consider. If the newly-eligible portion differs from the general populace then the expansion of Medicaid can affect the individual market for health insurance. We use policy-level data from the Health Insurance Exchanges to identify and estimate the effects of Medicaid expansion on the private health insurance market premiums. We find that expanding Medicaid reduces average monthly premiums by $22.94, a decrease of 7.6%. We find this is largely due to moral hazard from the most generous level of cost-sharing reduction (CSR) subsidies. Additionally, we are able to use the pseudo-random experiment created by the sharp discontinuity in CSR rates to estimate a price elasticity of healthcare of -0.34.

JEL Codes: **I13, I18, I38, G22**

Keywords: **Affordable Care Act, Health Insurance, Medicaid, Moral Hazard, Adverse Selection**

1 Introduction:

On March 23, 2010, President Obama signed into law one of the largest overhauls of the U.S. healthcare system in history – The Patient Protection and Affordable Care Act (ACA). In addition to numerous other clauses, the ACA mandated for the expansion of Medicaid eligibility requirements to allow more low-income Americans access to the program. The expansion raised the income ceiling for eligibility from 100% to 138% of the federal poverty line and allowed non-disabled, childless adults with income below this line access to Medicaid; potentially extending coverage to more than 20 million Americans (Holahan, 2012). While the majority of the ACA held up to judicial scrutiny, the Supreme Court ruled the mandatory aspect of the Medicaid expansion was unconstitutional. The ruling allowed states to "opt out" of the Medicaid expansion and keep their pre-ACA enrollment criteria. Initially, 25 states opted out. As of 2018, six of those states have since expanded.

The debate over the Medicaid expansion has focused on direct costs and benefits with lawmakers weighing the direct benefits of increasing insurance coverage versus the accounting cost of doing so (Harrington, 2010). Recently, another avenue through which Medicaid expansion impacts the U.S. healthcare market is being examined – lowering premiums in the private market. If Medicaid-eligible people have higher health costs than the general populace, then removing them from the private market will lower costs for the risk pool that remains decreasing premiums in the private market. We examine whether this is true by using a triple-difference approach (with small group plans as our additional control group) and confirm that Medicaid expansion lowers premiums on the private, individual market by $22.94.

The leading theory for this phenomenon is the positive correlation between health and wealth (Sen and DeLeire, 2018). We look to a different avenue. Those who would be eligible for Medicaid if they lived in a Medicaid expansion state typically qualify for the most generous cost-sharing reduction (CSR) subsidies on the ACA health insurance exchanges. Therefore, these individuals, who would have been eligible for Medicaid in an expansion

state, may capitalize on these CSR subsidies by consuming more healthcare, which would lead to higher premiums. We examine this possibility by using a regression discontinuity design and we find the increase in premiums on the private market is primarily driven by moral hazard from the CSRs. Individuals in the most generous CSR brackets, those with the equivalent of a 94% actuarial value plan, spend $1,079.66 per year more on healthcare than those in the second highest bracket (an 87% equivalent plan). This implies a price elasticity of healthcare of -0.34. Because insurers are unable to underwrite based on CSR eligibility, premiums for the whole pool increase.

Medicaid expansion will impact the price of health insurance for all people on the private, individual market given two assumptions. First, individuals who would have been eligible for Medicaid if they lived in an expansion state, and instead purchase health insurance on the private market, must have different expected costs than the general, Medicaid ineligible populace. Second, there must be a sufficient number of potentially Medicaid eligible individuals in non-expansion states who buy private insurance instead of going uninsured. The first condition, a discrepancy in expected costs between the Medicaid-eligible and the general populace on the individual market, potentially occurs through two channels. The obvious channel is the gradient of health and wealth – that income and health are, generally, positively correlated (Deaton and Paxson, 1998; Deaton, 2002; Sen and DeLeire, 2018). The less obvious channel, which we will focus on, is subsidized insurance coverage from the CSRs.

The link between low income and poor health is well documented and stems from many factors. Poor people are more likely to have insufficient nutrition and lower quality diets which can lead to health problems, a relationship that often begins in childhood (Case, Lubotsky, and Paxson, 2002). Malnutrition weakens the immune system, increasing the likelihood of health problems. Additionally, many low-income individuals cannot afford the healthcare services (both preventative and ex-post) or medicine required for treatment (Deaton and Paxson, 2001). In addition to the lack of discretionary funds and malnutrition, lower-income individuals also tend to live in rural areas and are far removed from standard

health amenities. This distance reduces access to healthcare and health services and is yet another contributing factor to the negative correlation between low income and poor health. The link between income and education is another avenue; the poor are typically less educated, and subsequently less likely to be aware of health services offered.

Our main contribution is through our examination of the second avenue. The ACA requires insurers to lower the cost-sharing components (deductibles, out-of-pocket maximums, copays, and coinsurance) of plans on the exchanges for lower-income consumers. A traditional "silver" level plan has an actuarial value of 70%. If the purchaser's income is from 200% to 250% of the federal poverty line, the actuarial value of that plan jumps to 73%; from 150% to 200%, the actuarial value increases to 87%; from 100% to 150%, the actuarial value increases up to 94%. These subsidies are significant and influence plan choices on the exchanges (DeLeire et al., 2017). Insurers have freedom on how to reduce the cost sharing features of their plans to achieve the required actuarial value. Figure 1 provides an example of how CSR subsidies work.

Figure 1: Example of Cost Sharing Subsidies:

	Standard Silver – No CSR	CSR Plan for 201-250% FPL	CSR Plan for 151-200% FPL	CSR Plan for up to 150% FPL
Actuarial Value	70% AV	73% AV	87% AV	94% AV
Deductible (Individual)	$7,150	$4,500	$800	$250
Maximum OOP Limit (Individual)	$7,350	$5,700	$1,700	$550
Inpatient hospital	30% (after deductible)	30% (after deductible)	10% (after deductible)	10% (after deductible)
Physician visit	$70	$30	$10	$5

Source: This figure was taken from http://www.healthreformbeyondthebasics.org/cost-sharing-charges-in-marketplace-health-insurance-plans-part-2/.

In Medicaid opt-out states, most of the would-be Medicaid eligible individuals qualify for the highest level of the CSR subsidies if they purchase insurance on the ACA individual

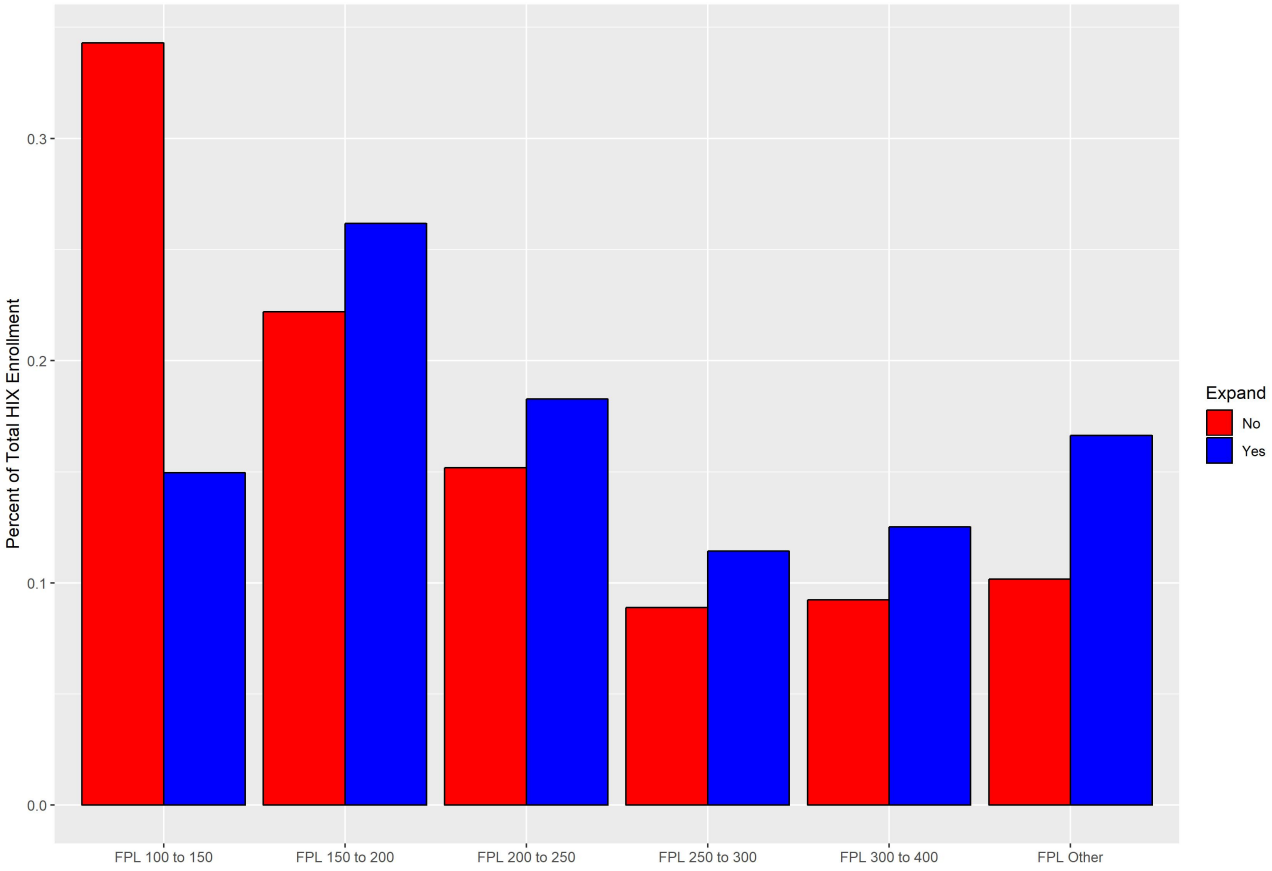
marketplaces (i.e. health insurance exchanges).[1] As shown by Manning et al. (1987) and many others (e.g. Chiappori, Durand, and Geoffard, 1998; Finkelstein et al., 2012; Chandra, Gruber, and McKnight, 2014; Brot-Goldberg et al., 2017), people with more generous health insurance tend to consume more healthcare. Thus, states that do not expand Medicaid will have a larger population receiving generous CSRs and, either through moral hazard or adverse selection, spending more on healthcare.[2]

The second assumption describes a form of health insurance "crowding-out." Coined by Cutler and Gruber (1996), crowding-out is the phenomenon where individuals forgo private insurance in favor of public insurance. Traditionally, crowding-out is seen as individuals who have private insurance suddenly becoming eligible for, and switching to, public insurance. Our situation differs slightly because our variation in eligibility is geographical rather than temporal. We describe a person in an opt-in state (i.e. Medicaid expansion state) as crowded-out if they would have purchased private insurance on the individual market if they lived in an opt-out state (i.e. Medicaid non-expansion state). For Medicaid expansion to affect the individual market, a sufficient number of consumers must be crowded-out. Enrollment data from states that participate in the federal exchange suggest this occurring. Figure 2 plots the average percent of total enrollment (in 2017) for different income categories relative to the federal poverty line (FPL) separated by expansionary status. The 100% to 150% bin, which contains most of the potential Medicaid eligible population, represents only 15% of the total enrollment for expansionary states while it holds over 34% for opt-out states.

[1] Child-less adults with incomes below 100% of the federal poverty line are the exception. They do not qualify for any ACA-related subsidies. Additionally, those who are newly eligible for Medicaid are not eligible for subsidies in states that expanded Medicaid, so dual enrollment is unlikely. Additionally, consumers who are offered insurance by their employers are not eligible for subsidies unless the premiums they would have to pay for an individual plan is larger than 9% of their income.

[2] Written contemporaneously, Lavetti, DeLeire, and Ziebarth (2018) use data from Utah and examine the gross effect of the cost sharing subsidies (not just the top level that would impact the potentially Medicaid eligible) and also find the CSRs lead to increased spending.

Figure 2: Income Distribution of HIX Enrollees:



This figure plots the average income distribution, separated by expansionary status, for the enrollees in the 2017 HIX markets. *Source:* This data for this figure were taken from https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Marketplace-Products/Plan_Selection_ZIP.html.

When there are more low-income, potentially less-healthy, individuals with more generous health insurance in the market, the cost for the whole pool increases. Due to the new underwriting restrictions, health insurance companies cannot charge higher prices based on lower income and thus must raise prices for everyone. Crowding-out is usually implied as a problem for those partaking in the private market, but this case is different. Here the group that is being potentially crowded out by the Medicaid expansion has higher expected costs than the general population. Taking these people out of the private market (and putting them into Medicaid) lowers prices for everyone who remains.

Our contribution is three-fold. We first extend upon and confirm the interaction between the individual market and Medicaid expansion. Since individuals are mandated to have

health insurance, in the states where the Medicaid expansion was refused there exists a coverage gap that the private market will, at least partially, pick up. This gap, and the portion picked up, are not random and systematically exhibit higher expected costs. This raises prices for everyone taking part in the health insurance exchanges in these Medicaid non-expansion states. Our second contribution is more novel. We examine why healthcare costs are different between the would-be eligible Medicaid population and the rest of the private market. We find the difference is largely due to asymmetric information issues arising from the CSRs and we provide a clean estimation of the price elasticity of healthcare in a pseudo-random experimental setting. Finally, we are able to separate the asymmetric information effect into *ex ante* (adverse selection) and *ex post* (moral hazard) and find the moral hazard effect dominates.

2 Institutional Details

2.1 Health Insurance Exchanges:

In addition to the Medicaid expansion (and numerous other more minor reforms), the ACA restricts what information health insurance firms are able to utilize for medical underwriting, restricts the variations in premiums over time, includes an individual mandate (which requires individuals to have insurance coverage or pay a fine), prevents insurers from denying coverage based on pre-existing conditions, and centralizes each state's individual market into online marketplaces called the Health Insurance Exchanges (HIX).[3]

The online marketplaces contain the vast majority of the individual market, with 11.75 million enrollees for 2018 (Kaiser Family Foundation, 2018). States had three separate paths to the development of their HIXs: (1) design and manage their own, (2) let the federal government design and manage it, or (3) some hybrid approach.[4] Regardless of the path

[3]States have the option of naming their exchange. Some examples are *Covered California*, *MNsure*, and *New York State of Health*.

[4]16 states and DC selected the first option, 27 selected the second, and 7 pursued the third.

chosen, all of the HIXs run in the same general manner; they are designed such that there are tiers of plans from which individuals can select and purchase insurance. In the HIXs there are five possible tiers of plans. Catastrophic, high-deductible, plans are the lowest rung, with the other four tiers being identified by different metals based on the expected share of healthcare spending the plan covers: bronze (60%), silver (70%), gold (80%), and platinum (90%).

Outside of the additional standardization of covering essential health benefits and a maximum out-of-pocket expenditure ($6,350 for individuals, $12,700 for families), insurers are able to tailor their policies in nearly any way, so long as the insurers are within 2% of the targeted actuarial-value. Premiums are required to be community-rated and can vary only across geographic areas, age (3-1 limit), tobacco use (1.5-1 limit), and family composition. Aside from these restrictions, insurers are free to set their own initial premiums, but any rise in premiums greater than 10% is subject to approval by a state board. There also exists a minimum, plan-level, medical loss ratio; all medical loss ratios must exceed 80% for individual and small-group markets and 85% for large groups. If the medical loss ratios are not met, the insurers must issue refunds to their customers.[5]

The geographic areas that insurers are allowed to vary premiums by are called rating areas and are determined by each state. The "natural" way to define rating areas was MSAs + 1, where each metropolitan area is a rating area, and then the rest of the state is combined into one. States had to apply to obtain a different definition, and many did. States have defined their rating areas based on either counties (or small collections of geographically connected counties), 3-digit zip codes, telephone area codes, or the entire state as one rating area.[6] Within a rating area, insurers can not vary their premiums (except for the reasons listed above). However, if a rating area covers multiple counties, insurers do not have to offer the same plan in every county – a form of red-lining (Fang and Ko, 2018).

[5]See Abraham and Karaca-Mandic (2011) for an in-depth discussion of focusing regulation on the medical loss ratio.

[6]A list of each state's rating area definitions is at https://www.cms.gov/cciio/programs-and-initiatives/health-insurance-market-reforms/state-gra.html

In addition to the individual market exchanges, the ACA also set up separate exchanges for small groups (less than 50 employees) called the Small business Health Options Program (SHOP). The SHOP plans are offered in the same rating areas as the individual exchanges but do not include the premium or cost-sharing reduction subsidies. Eligible small business can receive a separate tax credit if they pay over 50% of their employee's premiums. However, this should be unaffected by Medicaid expansion. Total enrollment for SHOP plans is difficult to estimate as plans listed on the exchanges can also be purchased by directly contacting the insurance company (which is often the recommended method). That said, enrollment in SHOP plans is likely much lower than the individual plans.

2.2 ACA Subsidies:

Any consumer, regardless of income, can purchase from the HIX marketplaces. However, the ACA additionally provides financial assistance to lower-income consumers to purchase health insurance on the HIXs. There are two types of assistance: the Advanced Premium Tax Credits (APTC) and Cost Sharing Reduction (CSR) subsidies. The APTCs reduce premium costs for HIX enrollees whose incomes are between 100% to 400% of the federal poverty level (FPL). The level of APTC a consumer qualifies for is dependent on three things: (1) their income level, (2) the price of the second-lowest silver plan in their rating area, and (3) the yearly IRS-determined maximum percentage of income that they must pay toward the purchase of a plan.[7] Despite being based on the price of a silver plan, consumers can apply this subsidy to any metal-level plan.[8]

More important to our story are the cost-sharing reduction (CSR) subsidies. Insurers who offer any plans on the HIXs are required to offer at least one silver plan. For each silver health plan offered, insurers are required to offer plan designs with reduced levels of cost sharing (i.e., higher coverage) to lower-income enrollees. The CSR subsidies lower the amount the consumer pays for deductibles, coinsurance, copay, and the out-of-pocket

[7]The percentage of income varies with income as well, but does not exhibit discontinuities.

[8]If the purchased plan costs less than the total subsidy the consumer does not get a rebate.

maximum. A traditional silver level plan has an actuarial value of 70%. If the purchaser's income is from 200% to 250% of the federal poverty line, that plan jumps to 73%; from 150% to 200%, it increases to 87%; from 100% to 150%, up to 94%. The plans are the same as the traditional silver version in all dimensions other than cost-sharing. CSRs are only available to consumers who purchase silver-level plans and are based only on income at the time of purchase (unlike the APTCs (DeLeire et al., 2017)). Initially, insurers were compensated by the federal government for these reductions. The Trump administration removed the reimbursement beginning in 2018, but insurers are still required to offer the CSR plans to those eligible. When purchasing insurance through the HIXs, the consumer is required to enter their income before seeing plan options, and they only see the CSR-relevant policies. That is, consumers can not "accidentally" choose into the wrong CSR plan.

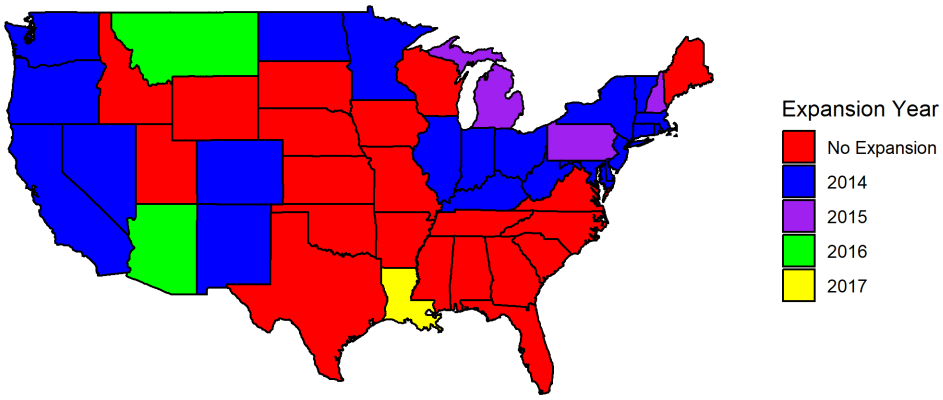
2.3 Medicaid:

The Medicaid program began in the late 1960s and was tied to state welfare programs. Medicaid was slowly separated into its own program and by the late 1990s covered most low-income (<100% of the poverty line) children. The State Children's Health Insurance Program (SCHIP), created in 1997, expanded coverage to cover uninsured children in families with modest incomes that were too high to qualify for Medicaid. Prior to the passage of the ACA, there was no federal regulation mandating coverage for low-income, non-disabled adults with no dependents. Though there were several other provisions to the Medicaid expansion, we focus on the raising of the income ceiling for eligibility to 138% of the poverty line and the inclusion of non-disabled, childless adults. It is projected that the Medicaid expansion provision of the ACA would increase overall Medicaid enrollment by more than 20 million if fully implemented (Holahan, 2012).

As of 2017, 16 states have opted-out of the Medicaid expansion of the ACA, citing budgetary constraints or costs as their main point of opposition. Many of the opt-out states are Southern and Midwestern states, with only a few exceptions. All of the opt-out

states have Republican governors, speaking to the highly politicized nature of the Medicaid expansion and the ACA in general. Figure 3 shows the timeline of each state's decisions to opt in or out of the Medicaid expansion.

Figure 3: Timeline of Medicaid Expansion:



A few states received waivers for the proposed expansion by providing a plan for how to increase coverage. Arkansas is an important one for our analysis, so we will further describe their policy here. Rather than including those newly eligible in Medicaid, Arkansas uses the federal funds to subsidize purchases on the Arkansas Health Insurance Exchange. For our analysis, we follow Sen and DeLeire (2018) and treat Arkansas as an opt-out state because the lower general health population is partaking in the private market.[9]

3 Data

3.1 Health Insurance Exchange Compare (HIX Compare):

The data for this paper are drawn from a number of sources. The policy-level data come from the HIX Compare dataset from the Robert Wood Johnson Foundation. The HIX Compare data contain premiums for consumers age 27 at the rating area level for plans in

[9]Omitting Arkansas or treating it as an expansionary state does not qualitatively change our results (or the significance).

every state and DC in plan years 2015 through 2018 and for all of the states who used the federal marketplace in 2014. HIX Compare also reports the number of plans each issuer offers in each county. While insurers can not charge differently within a rating area, they can offer plans in some counties but not others. Insurers are strategic in this "red-lining" for health insurers (Fang and Ko, 2018). The policy details include the metal level of the policy, the premium, the policy type (HMO, PPO, POS, EPO), the rating area, and the issuing insurer.[10] Plan quality is partitioned out into the following categories: Catastrophic, Bronze, Silver, Gold, and Platinum.[11]

3.2 Additional Controls:

We also include several county-level variables to help control for factors other than Medicaid expansion that may impact premiums. All county-level variables come from the Robert Wood Johnson Foundation County Health Rankings Dataset. We follow Sen and DeLeire (2018) closely in our use of controls. Our non-health related controls include: the age, education, race/ethnicity, rurality, and gender make up of the county. Our local health-status variables include access to exercise; measures of inactivity; the prevalence of low birth weight; percent of the population who are obese; and rates of teen pregnancy and diabetes. Our healthcare access measures include primary care physicians and dentists per 1,000 people and screening for diabetes and breast cancer.

Table 1 shows the summary statistics for silver plan premiums for 27 year olds, silver plan characteristics, demographic characteristics, local health variables, and healthcare access measures from 2014 to 2017. Table 1 is divided to include the full data sample, the sample of data for Medicaid expansion states, and opt-out states. The average premium for a silver plan for a 27 year old is $301.92. The average premium for a silver plan for a 27 year old is

[10] Though we have plan details on policies from Nevada, Oregon, and Washington State; we do not have information on which rating area the policies are from. Thus, we drop these three states (and Hawaii and Alaska) from our analysis.

[11] Due to the low availability and differing regulations on catastrophic plans we drop them from our analysis.

Table 1: Summary Statistics: Health Insurance Exchanges

Variable	Full Sample:		Expansion State:		Non-Expansion State:		Diff. Means:
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	t
Silver Plan Premium for 27 year old	301.92	107.43	334.03	118.73	281.70	94.2	110.13
Plan Type – PPO (%)	0.39	0.49	0.39	0.49	0.39	0.49	3.85
Plan Type – HMO (%)	0.39	0.49	0.38	0.48	0.41	0.49	−14.55
Plan Type – POS (%)	0.1	0.3	0.08	0.27	0.12	0.32	−32.64
Plan Type – EPO (%)	0.11	0.32	0.15	0.36	0.09	0.29	44.44
Multi-tiered Plan (%)	0.08	0.27	0.11	0.32	0.06	0.23	45.45
Education – Some College	0.56	0.11	0.59	0.1	0.54	0.11	110.16
Age – Under 18	0.23	0.04	0.22	0.03	0.23	0.04	−98.44
Age – 65 or Over	0.18	0.05	0.18	0.04	0.17	0.05	9.82
Sex – Female	0.5	0.02	0.5	0.02	0.5	0.02	5.87
Rural	0.57	0.31	0.53	0.31	0.59	0.31	−48.8
Race – Hispanic	0.12	0.17	0.09	0.12	0.14	0.2	−77.84
Race – Asian	0.01	0.02	0.02	0.03	0.01	0.02	59.17
Race – Black	0.07	0.12	0.04	0.07	0.09	0.13	−111.91
Low Weight Births (%)	0.08	0.02	0.08	0.02	0.08	0.02	−59.73
Population Obese (%)	0.3	0.04	0.29	0.05	0.31	0.04	−107.49
Population Inactive (%)	0.26	0.05	0.24	0.05	0.27	0.04	−125.37
Population with Access to Exercise (%)	0.6	0.24	0.67	0.21	0.56	0.24	120.14
Teen Birth Rate	41.45	20.99	33.21	15.09	46.62	22.46	−169.51
Population with Diabetes (%)	0.11	0.02	0.1	0.02	0.11	0.02	−104.25
Population with Access to Diabetes Screening (%)	0.85	0.07	0.85	0.06	0.84	0.07	27.62
Primary Care Physicians (per 1,000)	59.37	46.41	67.14	55.35	54.35	38.74	59.67
Dentists (per 1,000)	42.42	28.2	48.55	26.29	38.55	28.67	84.97
Population Access to Mammograms (%)	0.61	0.09	0.62	0.07	0.6	0.1	43.29

Note: This table shows summary statistics for the 2014 to 2017 Health Insurance Exchange Compare data and the Robert Wood Johnson Foundation County Health Rankings data. The summary statistics for plan characteristics are restricted to silver plans that have been actively marketed.

higher in expansion states than non-expansion states. These silver plans tend to be either PPO or HMO, with non-expansion states tending to have more HMO plans than expansion states. On average, 8% of all silver plans are multi-tiered, with a larger portion of multi-tiered silver plans in expansion states than non-expansion states. On average, expansion states have a larger population with some college education, a younger population, a lower rate of births with low weight, a more active population, and higher access to healthcare than non-expansion states.

3.3 Medical Expenditure Panel Survey (MEPS):

Our final dataset is the Household Component (HC) of the Medical Expenditure Panel Survey (MEPS). The HC-MEPS is a survey of health expenditure, utilization, payment sources, health status, demographic characteristics, and health insurance coverage from in-

dividual households and their members for a nationally-representative sample. The HC-MEPS is a two-year panel design, which features several rounds of interviews over the two years. While expenditures and utilization are self-reported, survey administrators verify and supplement this data from the individuals' healthcare providers.[12]

Table 2 shows summary statistics for 2014 to 2016 for expenditures for office based visits and prescriptions, which we label as discretionary spending, as well as inpatient visit expenditures, which we use as a placebo analysis. Additionally, Table 2 displays the summary statistics for demographic characteristics, including age, education, sex, race, and marital status. We define office based visit expenditures as discretionary spending because patients must decide to book an appointment for an office based visit generally in advance, and these visits tend to be for non-emergency care. We define prescription drug expenditures as discretionary spending as patients must (1) visit a physician to get the prescription, and (2) choose to fill that prescription. Inpatient visit expenditures are used as a placebo analysis as these expenditures can be viewed as non-discretionary as inpatient visits include emergency procedures where a patient is required to remain in a hospital for at least one night (e.g. heart attack) and are therefore outside of the control of the individual.

The first two columns of Table 2 show the summary statistics for the entire income range for individuals that participate in the ACA marketplaces in the MEPS. On average, individuals in the ACA marketplaces spend $1,516.21 on discretionary healthcare, $830.84 on office based visits, $519.89 on prescriptions, and $97.33 on inpatient visits annually.[13] Additionally, Table 2 shows that the average age of an individual on the ACA exchanges is 46, 39% have only a high school education, 38% of participants are male, the majority of participants are white, and most participants are married.

[12]For more information regarding the HC-MEPS please refer to https://meps.ahrq.gov/mepsweb/about_meps/survey_back.jsp.

[13]While the average inpatient visit expenditure may seem small; this is because not all individuals experience an inpatient visit annually. When excluding those that do not have an inpatient visit during the year, the average inpatient visit expenditure increases to $3,117.09.

Table 2: Summary Statistics: Healthcare Expenditures for Individuals in ACA Marketplace

Variable	Full Sample:		140% to 150% FPL:		151% to 161% FPL:		Diff. Means:
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	t
Total Discretionary Expenditures	1516.21	2107.77	1838.96	2483.44	935.26	1401.09	1.83
Office Based Visit Expenditures	830.84	1106.55	976.27	1231.89	594.53	885.21	1.46
Prescriptions Filled Expenditures	519.89	1040.07	698.85	1269.51	259.76	781.61	1.70
Inpatient Visit Expenditures	97.33	562.87	110.35	624.23	338.85	1006.42	−1.16
Age	45.54	12.97	45.03	10.91	41.79	13.05	1.13
Education – High School	0.39	0.49	0.44	0.50	0.32	0.47	1.04
Education – College or Beyond	0.27	0.45	0.19	0.4	0.26	0.45	−0.75
Sex – Male	0.38	0.49	0.31	0.47	0.37	0.49	−0.49
Race – Hispanic	0.25	0.44	0.25	0.44	0.26	0.45	−0.12
Race – White	0.42	0.49	0.34	0.48	0.53	0.51	−1.54
Race – Black	0.19	0.39	0.34	0.48	0.13	0.34	2.08
Race – Asian	0.12	0.32	0.06	0.25	0.05	0.23	0.17
Marital Status – Married	0.52	0.5	0.53	0.51	0.5	0.51	0.26
Marital Status – Divorced	0.15	0.36	0.16	0.37	0.16	0.37	−0.02
Marital Status – Never Married	0.28	0.45	0.12	0.34	0.29	0.46	−1.73

Note: This table shows summary statistics for the 2014 to 2016 Medical Expenditure Panel Survey for non-Medicare eligible adults with insurance from the ACA marketplaces. All expenditures are winsorized.

Because we exploit the sharp discontinuity in the CSRs at 150% of the federal poverty line, the latter columns of Table 2 are separated by the 10% block above and below our cutoff. On average, individuals on the ACA marketplaces with incomes 140% to 150% of the FPL spend an annual average of $1,838.96, $976.27, $698.85, and $110.35 on discretionary, office based visit, prescriptions filled, and inpatient visit expenditures, respectively. In comparison, individuals that received their insurance via the ACA marketplaces with incomes 151% to 161% of the FPL spend an average of $935.26 on discretionary healthcare, $594.53 on office based visits, $259.76 on prescriptions, and $338.85 on inpatient visits annually. The last column of Table 2 displays the t-value for a difference in means test for all of the variables comparing individuals in the ACA marketplaces with incomes 140% to 150% of the FPL to those individuals with incomes 151% to 161% of the FPL. The average expenditures on total discretionary spending and prescriptions filled for those with incomes 140% to 150% of the FPL are statistically significantly larger at the 10% level than those with incomes 151% to 161% of the FPL. The percent of the population that is black and the percent of the population that has never been married are the only demographic characteristics that are

statistically different between the two groups. Specifically, individuals that get their health insurance on the ACA marketplaces with incomes 140% to 150% of the FPL have a larger portion of the population that is black, and a smaller population that has never been married than those with incomes 151% to 161% of the FPL.

4 Methods and Results

4.1 Effect of Medicaid Expansion on Premiums:

Prior work estimating the effect of Medicaid expansion on the private market has used two main avenues for identification: a state-based difference-in-differences approach (Peng, 2017; Sen and DeLeire, 2018) and a geographic discontinuity method matching counties across state borders (Sen and Deleire, 2016; Sen and DeLeire, 2018). We add to the prior work with a triple-difference approach. Selection out of (or into) the ACA Medicaid expansion is not random.[14] It is possible that other state-level policies (for instance, advertising about the exchanges) that impact medical costs and exchange prices are correlated with the decision to opt-out, especially since the decision to expand Medicaid is politically driven.[15] To account for this, we adopt a triple-difference approach. We use plans in the Small business Health Options Program (SHOP), which do not require insurers to include CSR policies and should be subject to the same state-level changes, as our additional control group. The population that purchases from the SHOP market is different from the individual market, but any underlying changes in health policy/costs should be picked up by both groups. Specifically, our identification is driven by the relative change in prices for individual vs. SHOP plans before and after expansion in states that expand post-2014 using the relative change in prices

[14] Additionally, due to data limitations, the parallel trends assumption cannot be checked on the pre-trends.

[15] Correlation between Medicaid expansion and other state-level health decisions would also bias the border-county approach of Sen and Deleire (2016) and Sen and DeLeire (2018).

for individual vs. SHOP plans in states that either expand in 2014 or never expand as a control.

Our empirical model is:

$$\begin{aligned} Prem_{pmt} = \alpha P_{pt} + \gamma M_{mt} \\ + \beta_1 Area_m + \beta_2 Year_t + \beta_3 Ind_{pm} \\ + \beta_4 (Ind_{pm} * Year_t) + \beta_5 (Ind_{pm} * Area_m) + \beta_6 (Year_t * Area_m) \\ + \beta_7 (\mathbf{Ind_{pm}} * \mathbf{Expand_{mt}}) + \epsilon_{pmt} \end{aligned} \tag{1}$$

Where $Prem_{pmt}$ is the premium for a 27 year old purchasing a silver plan p, in market (i.e. rating area) m, in year t; P_{pt} and M_{mt} are vectors of plan and market covariates, respectively; $Expand_{mt}$ is binary representing one if the market is in a state that has expanded Medicaid by year t and zero otherwise; $Area_m$ is a vector of market fixed effects; $Year_t$ is a vector of year fixed effects; Ind_{pmt} is a binary indicator for if the plan is offered in the individual market; and ϵ_{pmt} is the mean zero, exogenous error term. P_{pt} comprises the following plan characteristics: plan type (PPO, HMO, etc.) and multi-tier status. M_{mt} consists of time-varying market characteristic controls described in section 3.2.

Our triple-difference method is identified as follows: the fixed effects control for time-invariant differences across rating areas (β_1) and the raw time series variation in premiums (β_2) and then the time-invariant differences between the individual and SHOP plans (β_3); The interaction of the year and individual fixed effects controls for changes how the difference between individual and SHOP plans evolves over time (β_4). The interaction (β_5) between the rating area and individual fixed effects controls for the time-invariant differences between the individual and SHOP plans across markets. The interaction between the rating area and year fixed effects (β_6) controls for how premiums change across rating areas over time. The final interaction (β_7) is the variation in premiums for the individual plans (where the CSR subsidies exist) relative to the SHOP plans in the expansion markets (relative to the

non-expansion markets) in the years following Medicaid Expansion. This is our variable of interest and is the causal effect of Medicaid expansion on health insurance premiums in the individual exchanges. Because our treatment is decided by individual state governments, all standard errors for all policy-level analysis presented are clustered at the state level (Abadie et al., 2017).

The results of equation (1) are shown in Table 3. Column (1) presents the results closely following the demographic, health, and healthcare access controls in Sen and DeLeire (2018). The controls included in our analysis depart from Sen and DeLeire (2018) as we exclude controls that have data missing for 5% or more of the data. Column (2) expands upon the controls in column (1) to include health insurance plan characteristics.

Column (2), which is our preferred specification, shows that expanding Medicaid decreases monthly silver plan premiums for a 27 year old on the health insurance exchanges by $22.94 relative to SHOP plans. The point estimate in column (2), which is statistically significant at the 5% level, represents an increase in silver plan premiums of 7.60%. This is lower than the 11% decrease in premiums found by Sen and DeLeire (2018). Sen and DeLeire (2018) likely overstate the decrease in premiums because there some correlation between a states' decision to expand Medicaid and other state level health decisions involving the health insurance exchanges (e.g. advertising decisions). The border county difference-in-differences analysis in Sen and DeLeire (2018) does not control for this omitted variable.

Column (2) of Table 3 suggests that removing individuals below 138% of the FPL from the health insurance exchanges (as the ACA Medicaid expansion does) decreases silver plan premiums on the health insurance exchanges. While the typical explanation for the premium differences between Medicaid expansion and non-expansion sates is variation in overall health for individuals living below 138% of the FPL (i.e. Medicaid eligible individuals in expansion states), moral hazard from the CSR subsidies on the health insurance exchanges could also explain the premium differential. That is, individuals who would have been eligible for Medicaid in a Medicaid expansion state are eligible for the most generous CSR subsidies

Table 3: Difference-in-Difference-in-Difference Estimation:

	Dependent variable: Silver Plan Premium for 27 year old	
	(1)	(2)
Treatment Effect:		
Individual:Expansion	−21.155**	−22.935**
	(9.430)	(9.752)
Demographic Controls:		
Some College Education	2.499	1.371
	(3.900)	(3.724)
Age – Under 18	−38.476	−42.668*
	(25.111)	(25.682)
Age – 65 or older	−6.031	−4.334
	(10.439)	(11.262)
Population Black (%)	−0.385	−0.907
	(2.919)	(3.665)
Population Asian (%)	75.355***	72.604***
	(28.975)	(28.043)
Population Hispanic (%)	4.621	4.302
	(2.871)	(3.134)
Sex	35.742	40.637
	(32.889)	(32.746)
Rurality	1.351**	1.393**
	(0.669)	(0.547)
Health Controls:		
Low Birth Weight Rate	4.851	2.491
	(24.318)	(26.820)
Obesity Rate	12.015*	12.939**
	(7.203)	(6.373)
Population Inactive (%)	−3.816	0.228
	(13.783)	(13.642)
Population with Access to Exercise (%)	−4.499	−4.693
	(2.853)	(3.112)
Teen Birth Rate	0.010	0.019
	(0.025)	(0.029)
Population with Diabetes(%)	10.999	11.228
	(36.466)	(39.194)
Healthcare Access Controls:		
Primary Care Physicians (per 1,000 population)	0.005	0.005
	(0.012)	(0.013)
Dentists (per 1,000 population)	−0.010	−0.010
	(0.024)	(0.026)
Population with Access to Diabetes Screening (%)	−13.907*	−14.870*
	(7.866)	(8.522)
Population with Access to Mammograms (%)	−0.519	0.335
	(2.632)	(2.774)
Plan Controls:		
Plan Type – PPO		−132.200
		(91.367)
Plan Type – HMO		−171.470*
		(93.311)
Plan Type – POS		−145.796
		(92.949)
Plan Type – EPO		−167.464*
		(90.412)
Multi-tiered Plan		2.106
		(14.662)
Individual/SHOP Year Specific Fixed Effects?	Yes	Yes
Individual/SHOP Rating Area Specific Fixed Effects?	Yes	Yes
Rating Area Year Effects?	Yes	Yes
Within R-squared	0.004	0.046
Observations	180,959	180,959
Residual Std. Error	75.243	73.636

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference-in-difference regressions for the impact of the ACA Medicaid expansion on monthly silver plan premiums for 27 year olds on the health insurance exchanges using prices for SHOP plans as the additional control. This analysis excludes red-lined plans (Fang and Ko, 2018). Cluster-Robust standard errors at the state level are reported in parentheses. Columns (1) displays the results that most closely follow the controls of Sen and DeLeire (2018). The results here depart from Sen and DeLeire (2018) by excluding controls that are missing data for over 5% of the sample. Columns (2) adds upon the controls of Column (1) by adding controls for plan characteristics.

on the health insurance exchanges in non-expansion states. These individuals, who would have been eligible for Medicaid in an expansion state, may capitalize on the most generous CSR subsidies by consuming more healthcare, which would lead to higher premiums. We explore the possibility that the CSR subsidies result in the decrease in silver plan premiums following Medicaid expansion in Section 4.2.

4.2 Effect of Cost Sharing Reductions on Expenditures:

Having confirmed that opting out of Medicaid expansion raises premiums, we examine why. When a state opts out of Medicaid expansion, many of those would-be eligibles will purchase insurance on the exchanges instead. Most of those who do are eligible for the most generous cost sharing reduction (CSR) subsidies which may lead to increased costs that, due to limits on medical underwriting, will be spread across the entire risk pool. We examine the impact of the CSR subsidies on healthcare expenditures by exploiting a sharp discontinuity. Unlike the premium subsidies, the CSRs exhibit a sharp discontinuity based on the individuals' income level. If you make 151% of the poverty line, a silver plan covers 87% of healthcare expenditures. If you make 149%, that exact same plan, including the same network and all other characteristics, covers 94%.[16]

We exploit this through a regression discontinuity design:

$$y_{it} = f(income_{it}, X_{it}) + Over150_{it} + e_{it} \tag{2}$$

Where y_{it} is health expenditures for individual i in year t; $income_{it}$ is income as a percentage of the federal poverty line (FPL); X_{it} is a vector of controls including gender, marital status, race, education, age, and year dummies; $Over150_{it}$ is a binary indicator for if the consumer's income level is greater than 150% of the relevant (for that year) FPL; and $f()$ is a local-linear spline with a triangular kernel for bandwidth calculation (as recommended

[16]For a visual example please refer to Figure 1.

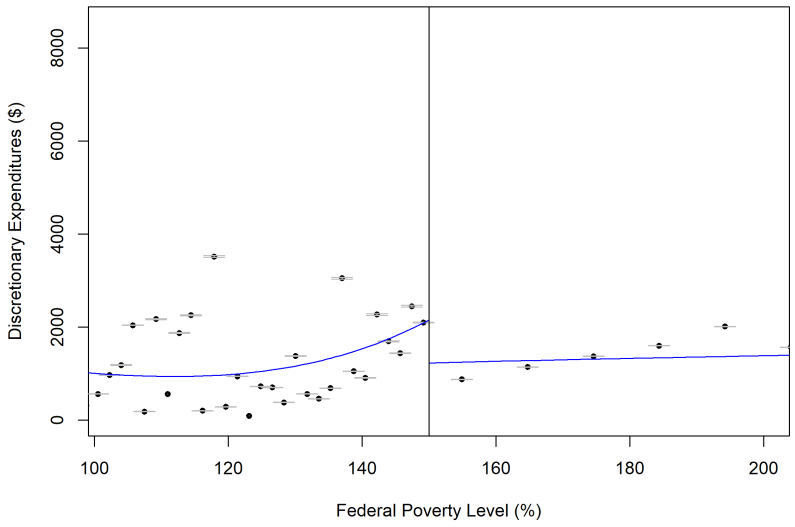
in Lee and Lemieux (2010)). Because overall health expenditures are exceptionally noisy, we limit y_{it} to two relatively more "discretionary" spending categories: office-based visits and prescriptions.[17] As a placebo check, we also estimate equation (2) using inpatient visit expenditures, which tend to be less discretionary as these expenditures include emergency procedures. Because health insurance decisions are typically made as a family, we the standard errors presented for all discontinuity models are clustered at the family level (Abadie et al., 2017).

Prior to estimating equation (2), we examine whether a discontinuity for discretionary expenditures appears graphically in the data. Figure 4 shows discretionary expenditures against the FPL for those individuals in the health insurance exchanges. Individuals below 150% of the FPL are eligible for CSR subsidies amounting to a 94% actuarial value plan, which means these individuals pay only \$6 for each \$100 of healthcare expenditures. In comparison, those individuals above 150% of the FPL are eligible for CSR subsidies amounting to an 87% actuarial value plan, meaning that these individuals pay \$13 for each \$100 of healthcare expenditures. Given that individuals above 150% of the FPL have to pay double for their healthcare expenditures, it is unsurprising that Figure 4 shows a clear discontinuity at 150% of the FPL for discretionary expenditures. Specifically, Figure 4 displays that just above 150% of the FPL, individuals have a sharp decrease in discretionary expenditures. Even in the absence of the discontinuity lines, which were calculated using local linear splines and a triangular kernel, the data shows a sharp discontinuity at 150% of the FPL.

Now that we have established that the data show a discontinuity present at 150% of the FPL for discretionary expenditures, we estimate equation (2). The numerical results of equation (2) for total discretionary spending, office based visit expenditures, filled prescription expenditures, and inpatient visit expenditures are presented in Table 4. Odd number columns display the results without controls, and even number columns display the results controlling for gender, marital status, race, education level, age, and year dummies. Com-

[17] We do not find statistically significant results (with or without controls) for total expenditures.

Figure 4: Discontinuity Plot: Discretionary Spending on Exchanges



This figure plots discretionary spending on healthcare (office based visits and pharmaceuticals) for consumers in the health insurance exchanges based on their income relative to the federal poverty line. Consumers below 150 are eligible for CSR subsidies amounting to a 94% actuarial value plan and those above are eligible for an 87% actuarial value plan.

paring odd and even columns for each respective expenditure type, we see that the results are not statistically different from each other, which we would expect in a regression discontinuity design.

Table 4: Regression Discontinuity Models for Healthcare Expenditure:

	Total Discretionary Spending:		Office Based Visits:		Prescriptions Filled:		Inpatient Visits:	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Over 150% FPL	−1009.983*	−1079.662**	−514.181*	−557.577**	−763.233**	−633.929**	62.594	107.86
	(581.214)	(535.497)	(308.932)	(280.76)	(349.366)	(287.968)	(190.367)	(187.85)
Number Observations LATE	344	344	280	280	213	213	238	238
Additional Covariates	No	Yes	No	Yes	No	Yes	No	Yes

Note: *p<0.1; **p<0.05; ***p<0.01

This table shows the results of the regression discontinuities for total discretionary spending, which is comprised of office based visit expenditures and total expenditure on prescriptions. The results for non-discretionary spending, which is total inpatient visit expenditures, are also shown. The sample is for non-Medicare eligible adults with insurance from the ACA marketplaces. All expenditures are winsorized. The bandwidths were calculated using the Imbens-Kalayanaraman method, the kernel is triangular (as recommended in Lee and Lemieux (2010)), and the results are clustered by family. The additional covariates are gender, marital status, race, education, age, and year dummies. Standard errors are in the parentheses.

Column (2) of Table 4 shows that individuals in the health insurance exchanges who are eligible for the most generous CSR subsidies spend $1,079.66 more per year on discretionary healthcare than those individuals just above 150% of the FPL. This result, which is sta-

tistically significant at the 5% level, is driven primarily by an increase in expenditures on prescription drugs. Specifically, columns (4) and (6) of Table 4 indicate that approximately 51.64% and 58.72% of the increase in total discretionary spending comes from an increase in office based visit and prescription drug expenditures, respectively. The results of columns (4) and (6) are statistically significant at the 5% level. Columns (7) and (8) of Table 4 show that we fail to find a statistically significant effect for more generous CSR subsidies on inpatient visit expenditures, which is a less discretionary form of health expenditure. Taken in conjunction, the results of columns (2) and (8) suggest that more generous CSR subsidies increase individual consumption of discretionary healthcare while, unsurprisingly, not affecting non-discretionary healthcare utilization.

Our results indicate that individuals below 150% of the FPL, and therefore eligible for the most generous CSR subsidies, increase their discretionary healthcare expenditures by $1,079.66 more per year than those who are not eligible for the most generous CSR subsidies. While this dollar amount seems large, the effect in terms of the number of office based visits and prescriptions filled is quite small. Specifically, the average expenditure on a single office based visit and filled prescription drug is $342.55 and $57.06, respectively. Our results are therefore equivalent to consumers going to 1.63 more office-based visits per year and 0.92 more prescription drugs per year (i.e. a prescription filled 11.1 times in a year which is approximately a monthly prescription). Our result indicates a price-elasticity of demand for healthcare of -0.34, which is well within the accepted ranges. Though our sample is localized at a certain income level and price range, our finding is between Manning et al.'s (1987) estimate of -0.2 and Ellis, Martins, and Zhu's (2017) estimate of -0.44. Our estimate is larger than the elasticity of -0.13 estimated by Lavetti, DeLeire, and Ziebarth (2018) who also use the CSR subsidies. However, we are not estimating across the same income range which likely contributes to the difference.

4.3 Robustness Checks:

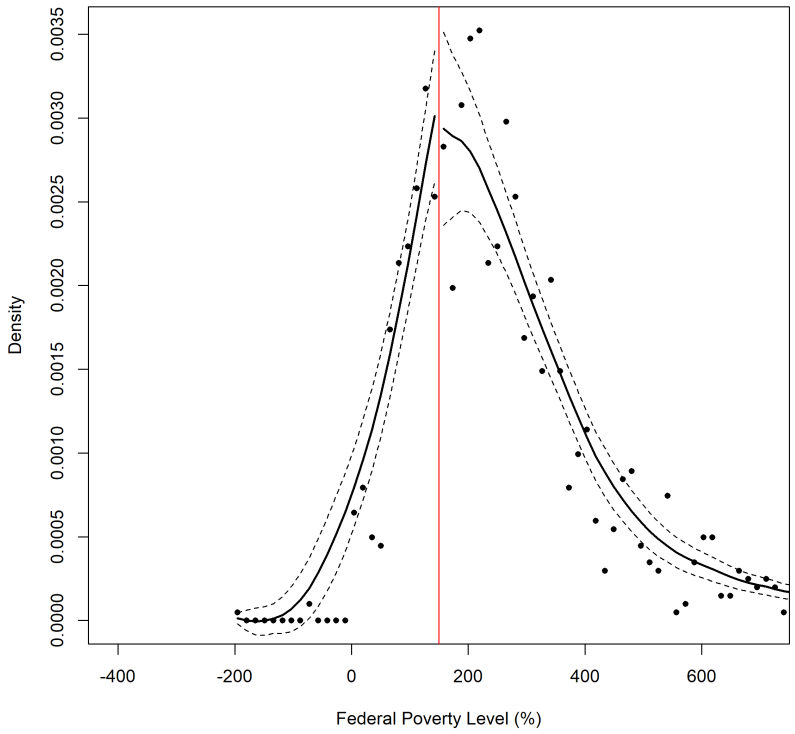
There are four main concerns about the causal interpretation of regression discontinuity designs: (1) Consumers manipulating the running variable to self-select into treatment; (2) Choice of kernel for bandwidth calculation; (3) Non-linear effects being picked up as a discontinuity; and (4) Correlation of the cutoff with other treatments. We will address all four.

4.3.1 Manipulation of Running Variable:

One concern for the validity of a regression discontinuity design is the threat that individuals are able to manipulate the running variable. For our analysis, this would imply that individuals' are manipulating their income by working fewer hours, fewer jobs, etc. to ensure that their income does not exceed 150% of the FPL. If this is occurring, the manipulation of income will violate the continuity assumption of the running variable, which is required for identification in a regression discontinuity design.

To determine whether individuals' appear to be manipulating their income around the 150% FPL threshold to self-select the most generous CSR subsidies, we run the McCrary (2008) sorting test. The McCrary (2008) sorting test checks for a discontinuity in the density of the data along the running variable. Figure 5 presents the results. Figure 5 does not display any clustering around our treatment threshold of 150% of the FPL, indicating that manipulation of the running variable is not occurring here. Additionally, the McCrary (2008) sorting test yields a p-value of 0.52 meaning that we fail to reject the null hypothesis that there is no sorting into treatment assignment.

Figure 5: McCrary Sorting Test:



This figure plots the density of the those in the exchanges along the running variable (income relative to the federal poverty line (FPL)) and checks for a discontinuity at 150% of the FPL.

4.3.2 Kernel Selection:

Another concern is that our choice of using a triangular kernel is driving the result that individuals' with the most generous CSR subsidies (i.e. those living below 150% of the FPL) spend $1,079.66 more on discretionary healthcare than those with less generous CSR subsidies (i.e. those above 150% of the FPL). To determine the stability of our estimate, we re-estimate equation (2) for total discretionary and inpatient visit expenditures using various kernels to calculate the bandwidths. Table 5 displays the results of our regression discontinuity at 150% of the FPL using various kernels.

The odd columns of Table 5 display the Local Average Treatment Effect (LATE) estimates using various kernels, and the even columns show the number of observations present in the bandwidth for estimation at the cutpoint. Column (1), which uses a triangular kernel,

Table 5: Regression Discontinuity Models for Healthcare Expenditure: Comparing Bandwidths

	Triangular (1)	Obs (2)	Quartic (3)	Obs (4)	Tricube (5)	Obs (6)	Triweight (7)	Obs (8)	Gaussian (9)	Obs (10)
Expenditures: No Controls										
Total Discretionary	−1009.98*	344	−1023.76*	371	−1005.72*	375	−1048.16*	422	−1114.23*	1247
Inpatient Visits	62.59	238	62.48	250	56.09	255	67.33	282	84.08	1205
Expenditures: Controls										
Total Discretionary	−1079.66**	344	−1174.47**	371	−1157.48**	375	−1195.66**	422	−1253.81**	1247
Inpatient Visits	107.86	238	99.77	250	90.9	255	104.32	282	120.65	1205

Note: *p<0.1; **p<0.05; ***p<0.01

This table shows the results of the regression discontinuities for total discretionary expenditures, and total inpatient visit expenditures for non-Medicare eligible adults with insurance from the ACA marketplaces. All expenditures are winsorized. The bandwidths were calculated using the Imbens-Kalayanaraman method and the results are clustered by family. The additional covariates are gender, marital status, race, education, age, and year dummies.

displays the results of our preferred specification and is identical to the results presented in Table 4. Columns (3), (5), (7), and (9) display the LATE estimates using quartic, tricube, triweight, and Gaussian kernels, respectively. Comparing the LATE estimate for total discretionary healthcare spending in column (1) to columns (3), (5), (7), and (9), we see that our point estimates are consistent across the different kernels and are statistically significant at the 10% level without controls, and the 5% level with controls. Additionally, the LATE estimate for the placebo check of inpatient expenditures fails to be statistically significant across the various kernels with or without controls. Table 5 shows that the choice of a triangular kernel does not appear to be driving the results of Table 4 and therefore remains our preferred specification.

4.3.3 Non-linear Effects:

An additional concern is that the chosen cutpoint is exhibiting a discontinuity due to non-linearities in the data rather than as a result of the treatment. To check that our cutpoint at 150% of the FPL is indeed capturing the treatment effect of the subsidies is indeed capturing the treatment effect of the CSR subsidies, we re-estimate equation (2) using alternative cutpoints. If there are non-linearities in the data, cutpoints other than 150% of the FPL will also exhibit discontinuities. Table 6 shows the results of equation (2) for total discretionary healthcare spending using cutpoints for each 1% increment from 140% to 160% of the FPL.

Table 6: Regression Discontinuity Models for Discretionary Healthcare Expenditure: Comparing Cutpoints

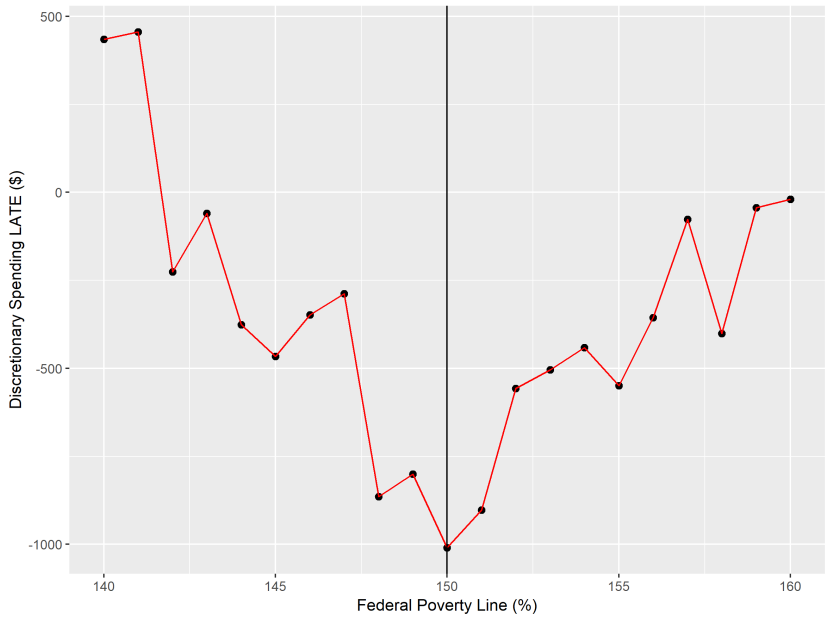
	LATE (1)	Standard Error (2)	P-value (3)
Over 140% of the FPL	435.11	723.85	0.55
Over 141% of the FPL	456.37	737.83	0.54
Over 142% of the FPL	−225.64	627.7	0.72
Over 143% of the FPL	−59.36	714.52	0.93
Over 144% of the FPL	−375.87	679.02	0.58
Over 145% of the FPL	−466.29	609.66	0.44
Over 146% of the FPL	−348.01	612.2	0.57
Over 147% of the FPL	−288.29	595.97	0.63
Over 148% of the FPL	−864.69	599.56	0.15
Over 149% of the FPL	−800.21	610.63	0.19
Over 150% of the FPL	**-1009.98**	**581.21**	**0.08**
Over 151% of the FPL	−902.43	560.31	0.11
Over 152% of the FPL	−557.52	520.83	0.28
Over 153% of the FPL	−503.61	500.82	0.31
Over 154% of the FPL	−440.7	492.03	0.37
Over 155% of the FPL	−549.43	495.84	0.27
Over 156% of the FPL	−355.37	480.37	0.46
Over 157% of the FPL	−77.04	447.82	0.86
Over 158% of the FPL	−401.37	435.91	0.36
Over 159% of the FPL	−43.92	427.72	0.92
Over 160% of the FPL	−19.28	429.61	0.96

Note: This table shows the results of the regression discontinuities for total discretionary expenditures for non-Medicare eligible adults with insurance from the ACA marketplaces. All expenditures are winsorized. The bandwidths were calculated using the Imbens-Kalayanaraman method and the results are clustered by family. The kernel is triangular.

The results of Table 6 show that of our 21 alternative cutpoints, only our treatment cutpoint at 150% of the FPL has a statistically significant discontinuity. Additionally, the results of Table 6 show that the point estimate of the LATE is largest at 150% of the FPL. Figure 6 graphically shows the point estimate of the LATE for each 1% increment from 140% to 160% of the FPL.

Given that the cutpoint that coincides with the most generous CSR subsidies (i.e. 150% of the FPL) is both the only statistically significant discontinuity compared to 20 alternative cutpoints, and it is the largest treatment effect, we conclude that our cutpoint of 150% of the FPL is indeed picking up the treatment effect of the CSR subsidies.

Figure 6: Discontinuity Plot: Discretionary Spending on Exchanges – Comparing Cutpoints



This figure plots the LATE for a regression discontinuity of total discretionary spending on healthcare (office based visits and pharmaceuticals) for consumers in the health insurance exchanges based on their income relative to the federal poverty line.

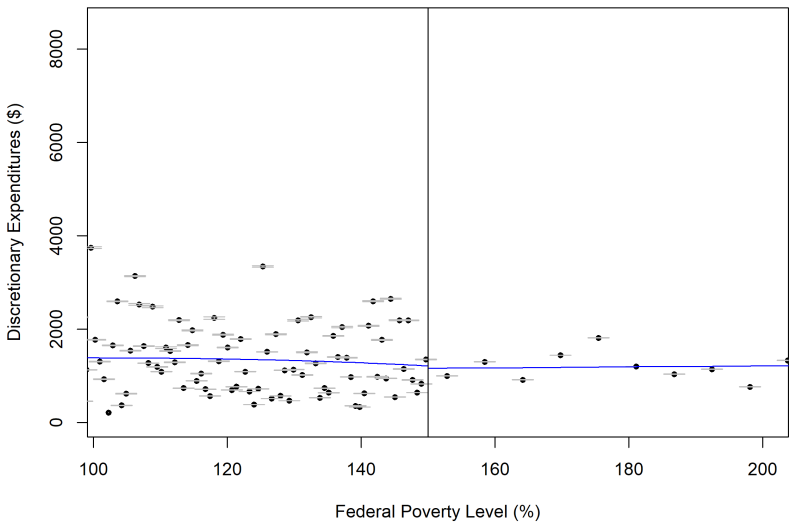
4.3.4 Correlation with Other Treatments:

Another concern for interpreting the results of Table 4 is that there could be other treatments occurring at 150% of the FPL that are unrelated to the CSR subsidies. If true, the correlation with other treatments would mean that our causal interpretation of the results of Table 4 is incorrect. To determine whether the CSR subsidies are indeed the only treatment at 150% of the FPL, we re-estimate equation (2) using individuals' with employer-sponsored health insurance. Given that individuals' with employer-sponsored health insurance are not eligible for CSR subsidies, there should be no discontinuity at 150% of the FPL based on the CSR subsidies. The presence of a discontinuity at 150% of the FPL for individuals' with employer-sponsored health insurance would indicate the presence of another treatment at that income level.

Before re-estimating equation (2) for those with employer-sponsored health insurance, we graphically check for the presence of a discontinuity at 150% of the FPL. Figure 7 shows

this graphical check. In contrast to Figure 4 there does not appear to be a discontinuity at 150% of the FPL in Figure 7.

Figure 7: Discontinuity Plot: Discretionary Spending with Employer Sponsored Health Insurance



This figure plots discretionary spending on healthcare (office based visits and pharmaceuticals) for consumers with employer sponsored health insurance based on their income relative to the federal poverty line.

The numerical results for the regression discontinuity for total discretionary, office based visit, prescriptions filled, and inpatient visit expenditures at 150% of the FPL for individuals' with employer-sponsored health insurance are shown in Table 7. Odd columns of Table 7 display the results without controls, and even columns show the results controlling for gender, marital status, race, education, age, and year.

Table 7 shows that there is no statistically significant discontinuity at 150% of the FPL for discretionary spending or non-discretionary spending (i.e. inpatient visit expenditures) with or without controls for individuals' with employer-sponsored health insurance. The results of Table 7 confirm the graphical interpretation of Figure 7 and suggest that the only treatment at 150% of the FPL is the generosity of the CSR subsidies.

Table 7 shows that there is no statistically significant discontinuity at 150% of the FPL for discretionary spending or non-discretionary spending (i.e. inpatient visit expenditures)

Table 7: Regression Discontinuity Models for Healthcare Expenditure: Out Of Sample Test – Employer Sponsored Health Insurance

	Total Discretionary Spending:		Office Based Visits:		Prescriptions Filled:		Inpatient Visits:	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Over 150% FPL	−34.632	−2.239	8.252	42.416	22.203	26.294	1.107	−0.54
	(178.327)	(215.643)	(109.796)	(131.011)	(91.452)	(90.497)	(76.67)	(75.716)
Number Observations LATE	2,263	2,263	1,696	1,696	2,772	2,772	1,814	1,814
Additional Covariates	No	Yes	No	Yes	No	Yes	No	Yes

Note: *p<0.1; **p<0.05; ***p<0.01

This table shows the results of the regression discontinuities for total discretionary spending, which is comprised of office based visit expenditures and total expenditure on prescriptions. The results for non-discretionary spending, which is total inpatient visit expenditures, are also shown. The sample is for non-Medicare eligible adults with employer sponsored health insurance. All expenditures are winsorized. The bandwidths were calculated using the Imbens-Kalayanaraman method, the kernel is triangular (as recommended in Lee and Lemieux (2010)), and the results are clustered by family. The additional covariates are gender, marital status, race, education, age, and year dummies. Standard errors are in the parentheses.

with or without controls for individuals' with employer-sponsored health insurance. The results of Table 7 confirm the graphical interpretation of Figure 7 and suggest that the only treatment at 150% of the FPL is the generosity of the CSR subsidies.

4.4 Separation of Moral Hazard and Adverse Selection:

Our results thus far have provided evidence that the CSR subsidies lead to increased spending via asymmetric information. This could be due to moral hazard – those facing lower prices consume more, but it could also be due to adverse selection – sick people are more likely to purchase insurance that is more generous. It is essential to separate the effects because the policy implications are different. If moral hazard is causing the increased spending, then moving those consumers to Medicaid, which has other means of spending control, may be optimal. If adverse selection is causing the increased spending on the exchanges, then moving those consumers to Medicaid may have no net effect and may merely be a redistribution from taxpayers who will fund the increase in Medicaid expenditures to those on the exchanges whose premiums will be lowered.

To check for potential adverse selection, we examine the impact of the policy on those who are eligible for CSR subsidies but choose to either keep their employer-sponsored insurance or remain uninsured. Unhealthy people who are adversely selecting into the health insurance exchanges are coming from somewhere, and a reverse effect should be observable. That is,

if our discontinuity is caused by unhealthy people being more likely to join the exchanges when they are eligible for the most generous CSR subsidies, then those who do not join the exchanges (but would have been eligible for the most generous CSRs) should be relatively more healthy with no moral hazard to cloud the analysis. If adverse selection exists, this means that we would expect to see an increase in discretionary healthcare expenditures at 150% of the FPL for individuals who are eligible for CSR subsidies but choose to either keep their employer-sponsored insurance or remain uninsured. To estimate this, we use the same discontinuity model (equation (2)) for those who are eligible for the exchange subsidies but choose not to partake. This consists of two groups of people: all uninsured who are ineligible for Medicaid and those with employer-sponsored insurance whose out-of-pocket premiums for the cheapest individual plan offered are higher than 9.56% of their income.

Table 8: Regression Discontinuity Models for Healthcare Expenditure: Out Of Sample Test – CSR Eligible and Not on Exchanges

	Total Discretionary Spending:		Office Based Visits:		Prescriptions Filled:		Inpatient Visits:	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Over 150% FPL	−190.47	−160.566	−51.857	−61.986	−45.029	−2.945	20.901	17.895
	(181.764)	(229.623)	(87.927)	(110.054)	(114.379)	(118.621)	(36.672)	(38.193)
Number Observations LATE	734	734	1,001	1,001	672	672	680	680
Additional Covariates	No	Yes	No	Yes	No	Yes	No	Yes

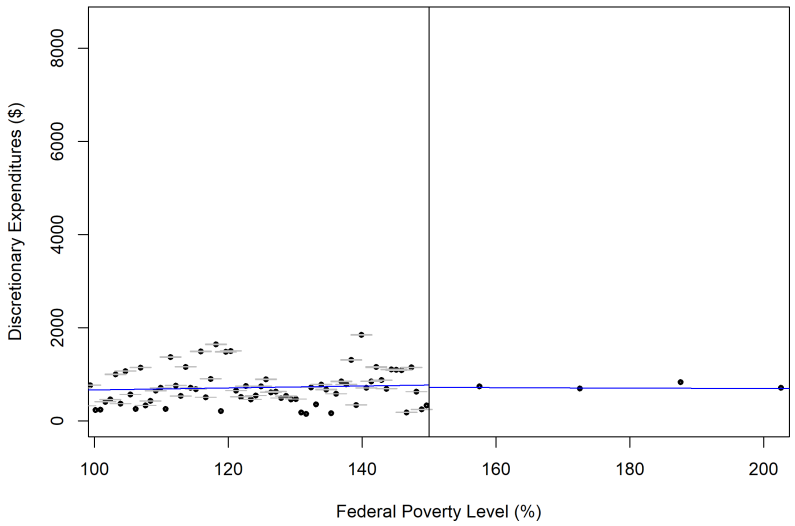
Note: *p<0.1; **p<0.05; ***p<0.01

This table shows the results of the regression discontinuities for total discretionary spending, which is comprised of office based visit expenditures and total expenditure on prescriptions. The results for non-discretionary spending, which is total inpatient visit expenditures, are also shown. The sample is for adults who are eligible for CSR subsidies (either uninsured or with employer-sponsored insurance with premiums greater than 9.56% of income). All expenditures are winsorized. The bandwidths were calculated using the Imbens-Kalayanaraman method, the kernel is triangular (as recommended in Lee and Lemieux (2010)), and the results are clustered by family. The additional covariates are gender, marital status, race, education, age, and year dummies. Standard errors are in the parentheses.

The numerical results for total discretionary, office based visit, prescription filled, and inpatient visit expenditures at 150% of the FPL for those who are eligible for but did not participate in the health insurance exchanges are presented in Table 8. There are no statistically significant results for discretionary or non-discretionary spending with or without controls in Table 8. Given that there is not a statistically significant increase for individuals who were eligible for the CSR subsidies but did not join the health insurance exchanges above 150% of the FPL, the results suggest that there is little, if any, adverse selection and that our main effect is driven largely by moral hazard. Figure 8 confirms the results of Table

8 as there does not appear to be a discontinuity present at 150% of the FPL. The results of Table 8 and Figure 8 indicate that the increase in total discretionary spending of $1,079.66 as a result of the most generous CSR subsidies as shown in Table 4 is from moral hazard and not adverse selection. The results of Table 4 therefore suggest that an additional benefit for states to expand Medicaid is decreasing prices in the private market.

Figure 8: Discontinuity Plot: Discretionary Spending on Exchanges – CSR Eligible and Not on Exchanges



This figure plots discretionary spending on healthcare (office based visits and pharmaceuticals) for consumers who are eligible for CSR subsidies, but do not purchase on the exchanges, based on their income relative to the federal poverty line.

5 Conclusions

While the majority of the ACA held up to judicial scrutiny, the Supreme Court ruled that mandatory expansion of Medicaid was unconstitutional. This ruling gave states the option of "opting out" of the ACA Medicaid expansion. The debate, in both congressional and judicial halls, over the Medicaid expansion largely weighed the direct benefits to the individuals newly covered versus the accounting cost of doing so. However, there will also be indirect effects of a state's refusal to expand Medicaid. In this paper, we examine the

potential indirect effects that a state's expansion of Medicaid has on the private, individual market for health insurance. Specifically, we investigate how the decision of a state to expand Medicaid impacts silver plan premiums on the ACA health insurance exchanges. Using a difference-in-difference-in-differences estimation strategy, we find that expanding Medicaid reduces average monthly premiums for a silver plan by $22.94, which is approximately a 7.6% decrease.

After confirming that expanding Medicaid decreases silver plan premiums on the health insurance exchanges, we then examine why. The conventional explanation for the decrease in premiums on the private market following the ACA Medicaid expansion has been the health wealth gradient. However, asymmetric information from the cost-sharing reduction (CSR) subsidies on the health insurance exchanges could explain the premium differential. In states that opt out of the expansion, some of those would-be Medicaid eligibles will purchase private insurance on the individual market, and most of those who do are eligible for the most generous CSR subsidies. These would-be eligible Medicaid individuals may consume more healthcare as a result of these generous CSR subsidies, which would increase premiums. We examine whether asymmetric information is increasing premiums by exploiting a regression discontinuity at 150% of the FPL. We find that consumers with the most generous CSR subsidies spend $1079.66 more per year on healthcare than those with the second most generous level.

The policy implications are different if the asymmetric information is *ex ante* (adverse selection) or *ex post* (moral hazard). If *ex ante*, then moving those consumers to Medicaid will have little effect on the overall cost of their healthcare and will instead be a transfer from the general taxpayer, who will fund the increase in Medicaid expenditures, to those who purchase on the exchanges, whose premiums will be lowered. If *ex post*, then moving the consumers to Medicaid is likely beneficial. While Medicaid also has very low cost sharing, it uses other methods to reduce the adverse effects of moral hazard. Using an out of sample test and exploiting a regression discontinuity design, we find no evidence that the effect is

ex ante. We conclude that the effect is therefore *ex post* suggesting an additional benefit for states to expand Medicaid.

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