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Abigail Millender   April 10, 2023

"Invest & Harvest" or the "Winner's Curse"? Evidence from the Health Insurance
Marketplace, 2014-2020

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An abstract of
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Abstract

"Invest & Harvest" or the "Winner's Curse"? Evidence from the Health Insurance Marketplace, 2014-2020

By Abigail Millender

The Health Insurance Marketplace, established by the Affordable Care Act, experienced a sizable decline in insurer participation between 2017 and 2018. This thesis utilizes public use files from the Robert Wood Johnson Foundation to assess how premiums and insurer type influenced the exodus of insurers from the market during this period. Specifically, this paper aims to uncover whether insurers who priced high or those who priced low had higher odds of remaining in the market from 2014 to 2020 in order to provide evidence for either an "Invest & Harvest" strategy or the "Winner's Curse." Based on my analysis, I conclude that there is evidence for the "Invest & Harvest" strategy in this market, because low premiums were significantly correlated with an insurer remaining in the market in 2017 and 2018. Moreover, I find that Non-Profit insurers were more likely to remain in the market during this period than For-Profit insurers.

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Contents

List of Figures

"Invest & Harvest" or the "Winner's Curse"? Evidence from the Health Insurance Marketplace, 2014-2020

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April 2023

1 Introduction

1.1 Introduction and Motivation

In 2010, approximately one in four Americans was either uninsured or underinsured, spending more than 10% of their household income on healthcare. Moreover, there were stark disparities in insurance rates among states. In New Mexico, for example, almost 40% of the population was either uninsured or underinsured. In Massachusetts, however, only 15% of the population fell into either of these categories. Premiums were also rising, from an average of 15% of median household income in 2003 to 22% in 2012, making healthcare less affordable for those who were insured (Chokshi, 2014). On March 23, 2010, President Obama signed the Patient Protection and Affordable Care Act (ACA) into federal law to make affordable, high quality health insurance available to more Americans. Through ten separate legislative titles, the ACA aimed to (1) cut the population of uninsured Americans by more than fifty percent, (2) increase access to Medicaid and Medicare, (3) im-

prove healthcare quality while simultaneously cutting superfluous spending, and (4) strengthen access to primary healthcare (Rosenbaum, 2011).

Thanks to the ACA, approximately 20 million Americans have gained access to health insurance, and the percentage of uninsured Americans has dropped to a low of 8% in 2022 ("New HHS Report Shows," 2022). Moreover, the expansion in health insurance coverage under the ACA has decreased disparities correlated with race, socio-economic status, and geographic location. Thirty-six states and Washington D.C. have expanded Medicaid under the ACA, thereby insuring 12.7 million more Americans, especially in rural parts of the United States. Additionally, the ACA has strengthened Medicare and reduced health insurance costs for elderly Americans. For example, over $20 billion dollars has been saved on prescription drugs for the elderly (Rapfogel et. al, 2021).

In addition to improving and expanding both Medicaid and Medicare, the ACA created a new insurance platform: the Health Insurance Marketplace. This market, available in every state, is a platform where families, individuals, and small businesses shop for coverage from among a variety of competitively priced, high-quality plans offered by different insurers. Moreover, qualifying participants can benefit from cost-sharing and premium subsidies in this market under the ACA. Each state has its own marketplace run either by the state, such as in California, or by the federal government. Although any American can purchase insurance through this platform, the Health Insurance Marketplace is especially important for individuals who are not covered by employer-sponsored health insurance, Medicare, or Medicaid and thus must purchase health insurance on their own ("What is the Health Insurance Marketplace," 2020). Since the start of the open enrollment period for 2023, a record number of 15.9 million Americans have purchased health insurance through the marketplace ("Nearly 16 Million People," 2023).

Within the Health Insurance Marketplace, other ACA policies have limited price

discrimination and protected vulnerable Americans. Consider, for example, the fact that before the ACA, women could be charged up to 1.5 times more than men for insurance. Under the ACA, premiums cannot be based on either gender or health status, and no individual can be turned away by an insurer because of their health status. Women, moreover, are guaranteed access to coverage for essential feminine health services; and plans are required to include coverage for a set of necessary health services, such as prescription drugs, to help individuals with pre-existing conditions. The ACA has also helped to reduce the cost of insurance for those using the marketplace. Approximately 90% of enrollees receive assistance to cover their premiums, and approximately 50% are eligible for reduced cost sharing (Rapfogel et. al, 2021).

While the ACA has brought about many positive changes, it also has forced insurers that participate in the Health Insurance Marketplace to adapt to new pricing and coverage rules. In order to stabilize premiums, to balance out large gains and losses in the market, and to disincentivize insurers from cherry-picking healthy enrollees, the ACA implemented three programs in 2014: Risk-Adjustment, Reinsurance, and Risk Corridor. The Risk-Adjustment program, which is permanent, redistributes financial risk from insurers with a high number of risky enrollees to those with lower-risk enrollees. Each enrollee is given an individual risk score that is used to calculate an average risk score for each insurer. Based on these scores, insurers with low scores make payments to insurers with higher scores. The Reinsurance program lasted until 2016 and provided insurance to insurers to cover costly high-risk enrollees. Finally, the Risk Corridor program, which also lasted until 2016, protected the market from inaccurately set premiums. It did so by redistributing funds from insurers with claims lower than what they had expected to insurers with claims that exceeded expectations (Cox et. al, 2016).

After the risk corridor and reinsurance programs ended in 2016, the market saw

high levels of insurer exit between 2017 and 2018 and entry into the market in the following years. According to the Kaiser Family Foundation, most insurers do not offer national coverage in the exchange, so insurer participation varies heavily by state. In 2021 there was an average of five insurers participating in the market in each state, with an average of only 2.5 insurers participating in rural counties. Moreover, during 2021 38% of counties gained a new insurer, and only 12% of counties nationwide lost an insurer. 2015 saw the highest levels of insurer participation in the market, with an average of six insurers per state. The market, however, experienced high levels of insurer exit from 2017 to 2018, in which the average number of insurers per state declined to 4.3 and 3.5, respectively (McDermott & Cox, 2021).

This paper attempts to explain the decline in insurer participation between 2017 and 2018, to identify which types of insurers were unsuccessful in the market during this period, and to discover if insurers employed an "invest and harvest" strategy or if the idea of the "winner's curse" can better explain how pricing affected insurer participation in the market during this period. In an "invest and harvest" strategy, insurers will price their plans strategically low in order to gain high levels of enrollment and to price out their competitors. The "winner's curse," by contrast, describes a phenomenon in the market where insurers who price too low gain market share but are unable to remain profitable and thus leave the market. Specifically, this paper answers the following question: How did insurer dynamic pricing strategies affect insurer participation in the Health Insurance Marketplace? Through my analysis, I find that Non-Profit insurers were most likely to participate in the market for the seven years that I examine and to stay in the market in 2017 and 2018. Moreover, I find that insurers who charged relatively low premiums within were also more likely to remain in the market in 2017 and 2018, thereby providing evidence that the strategy of "invest and harvest" might have helped some insurers in the Health Insurance Marketplace.

1.2 Literature Review and Contribution

It has been well established in the literature on the ACA that reduced insurer competition increases prices for consumers. For example, in 2015 economists from the Massachusetts Institute of Technology assessed the impact of reduced competition on the price of premiums in the Health Insurance Marketplace and found that premiums respond to competition within this market. They concluded that if all insurers present in each state were to participate in all rating areas within that state, premiums would be set more than 11% lower on average and that federal subsidies in 2014 would have been decreased by $1.7 billion. They also found that in rating areas where CO-OPs—a type of insurer created for the Health Insurance Marketplace—were among the participating insurers, premiums were lower on average, since CO-OPs tend to have among the cheapest plans in the market (Dafny et. al, 2015). The MIT study thus demonstrates that in order to keep costs low for enrollees, it is important to stimulate competition among insurers and to keep participation rates steady so that every enrollee has at least some choice when selecting a plan.

Similarly, a study published by researchers at Stanford and Duke University in 2018 assessed the correlation among premiums in the federally facilitated Health Insurance Marketplace, on the one hand, and insurer competition, hospital concentration, and provider concentration, on the other. They discovered not only that low insurer competition increases the average price of premiums but also that higher provider and hospitals concentrations were associated with higher premiums. Enrollees purchasing insurance from the marketplace in rating areas that face low insurer competition, but high provider concentrations, are, accordingly, subject to the highest premiums. This situation makes insurance less affordable in these areas and increases the premium tax credits paid by the government (Polyakova et. al, 2018).

In a Research Letter published in JAMA Internal Medicine in 2017, researchers from the University of Pennsylvania and Rutgers University assessed the correlation between the number of insurers in the ACA Health Insurance Marketplace and premiums. They found that between 2016 and 2017, premiums were raised an average of 48% in markets that became monopolies and an average of 30% in markets that remained monopolies, because monopoly insurers can increase premiums without negatively impacting enrollment. Federal subsidies will largely cover premium increases, since prices are capped for all enrollees who are eligible for subsidies. Moreover, the significant increase in premiums between 2016 and 2017 probably resulted from a number of factors and was not solely due to reduced competition during this period. As the Research Letter suggests, the end of both the Risk Corridor and Reinsurance programs as well as the fact that many insurers initially underpriced premiums in the market also likely influenced the rise in premiums (Zhu et. al, 2017).

There has been limited research on insurer entry and exit patterns in the Health Insurance Marketplace. One study published in 2018 by researchers from the Department of Health Law, Policy, and Management at Boston University identified patterns of diminishing insurer competition in the market by focusing on county-level factors that might influence insurer competition. The Boston University study found that decreased insurer competition was more common in counties that are rural, experience high mortality rates, or have a high percentage of the population living in poverty. The study also found that limited insurer competition was more common in counties that had low medical loss ratios. This correlation means that insurers were exiting the market in counties that were profitable and that the low profitability of certain markets does not fully explain insurer exit during this period. Finally, the Boston University study found that counties in Republican-controlled states where Medicaid and Medicare had not been expanded were more

likely to have limited insurer competition during this period. This finding, conse-
quently, demonstrates that Republican politicians' opposition to the ACA can also
have harmful consequences for the Health Insurance Marketplace (Griffith et, al).
While this study identified some of the county characteristics that explain where
insurer exit occurred between 2017 and 2018, it described the trend of insurer exit
by county—rather than by rating area—and did not include pricing or insurer type
in its analysis.

This thesis contributes to the literature on insurer exit from the Health Insurance
Marketplace in 2017 and 2018 by examining (1) insurer type and (2) the relative
pricing of premiums within each individual market – two factors that have received
relatively little attention in previous scholarship. Moreover, this study is the first, to
my knowledge, which considers whether success in the ACA market can be explained
by the "invest and harvest" strategy, by the winner's curse theory, or by neither.
Finally, this paper differs from previous studies by analyzing insurer exit at the level
of the rating-area rather than by county.

2 Methods

2.1 Overview of Data

I utilize as the foundational dataset plan-level public use files from HIX Com-
pare, a comprehensive set of data from the Robert Wood Johnson Foundation on
Medicare, Medicaid, and Health Insurance Exchange plans ("HIX Compare", n.d.).
The files include insurer names, HIOS numbers, premiums for different age groups,
plan metals, and rating areas, in addition to many other plan characteristics that
are not relevant to this paper. HIOS (Health Insurance Oversight System) numbers
are unique codes assigned to each approved health plan offered in the Health In-
surance Marketplace that can be used to match insurers and plans across datasets.

Premiums refer to the price of monthly payments that customers pay to insurers. Premiums are based on smoking status, age, plan metal, whether the plan is for families or individuals, and location. As noted above, premiums cannot be influenced by gender or medical history ("How Health Insurance Marketplace Plans Set Your Premiums," n.d). Like other insurance markets, insurers within the Health Insurance Marketplace split their plans into different categories, or metals, which differ in terms of how insurance costs are split between insurers and customers. Platinum plans, for example, have the highest premiums but the lowest costs for enrollees when they receive care, while Bronze plans have the lowest premiums but the highest costs for enrollees when they receive care ("The Health Plan Categories: Bronze, Silver, Gold & Platinum," n.d.).

Within the Health Insurance Marketplace, moreover, each state is divided into geographic rating areas. Rather than selling insurance on the state level, insurers sell insurance within rating areas. Therefore, each rating area is a unique market, and insurers can choose the particular rating areas for which they provide service. Rating areas, moreover, are an important feature of the Health Insurance Exchange, since they help to control how insurers set premiums. Insurers are not allowed to price discriminate within a rating area, so all individuals of a particular age and smoking status must be charged the same premium within the same rating area. Insurers, however, can price discriminate between rating areas. Therefore, individuals of the same age and smoking status living in different rating areas of the same state might be charged different premiums by the same insurer and might have access to different insurers. In some states, such as Florida, each county is its own rating area, while in other states, multiple counties comprise each rating area. In other words, it is up to the discretion of each state to determine how rating areas are designated ("Market Rating Reforms," n.d). For the purposes of this paper, the term "market" refers to each individual rating area, since each rating area functions as its own market.

I supplement the HIX Compare data with multiple datasets of County Population Data from the U.S. Census Bureau. These datasets include median age, median income, population counts for various age groups, total population, unemployment rates, and population percentages by educational attainment for each U.S. county in 2020. This set of variables is meant to control for market-level effects on insurer participation. For example, the median age in each rating area is included because insurers might be more inclined to enter markets with a younger, and thus healthier, population. ("County Population Totals", 2023).

2.2   Data Cleaning and Coding

Using Microsoft Excel, I combine HIX Compare public use files from 2014-2020 and clean the data to include only on-exchange, Silver plans for the thirty-six states that were present in the data for all seven years, which are identified in Figure 1. I further refine the data to include only the cheapest Silver plan offered by each insurer in each rating area using the premium for enrollees aged fifty. I compare each insurer's cheapest Silver plan, since Silver plans are the most popular type of insurance and are considered to be "middle of the road" ("Silver Health Plan," n.d). Therefore, my final dataset includes an entry for each insurer's cheapest Silver plan per rating area per year.
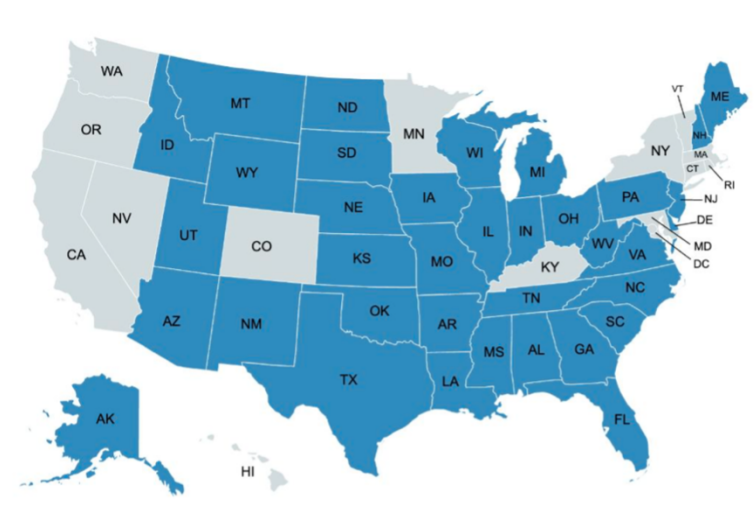
Figure 1: Map of States Included in Final Dataset.

Using the HIX Compare Rating Area to County Crosswalk and the Centers for Disease Control and Prevention and US Department of Health and Human Services' 2013 National Center for Health Statistics Urban-Rural Classification Scheme for Counties, I classify each rating area as either urban or rural. The Urban-Rural Classification Scheme for Counties designates each county in the US as one of six classifications: large central metro, large fringe metro, medium metro, small metro, micropolitan, and noncore. The first four classifications fall under the umbrella of "metropolitan," and the last two comprise "nonmetropolitan" (Ingram & Franco, 2014). Using the HIX Compare Rating Area to County Crosswalk, I determine the classification of each county in my dataset in order to classify entire rating areas as either urban or rural. I define all rating areas that include at least one metropolitan county as "urban" and rating areas comprised of only micropolitan and noncore counties as "rural." Based on this classification scheme, my dataset includes 339 urban rating areas and 71 rural rating areas.

The next set of classifications I make is for insurer type. I define each insurer as either For-Profit, For-Profit Medicaid-Managed Care, Consumer Operated and Oriented Plan (CO-OP), or Non-Profit. The CO-OP program was created to pro-

12

vide grants for non-profit organizations to establish private, competitive, consumer-controlled plans on the Individual and SHOP Health Insurance Marketplace. Originally, there were twenty-three CO-OPs operating in the marketplace in total. This number, however, dropped to just three in 2020 (Galewitz, 2020). After compiling a list of all insurers that participated in the Health Insurance Marketplace from 2014 to 2020 and conducting a basic internet search of each insurer, I have classified all insurers into one of the four categories. There were a total of 134 insurers operating in the Health Insurance Marketplace in the 36 states present in my dataset—27 For-Profits, 2 For-Profit Medicaid-Managed Care organizations, 13 CO-OPs, and 92 Non-Profits. Many of the Non-Profits, particularly Blue Cross Blue Shield organizations, operate within only one state. Thus, while the majority of insurers were Non-Profits, the ratio of Non-Profits to other insurers in each state marketplace is smaller than the raw figures suggest.

Using Python and the classifications I designated for rating area and insurer type, I create multiple new variables within my dataset. First, I add a categorical variable, Rating Area Type, which assigns a "1" to all urban rating areas and a "0" to all rural rating areas. Next, I create a categorical variable for insurer type in which For-Profit insurers receive a "1," For-Profit Medicaid-Managed Care insurers receive a "2," CO-OPs receive a 3, and Non-Profits receive a "4." I also include a variable, Market Years, which designates the total number of years a particular insurer was active in a particular market. Another new variable, called Insurer Competition, provides a count of the number of insurers active in each rating area each year.

Finally, I utilize Python to create two variables for insurer premium pricing in order to assess pricing at the rating area level: Premium Score and Lowest Premium. The variable Premium Score assigns the cheapest plan premium within each rating area a "1." All other plans are then assigned a score (by dividing the given premium

by the cheapest premium) that shows the price of the plan's premium relative to the cheapest premium within a rating area. Scores range from 1 to 2.92, which demonstrates that some plans were priced at almost three times the price of the cheapest plan within a given rating area. The second price variable, Lowest Premium, is a dummy categorical variable. T—the cheapest plan in each rating area receives a "1," and all other plans receive a "0." While the Premium variable from the HIX Compare data is included in my final dataset, the two pricing variables that I have created allow for a more nuanced examination of pricing within rating areas.

After establishing the main dataset, I use Python and R Studio to add market-control variables from the U.S. Census Bureau data. While most data is available on the county level, my dataset is divided by rating areas, and I therefore had to match the new variables to my existing data set by using Federal Information Processing Standard (FIPS) county codes. The HIX Compare Rating Area to County Crosswalk was not in a downloadable format, so I created a new crosswalk in CSV format. I merged the U.S. Census Bureau datasets together and matched them with the crosswalk in order to assign rating areas to each county. I then created new variables for rating area totals of each variable by using weighted averages based on population size for all variables that were averages or percentages, such as Median Age. Finally, I was able to merge these new variables with my main set of data. I initially attempted to include enrollment data from the Centers for Medicaid & Medicare Services (CMS) within my dataset as a market-control variable. However, because of many inconsistencies and missing values in the enrollment data, I was unable to match the CMS county-level enrollment data to my dataset. Figure 2 includes summary statistics for all numeric variables within the final dataset. The average Premium Score is 1.14, the average number of Market Years is just over 5, and the average Premium is 538. The average amount of Insurer Competition was 4 insurers per rating area, with a low of 1 and a high of 12.

Table 1: Summary Statistics

	Pop.	Age 15-44	Age 65+	Pop. %: Age 15-44	Pop. %: Age 65+	Median Age	Median Income	Premi.	Premi. Score	Insurer Comp.	Market Years
Mean	686,980	277,673	89,303	0.31	0.14	38.36	59,358	537.91	1.15	4.00	5.09
Std.	1,038,397	437,310	1,214,530	0.04	0.04	4.20	10,873	170.34	0.20	2.26	2.16
Min	8,365	3,210	880	0.20	0.06	24.60	32,701	228.07	1.00	1.00	1.00
25%	169,569	64,967	25,548	0.37	0.12	35.98	52,281	412.65	1.00	2.00	3.00
50%	351,810	134,058	50,144	0.39	0.14	38.27	58,530	491.36	1.07	4.00	6.00
75%	737,073	295,832	101,727	0.41	0.16	40.57	64,828	642.10	1.23	5.00	7.00
Max	8,791,894	3,487,435	1,859,933	0.55	0.43	62.70	116,029	1,440.40	2.92	12.00	7.00

Figure 2: Summary Statistics.

3 Thesis Results

3.1 Descriptive Analysis

In 2014 there were 1,131 unique insurer/rating area combinations and an average of 3 insurers per rating area. This number increased to 1,720 combinations in 2015 (an average of 4.2) and only slightly decreased to 1,481 combinations in 2016 (an average of 3.6 per rating area). As Figure 3 demonstrates, the market experienced a sizable decrease in insurer participation in 2017 and 2018, with the average number of insurers per rating area dropping to 2.3 and 1.9, respectively. Since 2018, the numbers have steadily increased to an average of 2.5 insurers per rating area in 2020.
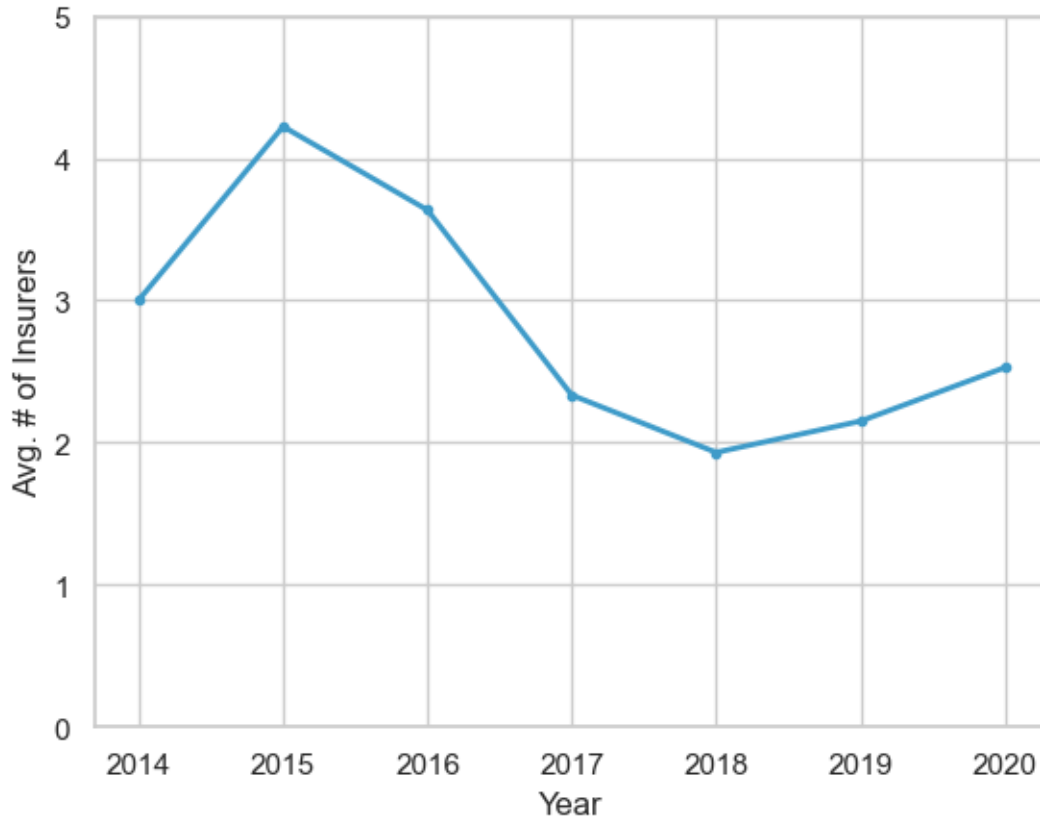
Figure 3: Average Number of Insurers Per Rating Area Per Year.

To explain the exodus of insurers from the market in 2017, I compare trends between urban and rural rating areas to assess if insurers were exiting more heavily from rural markets where it can be challenging to provide affordable health insurance (Newkirk & Damico, 2014). Figure 4 plots the average number of insurers per urban and rural rating areas each year and shows that both rating area types had similar trends in insurer participation. While urban rating areas had approximately one more insurer on average than their rural counterparts, both groups experienced a similar decline in 2017 and a steady recovery after 2018. These findings indicate that many insurers left both urban and rural markets in 2017 and 2018 and that this variable likely does not explain the decrease in insurer participation during this period.
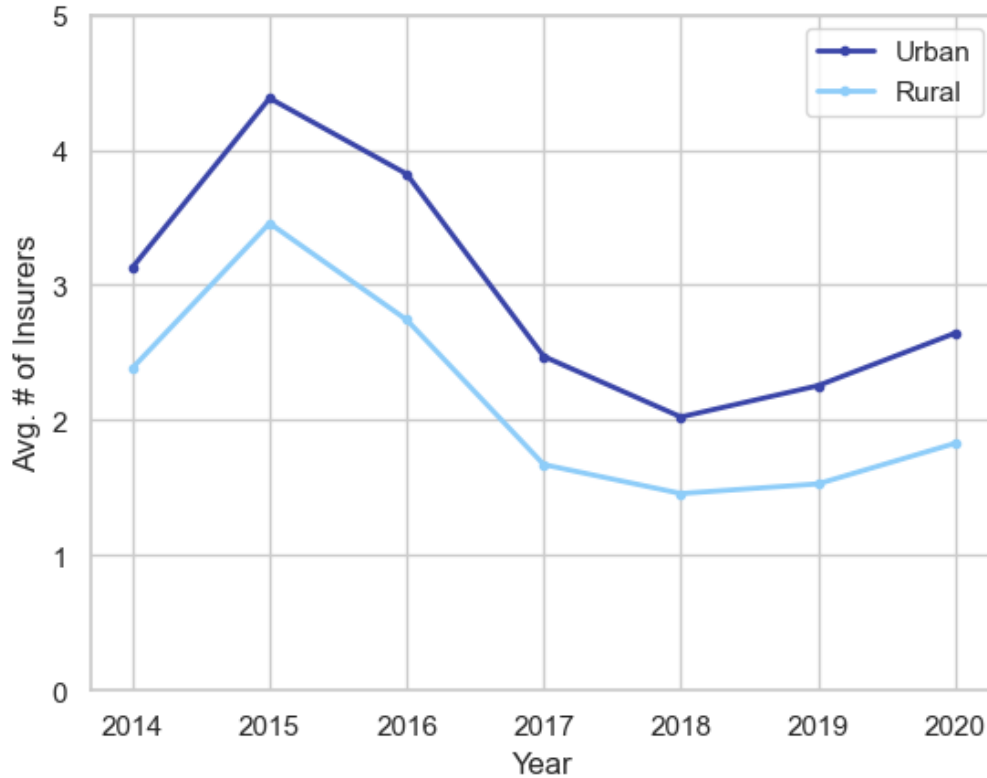
Figure 4: Average Number of Insurers Per Rating Area Per Year by Rating Area Type.

Next, I examine the trend of market participation by insurer type. Figure 5 shows that Non-Profit insurers maintained a steady presence in the market from 2014 to 2020 with an average of 1.52-1.8 insurers per rating area per year. The average number of For-Profit Medicaid-Managed Care insurers also remained stable at around 0.4 until 2020, when the average increased to 0.9. CO-OP and For-Profit insurer participation, however, dramatically declined in 2017. In 2014 there was an average of 0.8 CO-OPs per rating area, but by 2017 this number fell to 0.19. Finally, there were a total of 876 For-Profit insurer/rating area combinations in 2015 with an average of 2.27 per rating area, but only 259 remained in 2017, resulting in an average of 0.6 per rating area. While the rating area type variable likely does not explain the decline in insurer participation in 2017, Figure 5 indicates that insurer type likely played a role.
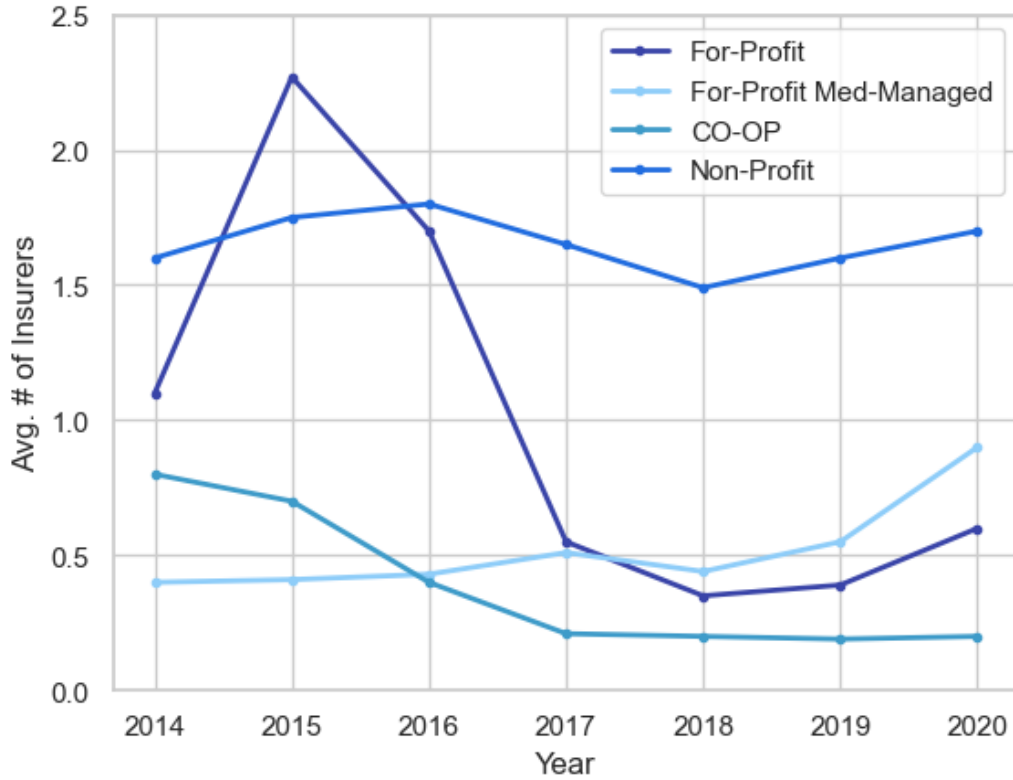
Figure 5: Average Number of Insurers Per Rating Area Per Year by Insurer Type

Figure 6 and Figure 7 further examine the trend of insurer exit from the market in 2017 based on insurer type. Figure 6 displays two pie charts of market participation in 2017 by insurer type—one chart for insurers that were active in 2017 and one for those that were absent from the market. These charts demonstrate that in 2017, 22% of For-Profit insurers, 53% of For-Profit Med-Managed insurers, 20% of CO-OP insurers, and 66% of Non-Profit insurers were present in the market. Similarly, in 2018, 75.1% of insurers active in the market were Non-Profits and only 17% were For-Profits. Therefore, Non-Profits had the highest percentage of insurers active in 2017 and 2018, while For-Profits and CO-OPs had the lowest.
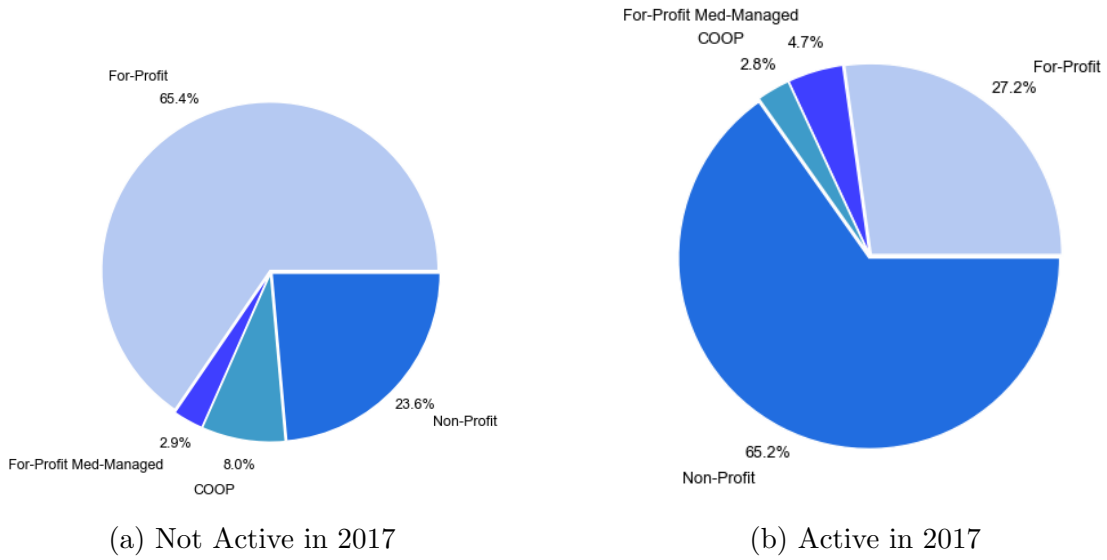
(a) Not Active in 2017

(b) Active in 2017

Figure 6: Market Participation in 2017 by Insurer Type

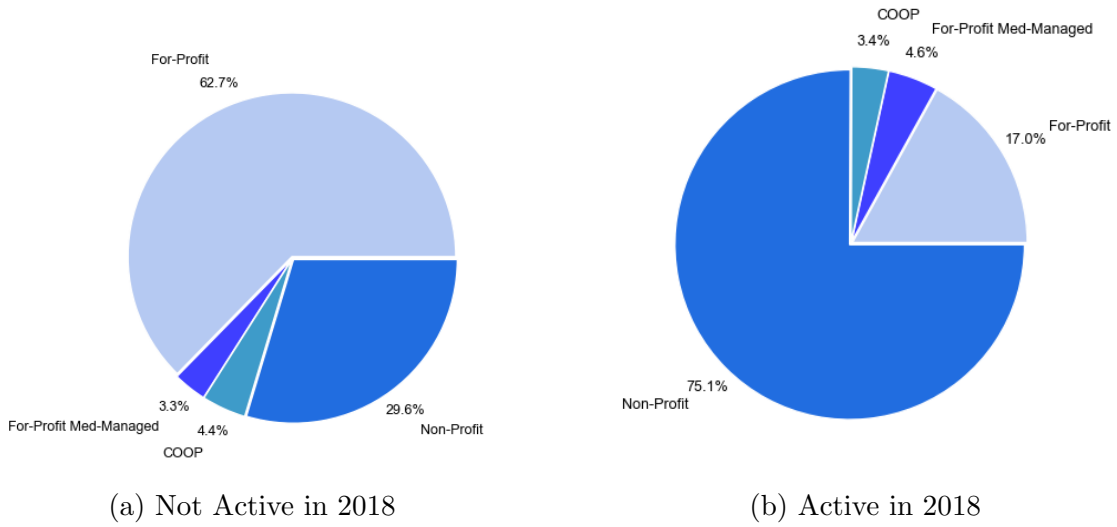(a) Not Active in 2018

(b) Active in 2018

Figure 7: Market Participation in 2018 by Insurer Type

Figure 8 examines the same trend by isolating insurers that were present in (a) 2014, 2015, and 2016 and (b) 2014, 2015, 2016, and 2017. 30% of For-Profit insurers, 0% of For-Profit Med-Managed insurers, 39% of CO-OPs, and 23% of Non-Profit insurers that were in the market for the first three years left after 2016. Figure 8(b) displays the same trend with even starker results. 88% of Non-Profit insurers active in 2014, 2015, 2016, and 2017 remained active in 2018 while only 50% of

For-Profits were active in 2018. Based on these graphs, it is clear that a larger portion of For-Profit insurers left the market in 2016 than Non-Profit and For-Profit Medicaid-Managed Care organizations.
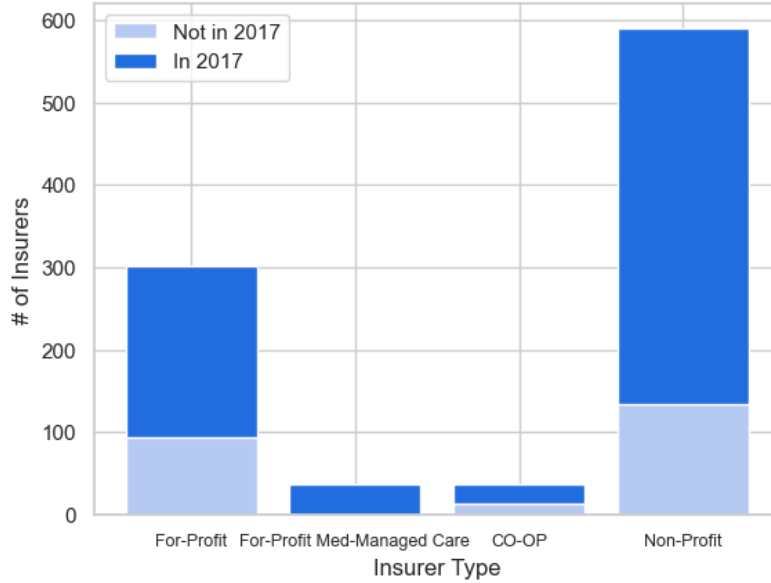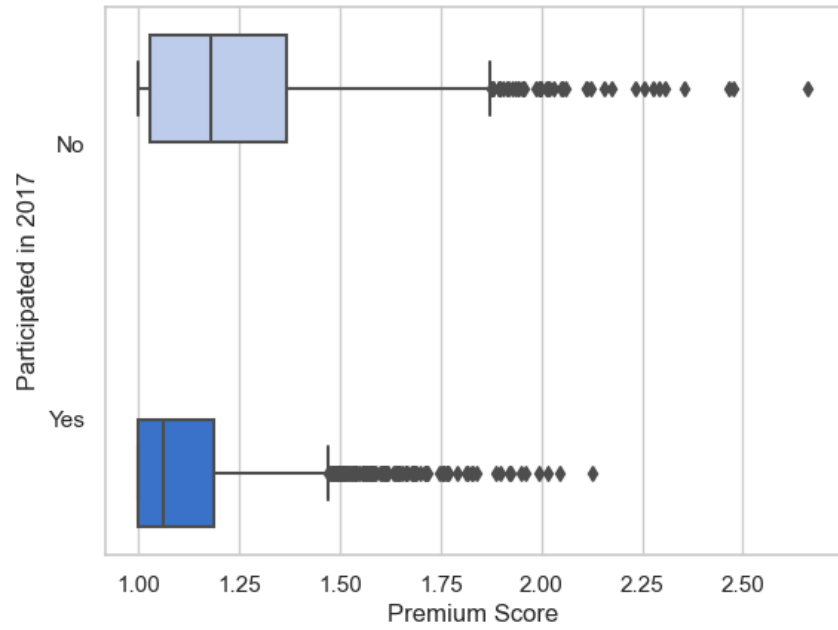

(a) 2017
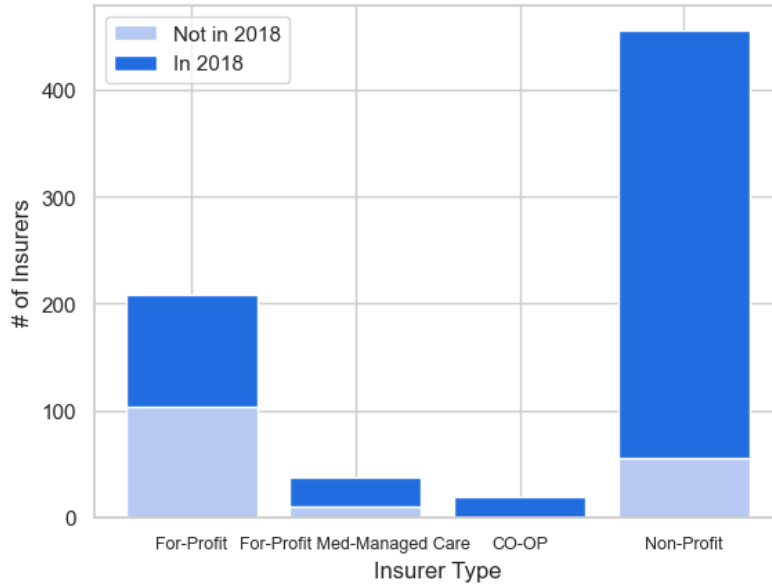
(b) 2018

Figure 8: Participation in 2017/2018 by Insurer Type out of Insurers Present in all Previous Years

In addition to insurer type, the data also shows that premium pricing likely influenced insurer exit from the market in 2017. Figure 9 displays two boxplots of the distribution of insurer premium scores grouped by whether they were active in the market in 2017 and 2018. These boxplots demonstrate that there was a larger distribution of premium scores for insurers that were out of the market in 2017 and 2018 compared to insurers that were still active in 2017 and 2018. Figure 9 (a) shows that among insurers absent in 2017, the median premium score is around 1.1875, the maximum premium score is around 1.875, and outlier premium scores are as high as almost 2.75. The box for insurers present in 2017 is much smaller with a median of approximately 1.0625, a maximum of approximately 1.3125, and the highest outlier at close to 2.05. Figure 9 (b) demonstrates a similar pattern, but the distribution of rate scores among insurers present in 2018 is even smaller with a median of close to 1. These distributions suggest that insurers that had relatively lower premiums in early years tended to remain in the market in 2017 and 2018, although the outliers suggest that some insurers who priced high in the early years were also still active in 2017 and 2018.
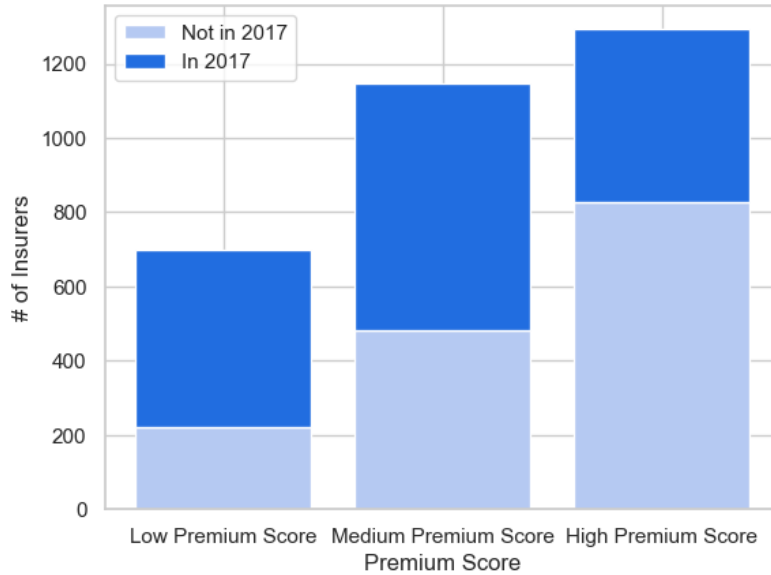
(a) 2017
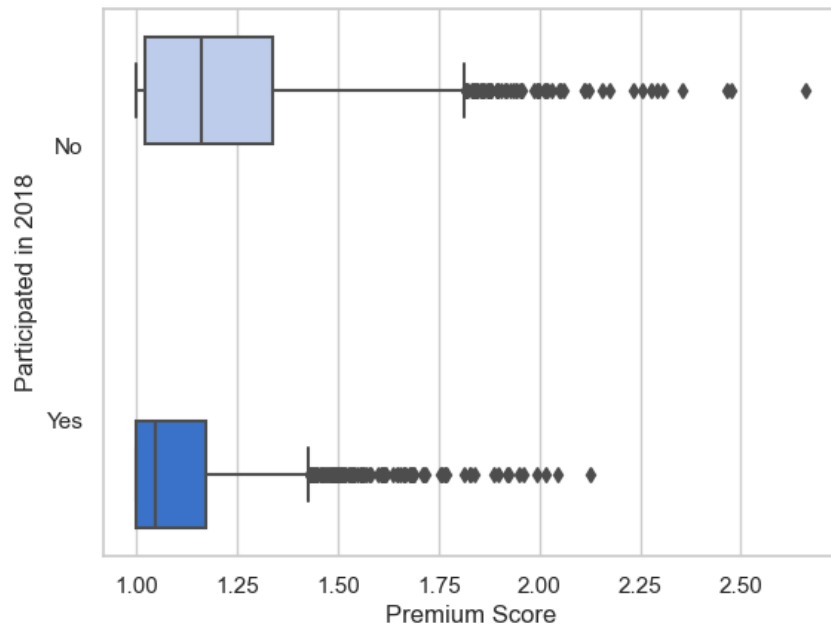
(b) 2018

Figure 9: Premium Score Distribution in Previous Years by Market Participation in 2017 and 2018

Figure 10 illustrates the breakdown of insurers active in the market in 2017 and 2018 by premium the in the previous years using the variable Premium Score. For the purpose of these graphs, Premium Score is grouped as low (less than 1.06),

medium (between 1.06 and 1.23), and high (greater than 1.23). Both Figures 10 (a) and (b) demonstrate that as premium score increases, the percentage of insurers still active in the market in 2017 and 2018 decreases. 68% of insurers who had a "low" Premium Score in 2014, 2015, or 2016 were still active in the market in 2017, whereas only 36% of those who had a "high" premium score remained in the market. Similarly, 60% of insurers with "low" Premium Scores in 2014, 2015, 2016, or 2017 remained in the market in 2018, and only 30% of insurers with "high" Premium Sores were still active in 2018. Moreover, in both graphs "medium" rate scores fall in between 58% still active in 2017 and 48% still active in 2018.

(a) 2017
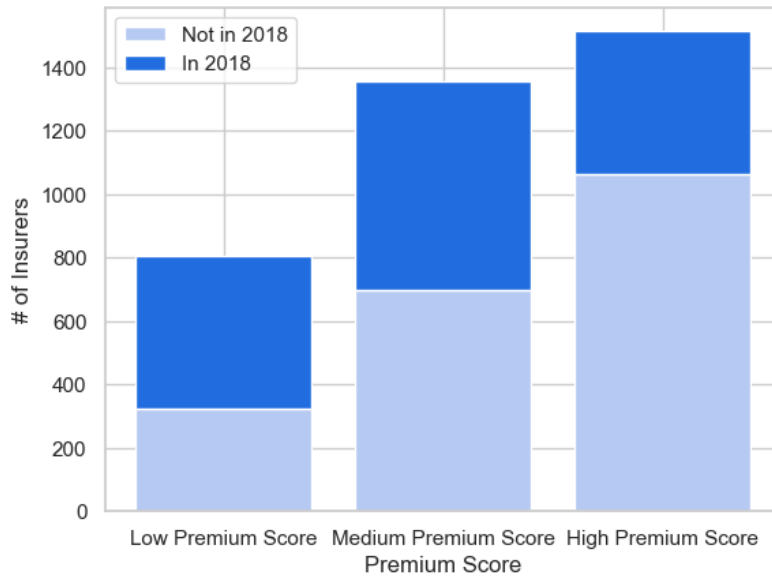
(b) 2018

Figure 10: Participation in 2017/2018 By Premium Score in Previous Years

Figure 11 shows that the average premium in the market substantially increased in 2017 and decreased after 2018. However, this graph also demonstrates that the average premium increased more in 2018 among insurers with the Lowest Premium in a rating area, since many of these insurers had a monopoly in the market in 2018. These insurers thus had the Lowest Premium by default, even if it was higher

than premiums in other rating areas not classified as being the Lowest Premium. Moreover, the average premium among these insurers did not decrease at the same rate in 2018 as the average for all insurers.
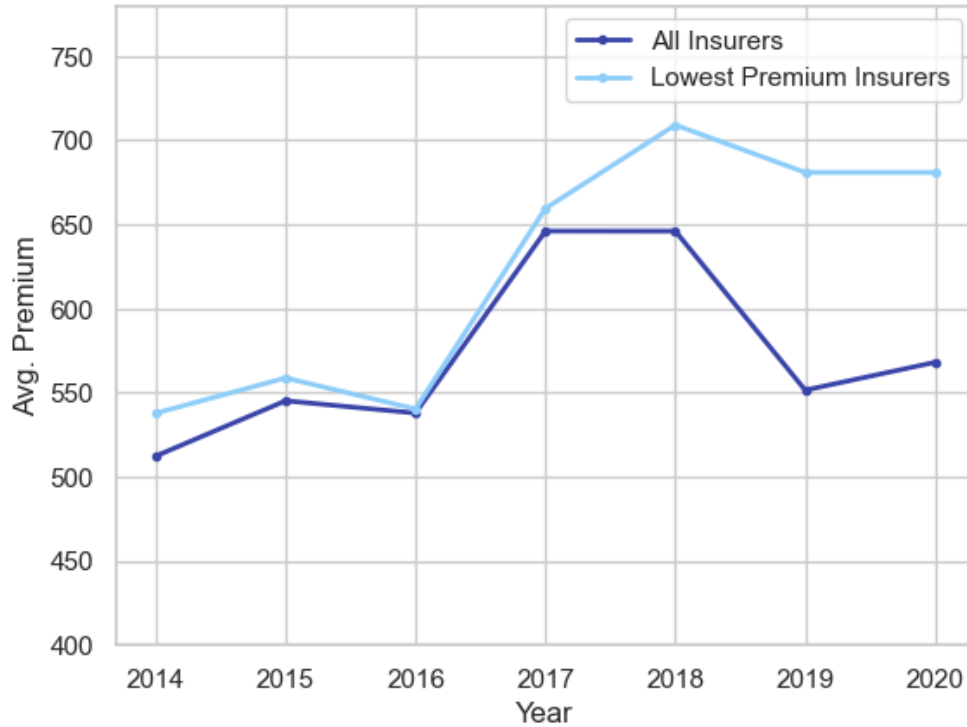
Figure 11: Average Premium by Year.

Finally, Figure 12 displays the distribution of *Premium Score* by insurer type. This graph shows that Non-Profits tended to have low premium scores, since the box for this group has a median of close to 1 and a maximum of around 1.75. The distribution of *Premium Score* is most spread out for For-Profits insurers, which has the highest median premium score; a substantially higher maximum at 1.75; and an outlier as high as almost 2.5. For-Profit Medicaid-Managed and CO-OP insurers had similar premium score distributions, with most insurers having a premium score between 1 and 1.313.
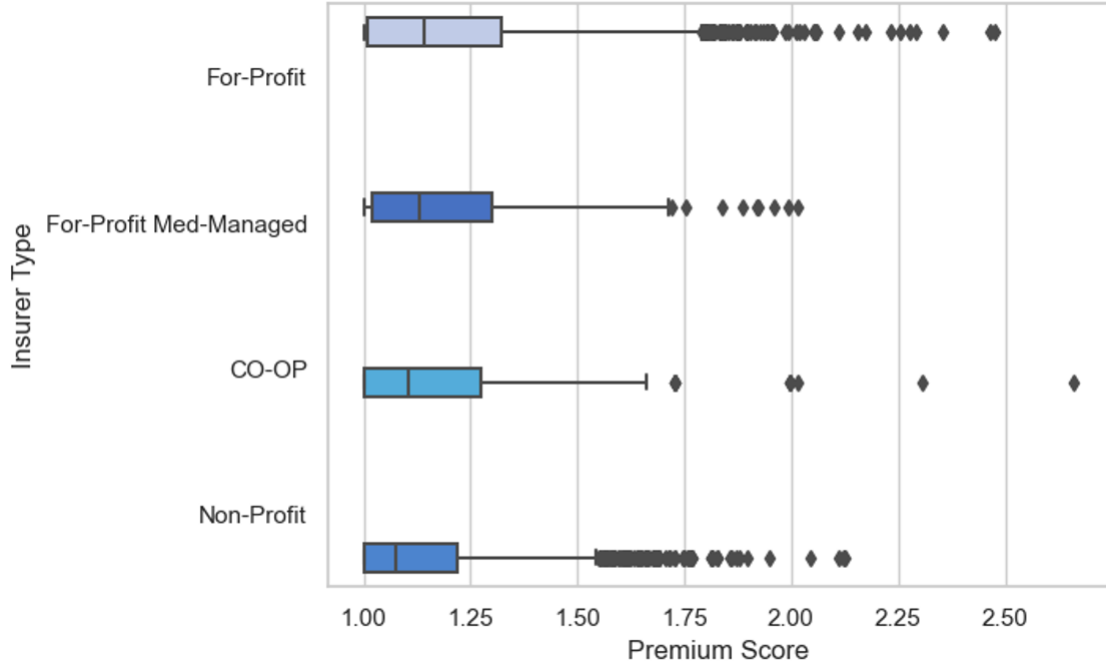
Figure 12: Premium Score Distribution by Insurer Type

3.2 Analytic Models

Logistic Regression:

$ln\frac{p(y)}{1-p(y)} = \beta_0 + \beta_1 InsurerType + \beta_2 LowestPremium + \beta_3 Urban + \beta_4 InsurerCompetition + \beta_5 RatingAreaDemographics$

Linear Regression:

$y = \beta_0 + \beta_1 PremiumScore + \beta_2 InsurerCompetition + \beta_3 RatingAreaDemographics$

I use two logistic and two linear models to estimate the effects of premium pricing and insurer type on market participation in 2017 and 2018. Logistic Regressions 1 and 2 are binary logit models that predict the probability of an event occurring—in this case, the probability of an insurer participating in the market in 2017/2018—based on the given data. The dependent variable in the first logistic regression is In 2017, which is a categorical variable for which insurers receive either

a "0" if they were not in the market in 2017 or a "1" if they were. The second regression uses the dependent variable In 2018, which assesses market participation in 2018 instead of 2017.

The dependent variables are regressed on seven-nine parameters that were deemed significant through previous logistic testing with all study variables, and I have removed all insignificant variables from the final models. I have created dummy variables for the categorical variable Insurer Type for these models, in which each insurer type has its own variable. For-Profit insurers, for example, have a value of "1" for the For-Profit variable and a value of "0" for the CO-OP, For-Profit Medicaid-Managed Care, and Non-Profit variables. The variable Urban captures rating area type. Insurers in all urban rating areas receive a value of "1," and those in rural markets have a value of "0." The remaining variables—Insurer Competition, and Rating Area Demographics (composed of the variables Age 15-44, Age 65+, and Population)—are all control variables. Both logistic regressions estimate the best fit of the log-odds for each parameter. To simplify the interpretation of the regressions results, I have also included the Odds-Ratios for each model, which can be interpreted as the probability of an event occurring for a certain group compared to those not in the group.

I ran two linear regressions using the continuous-variable Market Years as the dependent variable to estimate further the effects of premium pricing on market participation. Linear Regressions 1 and 2 do not specifically look at insurer participation in the market in 2017 and 2018, since Market Years only captures the total number of years an insurer was active in the market—which may or may not include 2017 and/or 2018. These models also do not include rating area type or insurer type variables, because these variables are all categorical and cannot be included in a linear regression. However, both regressions do estimate the effects of premium pricing—using the Premium Score variable—on total market participa-

tion. The first Linear Regression includes all continuous variables, and the second includes only those that were statistically significant.

Table 2: Logistic Regression Results

	Dependent Variable	
	In 2017	In 2018
	(1)	(2)
Non-Profit	1.740***	2.504***
	(0.388)	(0.070)
CO-OP	0.147	2.859***
	(0.068)	(0.190)
For-Profit Medicaid-Managed	5.669***	1.250***
	(1.006)	(0.144)
Lowest Premium	0.397***	-
	(0.777)	-
Urban	0.315***	0.482***
	(0.09)	(0.073)
Insurer Competition	-0.171***	0.310***
	(0.016)	(0.017)
Age 65+	-8.935e—06***	-
	(2.31e—06)	-
Age 15-44	-1.421e—05***	-6.6022e—06***
	(2.57e—06)	(1.13e—06)
Population	6.992e—06***	6.992e—06***
	(1.31e—06)	(4.8e—07)
Constant	0.387	-0.238***
	(0.388)	(0.083)

Standard Error in Parentheses

*$p < 0.1$ **$p < 0.05$ ***$p < 0.01$

Figure 13: Logistic Regression Results

Table 3: Logistic Regression 1 Odds-Ratios

	Odds-Ratio	2.5%	97.5%
Non-Profit	5.699	4.991	6.508
For-Profit Medicaid-Managed	289.673	40.32	2080.616
CO-OP	1.059	0.795	1.412
Lowest Premium	1.488	1.281	1.731
Urban	1.371	1.129	1.31
Insurer Competition	0.843	0.817	0.871
Age 65+	1.000	1.000	1.000
Age 15-44	1.000	1.000	1.000
Population	1.000	1.000	1.000
Constant	1.472	0.687	3.151

(a) Logistic Regression 1

Table 4: Logistic Regression 2 Odds-Ratios

	Odds-Ratio	2.5%	97.5%
Non-Profit	12.232	5.006	6.526
For-Profit Medicaid-Managed	17.441	40.643	2095.774
CO-OP	3.491	0.802	1.424
Lowest Premium	1.19	1.279	1.728
Insurer Competition	0.734	0.818	0.871
Age 15-44	1.000	1.000	1.000
Population	1.000	1.000	1.000
Constant	0.788	0.793	1.220

(b) Logistic Regression 2

Figure 14: Logistic Regression Odds-Ratios

The results of Logistic Regression 1 support the findings of my descriptive analysis. The Odds-Ratios for Non-Profit, CO-OP, and For-Profit Medicaid-Managed Care insurers compare the odds of participating in the market in 2017 for each of these insurer types compared to For-Profit insurers. Odds-Ratios of 5.7 and 291.9

for the Non-Profit and For-Profit Medicaid-Managed Care variables, respectively, mean that both types of insurers have higher odds of being active in the market in 2017 than For-Profit insurers. It is important to note, however, the large confidence interval for the For-Profit Medicaid-Managed Care variable. While the Odds-Ratio demonstrates that For-Profit Medicaid-Managed Care insurers had higher odds of market participation in 2017 than For-Profit insurers, due to the low sample size of this insurer type, the model may be overestimating the Odds-Ratio. An Odds-Ratio of 1.07 for CO-OP demonstrates that these insurers had about the same odds of participating in the market in 2017 as For-Profit insurers. Moreover, the Odds-Ratio for Lowest Premium is 1.49, which means that insurers who priced the lowest in their rating area had higher odds of participating in the market in 2017 than those who did not have the lowest premium. Surprisingly, the Odds-Ratio of 1.37 for the variable Urban indicates that insurers in urban rating areas had higher odds of participating in the market in 2017 than those in rural rating areas. The Odds-Ratio of 0.84 for Insurer Competition shows that the challenge of more competition from other insurers lowered an insurer's odds of participating in the market in 2017. The last three variables—Age 65+, Age 15-44, and Population—all had Odds-Ratios of 1, which indicates that they did not affect an insurer's odds of remaining in the market.

Logistic Regression 2 has similar results to Logistic Regression 1 for the Non-Profit, For-Profit Medicaid-Managed Care, Lowest Premium, Insurer Competition, Age 15-44, and Population parameters. The Odds-Ratio for Premium Score, 1.6, is even higher in Logistic Regression 2, which demonstrates that insurers who priced the lowest in a rating area had even higher odds of participating in the market in 2018, as compared to 2017. The Odds-Ratio for Non-Profit is also significantly higher in this model. Unlike the first regression in which CO-OP had an Odds-Ratio of close to 1, the Odds-Ratio in this regression is 3.5. Therefore, CO-OPs

were over three times as likely as For-Profits to be active in the market in 2018. The variables Urban and Age 65+ are not included in this model because they were not statistically significant.

Table 5: Linear Regression Results

	(1)	(2)
Premium Score	-2.237***	-2.237***
	(0.146)	(0.146)
Insurer Competition	-0.142***	-0.142***
	(0.015)	(0.015)
Median Age	-0.031***	-0.031***
	(0.008)	(0.008)
Age 15-44	-0.000***	-
	(0.000)	-
Age 65+	-0.000***	-
	(0.000)	-
Population	0.000***	-
	(0.000)	-
Constant	9.334***	-
	(0.410)	-

Standard Error in Parentheses

$*p < 0.1$ $**p < 0.05$ $***p < 0.01$

Figure 15: Linear Regression Results

The results of both linear regressions further support the results of both logistic regressions. Premium Score has a coefficient of -2.211 in Linear Regression 1 and a coefficient of -2.206 in Linear Regression 2. The interpretation of these coefficients is that a one-point increase in Premium Score results in a two-point decrease in

Market Years, a result which supports the conclusion that insurers that priced low stayed in the market for longer than those who priced high. Similar to Logistic Regression 1 and 2, the coefficient for Insurer Competition is negative, which shows that an increase in competition is correlated with a decrease in the number of years in which an insurer is active.

4 Conclusion and Discussion

4.1 Conclusions

Based on the results of this study, I conclude that the Health Insurance Marketplace between 2014 and 2020 conforms to an "invest and harvest" model. Most insurers priced their plans too low in the early years of the ACA; however, the Risk-Adjustment, Risk-Corridor, and Reinsurance programs helped keep many afloat. After the large exodus of insurers in 2017, many insurers that had priced their plans the lowest in the first few years became monopolies between 2017 and 2018. During this period, they were able to increase their premiums and benefit from reduced market competition. As both logistic regressions demonstrate, insurers that had the lowest premium within a rating area were 1.5-1.7 times more likely than other insurers to remain in the market in 2017 and 2018. As Figure 8 demonstrates, in addition, insurers present in 2017 and 2018 tended to have relatively lower premiums in 2014, 2015, and 2016.

Moreover, the results demonstrate that For-Profit and CO-OP insurers were the most likely insurer type to leave the market between 2017 and 2018. It has been well established that CO-OPs were largely unsuccessful in the Health Insurance Marketplace, since many were unable to compete with larger and more recognized insurers. CO-OPS also often had low enrollment figures that did not merit the over-head costs necessary to keep them in business. Granted, the performance of

For-Profit insurers compared to other insurer types has not received attention in the existing literature on this topic. Therefore, there might be many explanations as to why they left many rating areas in 2017 and 2018. First, as the name entails, For-Profit insurers aim to make a profit, while Non-Profit insurers do not aim to make a profit. Therefore, in 2016 when the risk-corridor and reinsurance programs ended, For-Profits might have no longer considered some rating areas to be profitable markets and subsequently left. Second, For-Profit insurers often did not have the cheapest premiums in their rating areas and might have had lower enrollment in the early years, leading them to exit the market in 2017.

4.2   Limitations

One limitation of this study is the fact that my analysis did not include data on enrollment figures, insurer profits, and market concentration. I was unable to locate data on profits or market concentration; and, as I stated above, I was unable to utilize publicly available data on enrollment figures. Controlling for these three variables in my analysis would have allowed me to isolate more precisely the effects of premiums and insurer type on market participation in 2017 and 2018. Moreover, profit and enrollment figures could also help to explain why For-Profit insurers left so many rating areas in 2017 and 2018.

Another limitation of this study is that it did not include all states. HIX Compare only had data in 2014 for states in which the Health Insurance Marketplace was facilitated by the federal government. Therefore, my analysis does not include the thirteen states and the District of Columbia that ran their own marketplaces in 2014. The missing states, moreover, are majority Democrat-controlled and have been enthusiastic about the ACA and expanding health insurance coverage. Finally, my analysis can only demonstrate correlations, and not causation, between my variables of interest and market participation in 2017 and 2018. Although I have

attempted to control for market effects, there are likely many reasons for insurer exit from the market that I was unable to control for.

4.3 Discussion

To my knowledge, this is the only study so far that has examined insurer exit from the Health Insurance Marketplace in 2017 and 2018 based on premiums and insurer type. It is also the first study to find evidence for the presence of the "invest and harvest" strategy in this market. The Health Insurance Marketplace has significantly stabilized since 2018; and according to CMS, over 92% of enrollees had three or more insurers to choose from when selecting a plan in their rating area this year ("Nearly 16 Million People", 2023). The market also has become more competitive, and consumers on average have more options now than they did in 2017 and 2018.

Nevertheless, the market has not yet reached the peak it experienced in 2015 in terms of choice for consumers; therefore, there is still much room for improvement in this market, as this paper demonstrates. First, the results of this study indicate that more can be done to encourage For-Profit participation in the Health Insurance Marketplace. As many Non-Profit insurers operate on a state or regional level, the entrance of large For-Profit insurers to rating areas across the nation could help to increase competition and choice for consumers. As Dafney et. al, 2015 found, for example, the second cheapest Silver premium offered by each insurer on average would have been 5.4% lower if UnitedHealthcare had participated in the Health Insurance Marketplace in 2014.

Second, evidence of the "invest and harvest" strategy influencing success in this market has important implications for future policies to help stabilize insurance markets. While the government is extremely concerned with keeping prices low in insurance markets, this study suggests that active purchasing policies by the govern-

ment could help to keep insurers from pricing their plans too low. Researchers from Harvard University and the University of California Los Angeles examined active purchasing policies employed by the government in Massachusetts for the Health Insurance Marketplace. They found that over 80% of prices in the market between 2010 and 2013 were within 1% of the pricing limits set by the policies (Shepard & Forsgren, 2022). Using policies similar to those employed in Massachusetts, governments could impose price floors, in additions to price caps, for premiums to ensure that plans are not priced so low that they allow insurers to drive others out of the market. Moreover, a price floor could be added to the criteria for subsidies given in some states for silver plans with premiums that fall below a certain level to encourage insurers to avoid pricing their plans too low in order to increase their enrollment. Although the "invest and harvest" strategy might have priced some insurers out of the market, the premium increases made by many insurers in the years following 2018 have opened room for new insurers to enter the market and lower prices. It is important, however, that policies are implemented in the future to keep prices in a healthy range, so that they are sustainable for insurers and affordable for consumers.

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