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INSURERS' RESPONSE TO SELECTION RISK: EVIDENCE FROM MEDICARE ENROLLMENT REFORMS

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ABSTRACT

Evidence on insurers behavior in environments with both risk selection and market power is largely missing. We fill this gap by providing one of the first empirical accounts of how insurers adjust plan features when faced with potential changes in selection. Our strategy exploits a 2012 reform allowing Medicare enrollees to switch to 5-star contracts at anytime. This policy increased enrollment into 5-star contracts, but without risk selection worsening. Our findings show that this is due to 5-star plans lowering both premiums and generosity, thus becoming more appealing for most beneficiaries, but less so for those in worse health conditions.

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The behavior of insurers is a crucial component of the functioning of any insurance market. Understanding such behavior is thus key to evaluate reforms like the creation of the healthcare marketplaces under the Patient Protection and Affordable Care Act (ACA) and the growingly privatized provision of Medicare throughout the Part C and Part D programs.[1] The question of how competition works in environments with potential risk selection (either advantageous or adverse) is, however, still unsettled from a theoretical perspective and there is still much to be learned on the complex interaction between market power and selection.

More specifically, nearly all the burgeoning literature on selection markets focuses on pricing distortions while abstracting from how selection affects the broader set of characteristics of the contracts offered. This fact, stressed, for instance, by the influential assessment of the existing literature by Einav, Finkelstein and Levin (2010), has spurred a lively theoretical debate,[2] but still very few empirical results.[3] This paper contributes to this emerging literature by providing one of the first empirical accounts of how insurers adjust plan features when faced with a potential change in selection. Evidence on this type of behavior is hard to collect because it is rare to observe changes in selection risk within a market. Furthermore, even when selection risk changes for a subset of plans, it is often impossible to consider the remaining plans as a valid comparison group since the equilibrium in the whole market is affected. Our analysis overcomes this difficulty by exploiting the combined effects of a Medicare reform that altered the potential selection risk of the highest quality (5-star) Part C and D plans and the geographical dispersion of such plans over the US territory. This allows us to separately observe treated and control geographical markets both before and after this policy change, thus allowing a differences-in-differences approach. Our main finding is that the policy triggered a response by insurers that involved not only changing premiums, but also adjusting generosity of coverage. This made 5-star more appealing for

[1] Part C, also known as Medicare Advantage, is a substitute for the traditional Medicare services (i.e., Part A covering in-hospital services and Part B covering physicians, surgeons and other outpatient hospital services. Part D is a program offering prescription drug insurance. See the following section for more institutional details.

[2] See, for instance, the different takes of three recent theoretical works: Mahoney and Weyl (2014), Azevedo and Gottlieb (2015), Shourideh et al. (2015) and Veiga and Weyl (2016).

[3] An exception is, for instance, the work of Carey (2016) analyzing how the benefit design of Part D plans exploits the inability of the government payment formula to correctly associate diagnosis-specific payments with their costs for insurers.

most beneficiaries, but less so for those in worse health conditions.

The starting point of our analysis is a Medicare reform changing the open enrollment period for a subset of plans. As in most insurance markets, beneficiaries select their Part C or D plan for coverage year t during a window of time in the fall of year $t-1$. However, starting with the enrollment year 2012, a reform allowed enrollees to switch to 5-star Part C or D plans at any point during the year. Despite the official motivation for this reform (known as "5-star Special Enrollment Period" or "5-star SEP") was to foster enrollment into high quality plans, the reform exposes 5-star plans to an evident selection risk: enrollees could initially select cheap plans and then move to expensive 5-star plans with generous coverage only after being hit by health shocks. The selection risk associated with within-year plan changes is different from the typical selection problem studied in the existing Medicare literature involving choices made in the open enrollment period and is potentially more severe as people select plans after fully learning their health status. This is indeed the logic behind the penalties for waiting beyond age 65 to join Part D and Medigap, for the individual mandate in the ACA and for insurers's resistance to expand the set of "qualifying life events" allowing plan changes.[4] Moreover, institutional remedies for selection that exist in both privatized Medicare and the ACA exchanges, like premium risk adjustment, are currently not arranged to deal with selection originating from within-year plan changes.

To study the impact of this reform, we exploit the heterogenous presence of 5-star plans in the market. Due to regulatory reasons, the US territory is segmented into geographically separated markets both for Part C - where insurers offer plans at the county level - and for Part D - where insurers offer plans at regional level. Since not all geographical markets have 5-star plans, some markets were affected by the reform while others were not. Our empirical strategy exploits this difference, together with the robustness to manipulations of the star rating in the first two years after the policy change, to identify the causal effect of the policy on various features of the plans supplied.

In a complementary paper, Decarolis, Guglielmo and Luscombe (2016) we quantify

[4]In theACA exchanges, for instance, these events include marriage, release from prison, and childbirth. The inclusion of pregnancy, however, is currently at the center of a lively policy debate, see *The New Yorker* March 17, 2015 article "The Cost of Insuring Pregnant Women."

whether and to what extent the 5-star SEP affected demand for 5 star plans. The three main findings are that: *(i)* consumers move to 5-star plans during the year, relative to comparable plans: for Part C plans, the 5-star SEP is associated with a positive and significant increase in the within-year change in enrollment ranging from 7 percent to 16 percent of the contract enrollment base;[5] (ii) there is no evidence in the data supporting a more sophisticated response that would entail exiting 5-star plans during the open enrollment period and rejoining them during the year when hit by a health shock; (iii) for both Part C and D risk score measures, we find clear evidence that the 5-star plans risk pool did not worsen in response to the policy.

Building on these demand-side results from Decarolis, Guglielmo and Luscombe (2016), this paper explores the mechanisms through which this happened, emphasizing the role of insurers behavior. We begin by describing how two large insurers offering 5-star plans, Kaiser and Humana, modified features of the plans offered in terms of both premiums and coverage generosity. Motivated by this descriptive evidence, we then address the issue of causally estimating the effects of the 5-star SEP on plan features. The methodology that we use is a quantile-based difference-in-differences analysis in the spirit of Chetverikov, Larsen and Palmer (2015). Relative to the first part of our analysis, this second part differs in terms of the unit of analysis: instead of looking at 5-star plans, here we analyze distributional changes in the whole market. Thus, we are able to assess how the distribution of premiums and generosity in the treated geographical markets changes in response to the 5-star SEP relative to control markets.

We find a tendency for premiums to increase in the medium-low end of the premium distribution and to decrease in the medium-high end of the distribution, where 5-star plans are located. Similarly, plan generosity - measured, for instance, via the Part C maximum out of pocket (MOOP) - remains unchanged for plans in the high end of the MOOP distribution, but tends to worsen for plans at the low and medium end of the distribution. Since 5-star plans are among those with low MOOP, this result implies a worsening of their generosity. We find the same result when looking at the Part C plan out of pocket cost (OOPC) of

[5]As explained below, within-year change in enrollment is measured as the difference between the enrollment in December and in January of the same year.

enrollees in poor health. For enrollees in excellent health, instead, the 5-star SEP does not cause changes at any quintile of the Part C OOPC distribution. Interestingly, we observe that among the coverage generosity measures, the only one for which 5-star plans improve relative to competing plans is the deductible. Given the importance of the Part D deductible for beneficiaries switching to 5-star plans during the year, we argue that this is consistent with a strategic response by insurers. We use the same empirical strategy to study the soft quality measures behind the star rating and show that 5-star plans do not worsen on those. Overall, we conclude that the insurers response entailed making 5-star plans more appealing than competing plans for most consumers (by lowering premiums and deductibles), but less so for the less healthy enrollees (by worsening generosity for enrollees in poor health).

Finally, to better understand the interaction between competition and the effects of the 5-star SEP, we repeat the analysis separately for markets where there is a monopolist insurer for 5-star plans and for markets where there is competition (duopoly) in the supply of 5-star plans. The most interesting result is that competition among 5-star insurers seems to exacerbate the extent to which these insures try to cream skim the market by worsening their plan generosity. Consumers in duopoly markets are more likely to be negatively affected by the 5-star SEP: while the premium changes in the two cases are similar, the increase in the OOPC for poor health enrollees is about twice in duopoly relative to monopoly markets.

From a policy perspective, our results offer several contributions. First, they are one of the first comprehensive assessments of a complex, but little analyze piece of regulation. The adoption of the 5-star SEP to boost 5-star plans enrollment was a risky choice from an ex ante perspective due to its potential to trigger substantial shifts in plan risk pools. It is therefore of great policy relevance to document both what it produced and what this implies for other possible policy reforms. Regarding the latter, our main insight is that insurers have the ability to design plan features even in the context of the tightly regulated Medicare market by changing not only easily observable features - like premiums - that a regulator can target, but also harder to measure financial generosity measures and soft quality features. Clearly, while the sophisticated reaction by insurers served to make the 5-star SEP reform successful in terms of improving 5-star plans enrollment without worsening their selection,

it also underscores the complexity of designing rules capable of steering the market toward the goals set by the regulator. Indeed, even for the 5-star SEP, the different effect that we estimate for enrollees in different health status highlights a drawback of this policy and, more generally a difficulty of relying on competition in selection markets. Thus, emending the risk adjustment mechanism to a more real time measure of enrollees' cost is a crucial step toward the proper functioning of privatized Medicare, as well as for the ACA exchanges.

Related literature - This study contributes to different strands of the literature on health insurance, especially within the context of privatized Medicare. Our paper is one of the first studies providing empirical evidence directly relevant for the long standing, but still ongoing, theoretical debate on competition in selection markets.[6] A series of recent empirical studies has analyzed the interaction of selection and competition when the latter involves premiums, but not the benefit design (see Bundorf, Levin and Mahoney (2012), Lustig (2012), Starc (2014), but also the seminal work of Cutler and Reber (1998)). Our broader focus on contract characteristics is more closely related to Hendel and Lizzeri (2003) and Crocker and Moran (2003) who argue that greater ex-ante commitment may reduce adverse selection and, thus, may increase insurance provision. In the Medicare Part D context, the study of Carey (2016) mentioned earlier is a relevant example of another study looking at competition through contract design, in the presence of selection. Indeed, for this market Polyakova (2014) and Ho, Hogan and Scott Morton (2014) find evidence of selection in Part D and discuss how that interacted with the plan offerings by insurers. Self selection also entails a potential for strategic insurers to try to cream skim the market and, indeed, Carey (2014) finds evidence of this behavior in Part D. In Part C, older studies found evidence of this phenomenon (Cao and McGuire (2003) and Batata (2004)), but more recent studies have argued that risk adjustment drastically reduced it (McWilliams, Hsu and Newhouse (2012), Newhouse et al. (2013) and Brown et al. (2014).) A closely related analysis is also that of Kuziemko, Meckel and Rossin-Slater (2014) on how competition in the presence of risk selection in Medicaid managed care leads to a worsening of outcomes for enrollees in poorer health conditions.

[6]This debate originates from the seminal studies of Akerlof (1970) and Rothschild and Stiglitz (1976). Several recent studies, Mahoney and Weyl (2014), Azevedo and Gottlieb (2015), Farinha Luz (2015), Shourideh et al. (2015) and Veiga and Weyl (2016), exemplify well how the theoretical literature is still hotly debating this issue.

Our study also contributes to the analysis of how insurers respond to regulation. Thus, it is also related to other recent empirical studies that address this issue in the context of Medicare, like Decarolis (2015) for Part D and Geruso and Layton (2015) for Part C. Finally, our analysis of how insurers affect soft quality measures of the offered plans is related to the issue of the public disclosure of quality measures analyzed in Glazer and McGuire (2000).[7] At a very general level, our findings about how firms adjust product features different than premium is an important contribution to the growing empirical literature on endogenous product characteristics (Crawford (2012); Fan (2013); Wollman (2014)). In most of the industrial organization literature, product characteristics are taken to be exogenous because it is to difficult to analyze when they are chosen, but our study isolates a clean setting in which it is possible to analyze multiple endogenous product characteristics. This is especially relevant in insurance markets where products are contracts characterized by multiple, simultaneously determined product features.

Finally, a few demand-related papers have already stressed the relevance of the Medicare star rating system for plan choices (see Abaluck and Gruber (2015), for Part D, and Reid et al. (2013) and Darden and McCarthy (2014), for Part C). The specific impacts of the 5-star SEP on the demand for plans is analyzed in Madeira (2015) and Decarolis, Guglielmo and Luscombe (2016). The former study, uses consumer-level data in the Part D market to study plan switching with regard to the presence of behavioral biases in enrollee choices and finds that at least some Medicare beneficiaries are present-biased. For these enrollees tending to procrastinate choices, the 5-star SEP leads to a drop in enrollment in 5-star plans, driven by an overall increase in inertia. The second paper, Decarolis, Guglielmo and Luscombe (2016), is the demand counterpart of the supply side analysis we conduct here. Its main results are based on aggregate (plan and contract level) enrollment data for the Part C market. By exploiting an identification strategy similar to the one in the current paper, we estimate that the introduction of the 5-star SEP caused an increase in within-year enrollment of 5-star plans amounting to 7% to 9% of their enrollment base at the beginning of the enrollment year (January). In that study, we also find that the policy did not significantly

[7]Related applications involve the cases of how cardiac surgery report cards led to selection by providers David Dranove and Satterthwaite (2003) in New York and Pennsylvania and the similar evidence on the Nursing Home Quality Initiative by Werner et al. (2009) and Lu (2012).

affect plan switching across years. Overall, consumers appear strategic enough to respond to the option of switching to 5-star plans during the year, but not to that of cycling between 5-star and cheaper, lower-starred plans (enrolling in those at the beginning of the year using the open enrollment window). A puzzling result left open by that study, however, is that the increased enrollment into 5-star plans is not associated with worsening of the risk pools for these plans. By using the yearly average contract risk score that CMS releases separately for Part C and D, that study reveals that, for both risk score measures, there is a *negative* and highly statistically significant effect on the risk score for both Part C and D. Nevertheless, this effect is rather small being in the order of 10 percent of a standard deviation of the dependent variable. For Part C, this is equivalent to reducing the expected average cost per enrollee by \$0.02 for each dollar spent. That paper extensively discusses whether the features of how the average plan risk score is calculated - in terms of both which enrollees it includes and the timing with which changes in individual consumers' risk measures are reflected in the plan-level risk score - might explain this puzzling result, but concludes that they cannot account for the finding. In the following analysis, we propose a solution to this puzzle that is based on the insurers' response to the 5-star SEP.

I Theoretical Example

This section presents a simple example to discuss the incentives created by the reform. Through it we show how, even when consumers have an heterogeneous taste for insurance, adverse selection emerges exclusively when within-year plan switches are allowed.[8] Consider a market with two firms, A and B, each offering one insurance plan and an outside option, Traditional Medicare (TM). For all consumers, let μ be the value of private insurance (A or B) relative to TM.[9] At the time of choosing, each consumer i knows that he will be either

[8]The objective of the example in this section is not that of providing a comprehensive model that we will then test through the data, but only to formulate a (very simplistic) framework through which interpreting our findings. Indeed, as it is well know, modeling insurers with market power in selection markets where the benefit design is endogenous is an open theoretical problem and "we currently lack clear characterizations of the equilibrium in a market in which firms compete over contract dimensions as well as price, and in which consumers may have multiple dimensions of private information" Einav and Finkelstein (2011).

[9]A $\mu < 0$ captures the negative utility from the restricted network characterizing private insurance.

sick, $h_i = 1$, or healthy, $h_i = 0$, and that, for all i, $h_i \sim Bernoulli(\gamma)$. Assume A is preferable to B for sick enrollees and, in particular, let b be a vertical (i.e., commonly agreed) measure of the quality of plan A for sick enrollees. Consumers are heterogeneous in how they value the benefit of insurance: let $\alpha_i \sim U[0,1]$ be such valuation and let it be known to consumers. Firms can only set their plan premium, cannot deny a consumer to enroll, and, for each enrolled consumer, face a cost of zero if the consumer is healthy and c if he is sick.

We consider two scenarios and illustrate the associated equilibria through Figure 1 (see the web appendix for an algebraic characterization). In the first scenario, consumers must choose between A, B or TM before learning their health status and plan switches are not allowed afterwards. Assume that the expected utility for consumer i before observing h_i is: $u_i = -h_i$ if in TM, $u_i = \mu - p_B + \alpha_i$ if in B, and $u_i = \mu - p_A + h_i(\alpha_i + b) + \alpha_i$ if in A.[10] The outside option, TM, is thus most appealing to those with low α and, as α increases, so does the value of A relative to B. The top panel of Figure 1 shows that there are two indifference points: one separating consumers that choose B from those choosing TM ($\alpha_{B>TM}$) and the other separating consumers that choose A from those that choose B ($\alpha_{A>B}$). These cutoff points define the plans demand and their exact location is an equilibrium outcome.

The second scenario that we consider entails the possibility of plan switching. To illustrate the effects of allowing consumers to switch to the high quality plan without entering the complexities of a fully dynamic model, consider now the setup above with the following modification of the timing of choices. Insurers set premiums aware that consumers in TM or B will be allowed to switch to A after observing the realization of h. Consumers choose a plan or the outside option aware of their own value, α_i, but unaware of their health status h or that they will be able to switch to A. Then h is realized and consumers learn they can switch to A by paying a switching cost $\phi_{TM\to A}$ or $\phi_{B\to A}$ respectively, plus any price differential to p_A. Switching occurs and, finally, market shares and profits are realized.[11]

The bottom panel of Figure 1 describes the equilibrium in this model. Compared to the case without the policy intervention, the $\alpha_{B>TM}$ and $\alpha_{A>B}$ cutoffs move due to the different

[10] The utility of TM is normalized to zero for sick enrollees and that of B is set to full insurance. Many alternative formulations leaving the plan ordering unchanged result in qualitatively similar results.

[11] This model is likely more adequate to capture the initial response in the market after the introduction of the 5-star SEP, than to characterize its medium run impacts on consumer and insurer behavior.

equilibrium premiums. Moreover, two new cutoffs points exist determining which enrollees of TM and B will switch to A. The location of these two new cutoffs points, $\alpha_{TM\to A}$ and $\alpha_{B\to A}$, shows that among the enrollees of TM (or B) it is the subset with the highest values of α that will potentially move. Since switching is dominated for healthy enrollees, those switching are the sick ones, so a share of γ enrollees from both TM and B.

This simple framework allows us to illustrate several interesting facts. First, although the policy allows switches only to firm A, in equilibrium both A and B adjust their prices relative to the case without the policy. Depending on the model parameters, prices and profits can either tend to converge or diverge. Second, the policy creates an adverse selection problem since some of those who are sick switch to A. The average cost without the policy is $c\gamma$ for both A and B, while under the policy it becomes higher for A and lower for B. Third, switching costs play an important role as, without them, major switches of sick enrollees to A could make the market unravel. Fourth, insurers have an incentive to engage in plan design manipulations: by altering b, firm A would be able to better control the potential adverse selection. How firm A would like to alter b is, however, ambiguous: an higher b induces more sick enrollees to switch during the year, but also increases the initial enrollment. Interestingly, in the initial enrollment decision, consumers discount b at the rate $\gamma < 1$, but in the switching decision sick enrollees value b in full. The premium is valued in full in both stages. This suggests that if there were a second high quality firm that can be joined via within-year switches, the incentive to compete in quality would be stronger than that of competing in premiums. This is relevant to understand some evidence we present at the end of this study.

Finally, although not explicitly analyzed in this framework, it is evident that additional institutional features like a subsidy for the high quality plan or the usage of an ex post risk adjustment are potentially important elements capable of altering the equilibrium response of insurers. In particular, both a subsidy on plan A and a risk adjustment mechanism, equalizing the costs between A and B post switches, could induce firm A to exploit plan switching behavior to bolster its market share without worrying about selection.

II Institutions: Rating System and Policy Changes

The Medicare Part C and D programs share several organizational features. Both programs entail Medicare beneficiaries choosing a plan from a menu of plans offered by private insurers. Detailed regulations, mostly from the Center for Medicare and Medicaid Services (CMS), contribute to the determination of both the types of plans offered and their premiums. The two programs, however, differ along many dimensions: Part C is a privately provided alternative to TM. Thus, plans must cover Medicare Part A and Part B benefits (except hospice care), but can offer additional benefits.[12] Part D, instead, is a program with voluntary enrollment that provides coverage for prescription drugs. For Part C, nearly all Medicare Advantage (MA) plans also include Part D benefits.[13] However, enrollees of TM can obtain Part D benefits by enrolling in stand alone Part D plans know as Prescription Drug Plans (PDP). This section describes three key regulatory aspects: the plan rating systems and the two reforms linking ratings with enrollment periods and subsidies, respectively.[14]

A. Rating Systems for Part C and D

To help beneficiaries select plans and to monitor the market, CMS rates plans on a 1 to 5 scale, with 5-stars indicating the highest quality. More precisely, CMS assigns ratings at the contract level and so every plan covered under the same contract receives the same rating.[15] Information about plan performance has been collected since 1999, but the introduction of the star rating system started only in 2006 for Part D and in 2007 to Part C.

The details concerning the rating system are fairly complex and have changed over time. The essential aspect is that different data sources (enrollees surveys as well as CMS administrative data, and data from plans and other CMS contractors) are used to collect information on a broad set of indicators. The process through which CMS calculates the star rating in-

[12]Medicare Part A includes inpatient hospital, skilled nursing, and some home health services. Medicare Part B includes physicians' services, outpatient care, and durable medical equipment.

[13]The subset of plans offering both Pat C and D coverage are usually indicated as MA-PD plans. With a slight abuse of notation we will refer to all Part C plans as MA plans.

[14]Newhouse and McGuire (2014) and Duggan, Healy and Scott Morton (2008) are recent studies discussing more broadly the institutional aspects of Part C and D respectively.

[15]In Part C, a contract is a particular product type (HMO, PPO or Private FFS) covering a specific service area (i.e county or group of counties), while a plan is finer specification of benefit package that include type of coverage, premium, copayment, etc. In Part D, a contract typically indicates a drug formulary and, then, each plan within the contract applies different conditions (for instance copays) to the same formulary.

volves several steps. At the most disaggregated level there is a large number of "individual measures," which are aggregated into a smaller number of "domain measures" and finally into the "summary rating" through a complex weighting system.[16] Table 1 reports the domain measures: for Part C, they cover features such as clinical quality, patient experience, and contractor performance; for Part D, they cover aspects such as call center hold time, members' ability to get prescriptions filled easily when using the drug plan, and plan fairness in denials to members' appeals. The overall rating, expressed in a 5-Star scale with increments of half a star, is released every year in October on the CMS Plan Finder web site.

A notable feature of the rating system is that it is hard to manipulate for insurers, especially in the short run. There are at least three reasons for this: first, CMS changes the system from year to year in terms of both which parameters are evaluated and how they are aggregated into the overall rating. This aspect is particularly salient given the large number of different measures that are evaluated, as shown in Table 1. Second, ratings on individual measures are assigned by comparing the *relative performance* of each contract to the entire population of contracts so that manipulations would require detailed information on all competing contracts. Third, and most crucially, the rating is based on lagged data: year t ratings (released on October of year $t-1$) use data for the period between January of year $t-2$ and June of year $t-1$. Thus, to ensure our results are not affected by rating manipulations, we will focus exclusively on the first two years after the enrollment reform.

Very few contracts obtain the 5-star maximum. In 2012 and 2013, for instance, only two firms offer 5-star PDP, while for Part C seven firms offer 5 star plans, as shown in Table 2. Regarding the geographical distribution of plans, out of the 34 regions into which Part D divides the United States, only 2 regions (region 3, New York, and region 25, formed by 7 midwest states) had a 5-star PDP. 5-star plans are more frequent among MA. However, while PDP must be offered to all counties within a region, Part C plans are offered at the county level. Figure 2 presents a heat map showing the offerings of MA plans. In 2012, 5-star plans are offered in 156 counties belonging to 17 different states and spanning almost all the U.S.

[16] More precisely, for PDP and MA plans not offering Part D, the summary rating is also the overall rating. For MA plans, the Part C and D summary ratings are combined to obtain an overall rating. A more complete description of the process through which CMS calculates the star rating is detailed in the web appendix.

geographical areas, with the relevant exception of the center-south area. This geographical dispersion of 5-star MA plans plays a fundamental role in our empirical strategy and we return to it in the next section.

B. Demand Side Reform: Plan Rating and Enrollment Periods

Generally, beneficiaries enroll in a plan from October to December of the the year before the coverage period (Open Enrollment Period, OEP) and must keep the same plan for the entire coverage year. Exceptions to the OEP, known as Special Enrollment Periods (SEPs), permit enrollees to change plans, but are typically confined to special circumstances.[17]

Starting with the 2012 coverage period, CMS introduced a new type of SEP linked to the star rating system. This reform allows all beneficiaries to enroll in a 5-star Part C or D plan at any point in time.[18] This SEP rule can only be used once per year and is available even to enrollees already in a 5-star plan, but who want to switch to another 5-star plan. Coverage with the new 5-star plan takes effect the first day of the month following the enrollment. Similar to any other enrollment request, 5-star plans must accept all applicants. The SEP is not available to enroll in a plan that does not have an overall 5-star rating, even if the plan receives 5-stars in some rating categories, or if the plan is in the same parent organization.[19] CMS has extensively advertised this new SEP rule in its communications to consumers. As regards insurers, they were publicly informed of the introduction of the 5-star SEP on November 2010. Since the next round of plan bids was in June 2011 for the menu of plans to be offered in 2012, then we can consider 2012 as the first year from which we shall expect to see reactions in plan features driven by the policy change.

C. Supply Side Reform: Plan Rating and Insurers' Payments

Payments to insurers come mostly from various types of Medicare payments and, only in small part, from enrollees premiums, see Newhouse and McGuire (2014) and Decarolis (2014).

[17] The most relevant SEPs are: (i) for change of residency, including moving to a nursing home; (ii) for low income people (dual eligible or qualifying for the LIS or for SPAPs); (iii) for people who enroll in a MA plan when they are first eligible at age 65 get a "trial period" (up to 12 months) to try out MA. This SEP allows them to disenroll from their first MA plan to go to TM.

[18] See the *2012 Newsletter* at `http://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovContra/downloads/Announcement2012final2.pdf`.

[19] There is also a special provision for which, if the enrollee uses the 5-Star SEP to enroll in either a 5-star PFFS plan or a 5-star Cost Plan, then he gets a "coordinating Part D SEP" allowing him to enroll in a stand-alone PDP, or in the Cost Plan's Part D optional benefit, if applicable.

The ACA of 2010 reformed various aspects of the system and, crucially, introduced a link between the star rating system and payments.

This supply side reform affects exclusively Part C and, like the enrollment reform, became effective in 2012. Essentially, the reform wanted to reduce overall plan payments, but also to make payments relatively more generous for higher quality plans than for lower quality plans. For the purposes of our study, this reform implies that after 2012 per enrollee payments of 5-star plans are more comparable to those of 4 and 4.5 then to those of plans with lower ratings. In essence this is due to how this reform affects two features of the payment system.

The first is the benchmark. The benchmark is a function of what TM spends in the plan's service area. CMS determines the payment to an MA plan by comparing its "bid" (the amount the insurer requests to enroll a beneficiary in the plan) to the service area benchmark. Plans with a bid below benchmark (the typical case) receive their bid plus a rebate based on the difference between benchmark and the bid. The ACA reform aligned benchmarks more closely with TM spending[20] and, instead of the flat 75% rebate used before 2012, introduced a variable rebate, ranging from 50% to 70%, linked to the plan star rating.[21]

The second is the bonus. Bonuses were introduced in 2012 to bolster payments for high-quality plans by proportionally increasing their benchmarks. For instance, in 2012 the bonus for 5-star plans is 5% of the benchmark. Thus, a 5-star plan with a bid below the benchmark receives a rebate equal to 73% of 1.05 times its service area benchmark. While under the ACA bonuses were reserved for plans with 4 or more stars, CMS used its demonstration authority to extend bonuses to plans with 3 or more stars. In the period that we study, benchmarks are increased by 4% for 4.5-4 star plans, by 3.5% for 3.5 star plans, by 3% for 3 star plans and plans that are too new or with too few enrollees to be rated.[22]

[20]It ties the benchmarks to a percentage of mean TM cost in each county and caps them at the pre-ACA level. These benchmarks are phased in from 2012 to 2017 by blending them with the old benchmarks.

[21]The new rebates are phased in from 2012 to 2014. In 2012, the rebate equals the sum of two-thirds of the old rebate amount and one-third of the new rebate amount. In 2013, the rebate equals the sum of one-third of the old rebate amount and two-thirds of the new rebate amount. From 2014 onward, the rebate is 70% for 5-4.5 star contracts, 65% for 4-3.5 contracts and 50% for the rest of the contracts.

[22]The demonstration is expected to cost more than $8 billion, making it more costly than the combined cost of all 85 other Medicare demonstrations that have taken place since 1995. See Layton and Ryan (2014) for a first assessment of its effects.

III Data and Descriptive Evidence

A. Data Description

Our analysis is based on publicly available data released by CMS describing MA and PDP plan/contract characteristics. In addition to monthly enrollment, we observe characteristics such as Part C and D premiums, deductible, extra coverage in the gap, measures of drug generosity, risk scores for Part C and D and the star rating. For this latter variable, we have both the overall summary rating, as well as the score on each individual measure. We also use the Area Health Resource File released by the Health Resource Service Administration to assess a number of county-level demographic, economic and heath indicators.

We focus on the period from 2009 to 2013 to assess the immediate response to the reforms implemented in 2012. We conduct the analysis at contract and not at plan level both because the rating does not vary among plans under the same contract and because missing enrollment data are more common at plan than at contract level.[23] Our main dependent variables are premiums (for Part C and D) and other financial features that proxy for generosity of coverage. Among the latter, the Part C maximum out of pocket (MOOP) is particularly relevant as it measures the maximum amount that an enrollee might spend to access in-network health care services through the plan (it includes all costs but the premium). Another relevant variable is the out of pocket cost (OOPC) that we observe separately for the Part C and Part D components of the plan. This value, released by CMS, is obtained by simulating what would be out of pocket costs of representative beneficiaries and is available for enrollees with different health status ranging from poor to excellent health. Finally, as explained below, we explore the effects of the 5-star SEP on additional features involving both plan drug-related characteristics, such as number of top and unrestricted drug included the plan formulary, and soft quality measures, such as *health care quality*, *customer service* and *drug access*. The latter set of measures are all components of the star rating system illustrated in the previous section for which we take the appropriate time window.[24]

[23] A subset of our measures are available only at plan level. We aggregate them at contract level by weighting the plan characteristics by the enrollment of the plan. We tested the robustness of our results to aggregation (i.e. simple average), the results are reported in appendix.

[24] As mentioned earlier, certain components of the rating enter its calculation with a time lag and, hence, their usage requires attention to their period of reference.

B. Descriptive Evidence

As documented in Table 2, there are seven insurers offering 5-star plans in 2012-2013.[25] A first interesting feature revealed by the table is the fact that the 5-star SEP did not trigger any major entry/exit of plans. Table 2 illustrates this point by reporting the number of counties in which the plans achieving 5-star in 2012 or 2013 are offered (by year and insurer). Comparing 2012 to 2013, it is clear that the 5-star plans did not reduce their presence. Indeed they seem to expand the number of counties served, regardless the parent organization. Our results below will offer an economic rational for why insurers were able to maintain their 5-star contracts. However, it is also relevant to point out that CMS poses limits to the exit of plans as it can impose a two year ban to a firms that retires all its contracts from MA.

A second feature related to these seven insurers is that only three of them, Group Health, Humana and Kaiser Foundation, are major national players. However, while the 5-star plans of Group Health and Humana are offered only in a limited geographical area (Wisconsin for Humana and Oregon-Washington for Group Health), Kaiser has 5-star plans in various states: California, Colorado, Hawaii, Oregon and Washington. Moreover, Kaiser's 5-star contracts have large market shares in all of these states, ranging from 12 to 48 percent of the relative markets. For Group Health and Humana, the market shares of their 5-star plans are smaller, but in both cases greater than 5 percent.

The small number of insurers makes feasible and interesting to look at the possible strategies with which they responded to the 5-star SEP. For both Humana and Kaiser, the fact that both insurers also offer non-5 star plans in counties where no 5-star plan is offered by any company allows some descriptive comparisons. The most relevant aspect that we find is that Humana and Kaiser seem to follow different strategies. Comparing the periods before and after the 5-star SEP, Humana's 5-star plans offered in Wisconsin lower their generosity (the average MOOP grows from \$3,400 to \$6,260), substantially more than what is done by both the 4.5 star plans also offered in Wisconsin (the average MOOP grows from \$4,500 to

[25]The overall set of firms active on the supply side of Part C and D are many and heterogeneous. They range from large scale, nation-wide insurers like United Healthcare and Humana, to a plethora of small local companies. Almost all insurers offering Part C also offer Part D, but some major Part D insurers, like CVS Caremark, are not present in Part C.

$6,331) and the 4.5 star plans offered in other Midwest counties (the average MOOP grows from $3,952 to $4,431). In the same period, the average premium of 5-star plans registers a small increase, but in line with that of the 4.5 plans. For Kaiser, instead, we can compare its 5-star plans with the 4.5 star plans it offers in Georgia. We observe that generosity remains nearly identical for both the 5-star plans (the average MOOP goes from $3,200 to $3,230) and 4.5 star plans (the average MOOP remains identical at $3,400). Average premiums, however, decline slightly more for 5-star plans than for 4.5 star plans (Part D premiums decline from $132 to $108 for 5-star plans, while they increase from $18 to $24 for 4.5 plans; Part C premiums, instead, remain almost identical).

This descriptive evidence is suggestive that insurers response to the increased selection risk involves both premium and generosity dimensions. To draw more consistent conclusions about such responses, however, it is strictly necessary to take into account how not only 5-star insurers, but also their competitors reacted to the policy change. Non 5-star insurers operating in markets with 5-star plans face the possibility of losing enrollees during the year and, accordingly, of experiencing changes to their risk pools. Indeed, they might face a worsening of selection if 5-star plans increase their cream skimming activity to limit their own potential risk worsening. We describe below an empirical strategy that aims to detect this type of insurers' responses.

IV Empirical Analysis

A. Empirical Strategy

The empirical strategy that we pursue is a form of difference-in-differences (DID) strategy. The two key features of our approach are as follows. First, our unit of analysis is the county, and not the contract (or plan). As discussed above, since all contracts offered in a county with at least one 5-star contract can respond to the 5-star SEP reform, our interest is in understanding how the market (i.e., the county) responded to the policy change. Hence, we label *treated counties* those with at least one 5-star contract in either 2012 or 2013, and as *control counties* those having either 4 or 4.5 star contracts as their highest rated contracts.

The second feature is that, to capture the changes in how the overall market readjusts, we pursue a quantile-based DID analysis. This allows us to evaluate changes along the whole distribution of each one of the dependent variables that we will consider (premium, deductible, etc.). The goal is to understand how the 5-star SEP affects the nature of competition within a market. For example in the case of the premium, a 3 star contract with a low premium and a 5-star contract with an high premium would probably have a different reaction to the 5-star SEP, and analyzing different quantiles of the premium distribution within a market can be more informative than just focusing on the mere average effect.

We model the τ^{th} quantile of the distribution of characteristic Y in county c at time t as:

$$Y_{ct}(\tau) = a_c(\tau) + b_t(\tau) + \beta(\tau) \times 5StarCounty_{ct} + \varepsilon_{ct}(\tau) \tag{1}$$

where the coefficient of interest is $\beta(\tau)$, the effect of the 5-star SEP on the dependent variable Y for the τ^{th} quantile. For instance, when analyzing the Part C premium, estimating $\beta(0.2)$=2 implies that the 5-star SEP induced an increase in the 20^{th} percentile of the Part C premium distribution by \$2. $a_c(\tau)$ and $b_t(\tau)$ represent the county and year fixed effects. The error term $\varepsilon_{ct}(\tau)$ includes all the unobserved factors that may affect the τ^{th} quantile at the county-year level.

The assumptions required for the validity of this strategy are the same of the standard DID framework, in particular the presence of a five star contract in a county after 2011 must be uncorrelated with other unobserved county-year specific shocks ($\varepsilon_{ct}(\tau)$). Our model is a special case of the grouped instrumental variables quantile model of Chetverikov, Larsen and Palmer (2015) and can be estimated using OLS. As explained in Larsen (2015), we can easily estimate this model in two steps: first, we compute the quantile for the contracts characteristic of interest (i.e. Part C premium) for each group (county-year); second, we estimate equation (1) using the computed quantile as a dependent variable in an OLS regression where the units of observation are the groups.[26]

[26]Compared to standard quantile method, the simplicity of this approach allows us to include a rich control structure, such as county and year fixed effects, while limiting the computational time given the use of OLS. Moreover, standard quantile methods would retrieve a biased $\beta(\tau)$ in presence of a county-year specific shock $\varepsilon_{ct}(\tau)$ (see Chetverikov, Larsen and Palmer (2015)).

There are challenges to interpret β as the causal effect of the policy change. As usual in any DID study, the first and foremost concern is to select an adequate control group. In our setting, counties with highest rated contracts that have no more than 4 or 4.5 stars are an appropriate control group. Clearly, both treatment and control counties have similar quality plans at the top of their respective menu of offerings. As discussed above, this is relevant to ensure that insurers in both sets of counties face similar financial incentives, thus allowing us to identify the effect of the 5-star SEP policy reform separately from any other effect produced by the simultaneous payment reform. The geographical location of the two sets of counties is also similar: Figure 2, shows the geographic distribution of treated (dark red) and control (light red) counties. Nevertheless, treatment and control groups differ along several observable characteristics, like size of the enrollment base and features of the enrollment pool. Indeed, the fact that the 5-star plans are scattered across many different counties does not ensure that their assignment to counties is random. We have two arguments to address this concern, the first is that, for the three reasons explained earlier, it is hard for insurers to perfectly control their rating so that the difference between a 4-4.5 and a 5-star plan is likely quasi-random, at least for the period object of analysis. Second, to the extent that the selection into the treatment state is based on observable characteristics, we have a rich set of covariates that permits us to control for this threat. Thus, as a robustness check for our baseline estimates, we use a matching DID strategy, where the control group observations are selected to match the characteristics of the treatment group in terms of observable characteristics.

Therefore, our identification strategy rests upon the fact that the assignment of the treatment relative to the control status is quasi-random within the union of the counties marked in dark and light red in Figure 2. Since the regulation separates the geographical markets, an additional benefit of this strategy is that, by selecting treatment and control groups from different counties, it avoids contamination issues.

B. Baseline Results

The plots of Figure 3 summarize our findings for each of the plan characteristics analyzed. Plot (a), for instance, reports the effect of the policy change on the Part C premium. The

plot contains a great deal of information: the solid, dark line is drawn using the regression coefficients, $\beta(\tau)$, estimated separately for each one of the quantiles (τ = 0.05, 0.1, ..., 0.9, 0.95) of the Part C premium distribution. The two slid lines around it show the 95 percent confidence interval. This plot reveals that the policy change is associated with a premium increase at the lower end of premiums (up until the third decile) and with a premium decrease in the top end of the premiums (starting from the seventh decile). The decline is about $250 for plans at the 90^{th} percentile of the distribution. The plot also describes where 5-star plans are located within the Part C premium distribution. Small squares and circles are used to mark the fraction of 5-star plans present at each decile of the distribution: squares measure the share of 5-star plans in the pre-policy period, while circles measure them in the post-policy period. In terms of the Part C premium distribution, 5-star plans are mostly concentrated in the top 50 percent of the distribution, both pre and post policy. Finally, to illustrate the usefulness of a distributional analysis, the plots also report the average effect. The dark, horizontal, dashed line shows the mean effect (with the associated surrounding lines denoting the 95 percent confidence interval) that is estimated by applying a conventional DID method, like the one used for the enrollment analysis. For Part C premium, this mean effect is negative but not statistically significant. The mean effect is unable to reveal the nature of the market readjustment uncovered by the distributional analysis.

Using the same logic to interpret the evidence in the remaining plots, we find a number of interesting results. First, consistent with the behavior of Part C premiums, also for Part D we observe a slight tendency of premium increases for plans in the medium-low end of the distribution and decreases for plans in the medium-high end of the distribution (where 5-star plans are mostly located). Second, and most crucially, plan generosity - as summarized by the MOOP - tends to worsen for plans at the low and medium end of the MOOP distribution, while it remains unchanged for plans in the high end of the MOOP. 5-star plans, that are disproportionately concentrated in the lowest end of the MOOP distribution, seem to respond by reducing their generosity and so do the plans closest to them in terms of MOOP.

The following plots, (e)-(h), report additional results in terms of the OOPC. It is particularly interesting to compare the estimates for the Part C OOPC of beneficiaries in poor

health and excellent health. For enrollees in poor health, the evidence in Plot (e) is once again of an increase in costs for the plans at the low end of the OOPC distribution and a decline in costs for the high OOPC plans. This is not surprising given the close connection between this OOPC measure and the MOOP. For enrollees in excellent health, however, Plot (f) shows that for all deciles there is no effect. For the Part D OOPC, the results are rather different and we see an improvement of generosity for the plans that, like the 5-star ones, were already low in terms of their OOPC and a worsening of generosity for high OOPC plans. These features involve both the case of poor health beneficiaries, Plot (g), and of excellent health beneficiaries, Plot (h). A likely explanation for the different behavior of the Part C and D OOPC measures is based on what happens to the Part D deductible.

For the Part D deductible, the estimates in Plot (d) indicate that low deductible plans (like 5-star plans) reduce their deductible even further, while the deductible increases further for high deductible plans. This evidence, is likely explained by the very peculiar role played by the deductible under the 5-star SEP. If 5-star plans were to ask for high deductibles, this would reduce their appeal for every consumer considering a within year switch. On the other hand, for non 5-star plans increasing the deductible might not trigger a major loss of enrollees since these enrollees are aware of the possibility of switching to 5-star plans.

Observing the presence of such heterogenous responses is particularly interesting as they indicate the need, stressed by Glazer and McGuire (2000), to broaden the view of the margins along which insurers compete. The fact that, relative to non 5-star plans, the generosity of the coverage of 5-star plans worsens mainly for those individuals with worst health status indicates that a sophisticated type of cream skimming might be happening.[27] This can

[27]In the web appendix we explore the effect of the 5-star SEP on further margins that insurers could modify. The decline in generosity of 5-star plans is also confirmed by two Part D plan characteristics: the share of most frequently used drugs that the plan covers and the number of drugs that the plan covers without placing any utilization restrictions. For both variables, generosity improves for plans in the low end of the distribution, while it declines for plans in the medium-high end (where 5-star plans are located). We also report the individual measures composing the summary rating. An interesting result revealed by these estimates is that, while the distribution of premiums and MOOP tend to converge toward the middle, the distribution of various quality measures like *health care quality*, *customer service* and *drug access* widens: plans at the higher end of the distribution experience an increase relative to plans at the lower end of the distribution. There is an apparent heterogeneity, however, across the various measures: while for *health care quality* plans at the high end of the distribution experience a positive and statistically significant effect, for *customer service* the the effect is negative essentially throughout the entire distribution.

further help to explain the previous evidence in terms of risk scores slightly improving for 5-star plans. Thus, it is informative for descriptive purposes to apply the quantile based DID also to the Part C and D risk scores measures. These results are reported in Plots (i) and (j). For Part C, we observe that risk scores in the middle-upper end of the distribution tend to slightly decline, while they remain unchanged in the lower end. For Part D, the effect is mostly negative for the portion of the distribution where 5-star plans tend to concentrate, but the effect is typically non significant for most of the quantiles.[28]

We conclude by exploring the effect of the 5-star SEP on further margins that insurers could modify. In Figure 4, we report the estimates of the quantile DID for both plan drug-related features, such as number of top and unrestricted drug included the plan formulary, and soft quality measures, such as *health care quality*, *customer service* and *drug access*. The decline in generosity of 5-star plans is also confirmed by two Part D plan characteristics: the share of most frequently used drugs that the plan covers and the number of drugs that the plan covers without placing any utilization restrictions. For both variables, generosity improves for plans in the low end of the distribution, while it declines for plans in the medium-high end (where 5-star plans are located). We also report the individual measures composing the summary rating. An interesting result revealed by these estimates is that, while the distribution of premiums and MOOP tend to converge toward the middle, the distribution of various quality measures like health care quality, customer service and drug access widens: plans at the higher end of the distribution experience an increase relative to plans at the lower end of the distribution. There is an apparent heterogeneity, however, across the various measures: while for health care quality plans at the high end of the distribution experience a positive and statistically significant effect, for customer service the the effect is negative essentially throughout the entire distribution.

C. Markets with 5-Star Contracts Monopoly or Duopoly

As discussed at the beginning of this section, counties where 5-star plans are present have either one or two insurers offering these plans.[29] The distinction between markets with

[28] In the web appendix, we report the quantile analysis for matched samples. We use the same procedure - matching on county characteristics - described before. The results are similar to those discussed above.

[29] We observe 7 counties for which there were more than one 5-star plan in either 2012 or 2013.

5-star plan monopoly and duopoly is potentially informative of the interactions between competition and the 5-star SEP reform. Indeed, the reform is such that even enrollees of a 5-star plan can switch plan within the year, provided they move to another 5-star plan. As argued through our theoretical example, while irrelevant in monopoly markets, this provision can exacerbate the downward pressure on plan generosity in duopoly markets. Moreover, since the typical 5-star plan in the data typically enrolls high risk beneficiaries, for a 5-star plan receiving the riskiest enrollees of some other 5-star plans can be particularly costly.

To evaluate differences in market responses to the policy between monopoly and duopoly markets, we repeat the previous analysis on two subsamples. The six top panels of Figure 5 report the distributional effects for the monopoly case, while the latter six report the effect for the duopoly cases. The comparison of the two environments reveals that, while the decline in premiums is roughly similar, the worsening in generosity for enrollees in poor health is stronger for duopoly than for monopoly markets. Interestingly, for the duopoly case we observe a slight worsening of the OOPC also for individuals in excellent health, suggesting that insurers cannot perfectly target enrollees with different health status.

This evidence is further supported by the results involving the risk score. Both Part C and D risk scores experience a clear decline for 5-star plans in duopoly markets, but there is no statistically significant decline for the case of monopoly markets. Altogether, this evidence is suggestive that 5-star plans in duopoly markets decreased their generosity and quality more than 5-star plans in monopoly markets. On the other hand, these reductions are not accompanied by a more pronounced premium decline. Thus, relative to the pre-policy period, the effect of the 5-star SEP appears to have been more beneficial for consumers located in counties with a single firm offering 5-star plans than in areas with competition between 5-star plans. This potentially problematic effect of competition is an interesting manifestation of the complexity of making competition work in healthcare markets. This result complements similar findings by Kuziemko, Meckel and Rossin-Slater (2014) for the related, but different setting of Medicaid managed care where no outside option is present.

D. Robustness Checks

Finally, we present two sets of robustness checks. The first one entails using a control group

that matches the treatment group on observable characteristics. By comparing demographic characteristics of treated and control counties collected from the AHRF files of the Health Resources and Services Administration, we find that treated counties tend to have a larger population of Medicare enrollees (and eligibles) and slightly less of both female Medicare enrollees and hospitals accepting Medicare patients (see Table A.2 in the web appendix). Thus, we repeat the analysis a matched DID strategy: we performing the DID analysis on a sample that matches the control counties to the treated ones by using a propensity score method.[30] The results obtained are reported in Figure 6. Qualitatively, they show patterns nearly identical to what is reported as our baseline results.

The second set of robustness checks involves the way plan features are aggregated at contract level. Indeed, while we perform our analysis at contract level, certain features, like the Part D deductible are plan-specific and will differ among plans within the same contract. For our baseline estimates presented above, the aggregation method used is an enrollment-weighted average of the plans. As an alternative, in Figure 7 we report the results obtained from using equally-weighted plans.[31] The findings are broadly in line with the baseline estimates.

V Conclusions

The reform that, starting in 2012, allowed Medicare enrollees to switch at any point in time to the highest quality, 5-star plans could have backfired. By undermining the use of rigid open enrollment periods, a pillar of most insurance markets, this policy could have exacerbated the adverse selection faced by 5-star plans, potentially triggering premium spikes or even plan exit. The fact that this did not happen and that, despite the substantial growth in within-year enrollment in 5-star contracts, their risk pool did not worsen creates a puzzle.

This paper shows that a relevant force behind these facts is the sophisticated response

[30]For the propensity score, the probability that a county has a 5-star contract is estimated over a range of socio-economical, demographic and health indicators of the counties. Only the counties on the common support of the propensity score between the treatment and the control groups are included. The matched DID estimates reported in Figure 6 are based on the probit estimates in column 6 of Table A.2 in the web appendix.

[31]We consider only the subset of characteristics varying at plan level.

adopted by suppliers. Both 5-star insurers and their competitors responded to the new policy. The 5-star insurers lowered their premiums, while, at the same time, worsening the amount of coverage offered by their plans. This contributed to expand their enrollment base, without worsening their risk pool. The overall market adjustment entails a compression in the characteristics of the available plans, with greater convergence in terms of both premiums and financial characteristics of the plans.

These results, based on a clean identification strategy, empirically document key features of insurance markets. There are various implications for both research and policy. In terms of research, our findings suggest the relevance of three main avenues for future research. First, when modeling insures behavior it is necessary to consider that competition extends well beyond premium competition and entails subtle aspects of plan design. Second, enrollees inertia in plan choices makes prominent the need to better understand the drivers of plan switching behavior. Third, effective risk adjustment systems need to take into account plan switching behavior associated with the presence of special enrollment periods. The potential enlargement of the set of "life qualifying events" in the ACA exchanges referenced in the introduction might be a fruitful area to further analyze this issue.

Finally, in terms of policy, our results are both encouraging and problematic. On the one hand, the flexibility in product design that insurers retain in Medicare Pact C and D has allowed the 5-star SEP to achieve the goal of bolstering enrollment into 5-star plans. More generally, such flexibility is likely to help making the market sustainable for insurers. On the other hand, however, the very presence of such flexibility implies difficulties in designing rules capable of steering the market toward any public goal. In the context of the 5-star SEP, the reduced generosity of 5-star plans could negatively affect the well being of the weakest beneficiaries and could also represent a diminished allocative efficiency in the market.

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Table 1: Domain Measures for Part C and D - Year 2012

Managed Care		**Prescription Drugs**	
Staying Healthy: screenings, tests, vaccines	12	Drug Plan Customer Service	3
Managing Chronic (long-term) Conditions	9	Member Complaints, problems getting services, and improvement in the drug plan's performance	3
Member Experience with the Health Plan	5	Member Experience with the Drug Plan	3
Member Complaints, problems getting services, and improvement in the health plan's performance	3	Patient safety and accuracy of drug pricing	6
Health Plan Customer Service	2		

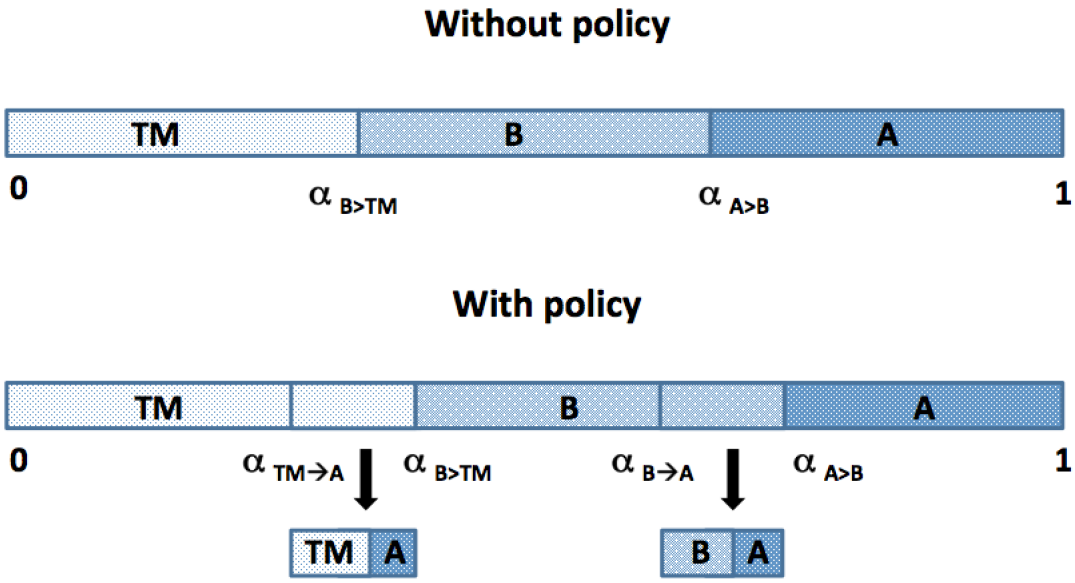
Notes: The table reports the list of the domain measures used to calculate the Part C and D summary ratings in 2012. There are 5 domain measures for part C and 4 for Part D. The numbers in the table that follow the description of each domain measure indicate the number of underlying individual measures.

Table 2: Number of Counties with Treated Contracts by Insurer

Year	2009	2010	2011	2012	2013
Baystate Health, Inc.	3	3	3	3	3
Group Health Cooperative	13	13	13	13	13
Gundersen Lutheran Health System Inc.	11	11	11	16	16
Humana Inc.	0	0	11	30	30
Kaiser Foundation Health Plan, Inc.	63	63	64	64	64
Marshfield Clinic.	32	32	32	32	36
Martin's Point Health Care, Inc.	12	15	16	16	18

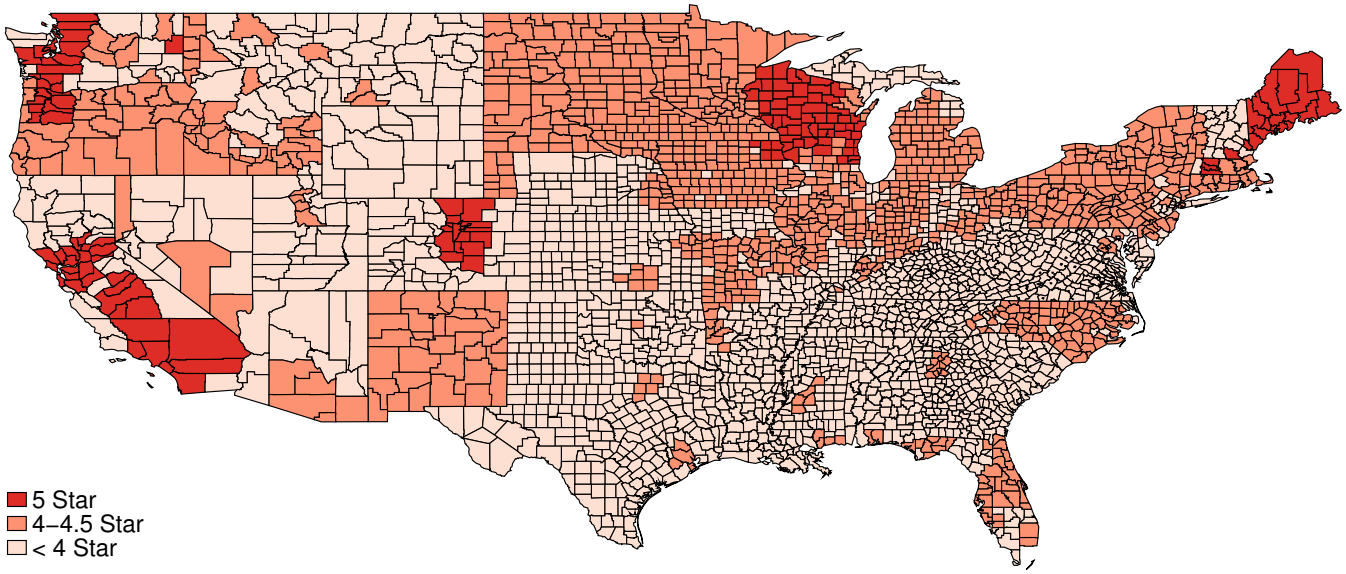
Notes: The table shows the number of counties in which the treated contracts where offered. Treated contracts are contracts that achieve the 5-star rating in 2012 or 2013.

Figure 1: Enrollment Shares with and without Policy



Notes: The two figures show the allocation of consumers to A, B and the outside option TM. There is a unit mass of consumers who are sorted in the figure by their value of α, from the lowest (zero) to the highest (one).

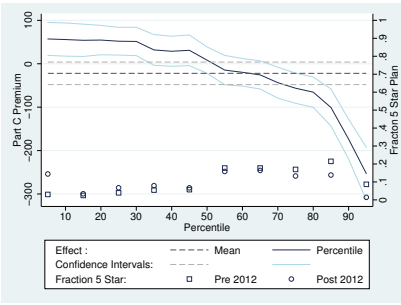
Figure 2: Maps of 5-Star Counties



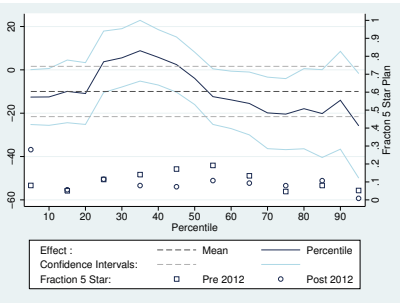
Notes: The heat map reports with the darkest color the set of counties where at least one 5-star plan was offered in 2012 or 2013. The lightest color counties are those where in the same period no plan got a score of 4 or higher. The remaining counties have at least one plan with a score of al least 4, but no plan with a score of 5.

Figure 3: Quantile Regression Estimates for Plan Characteristics

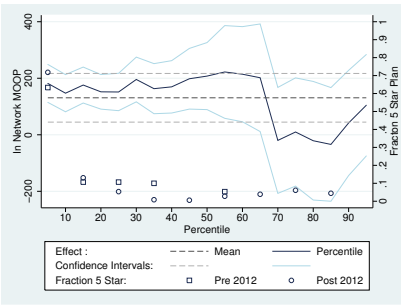
(a) Part C Premium



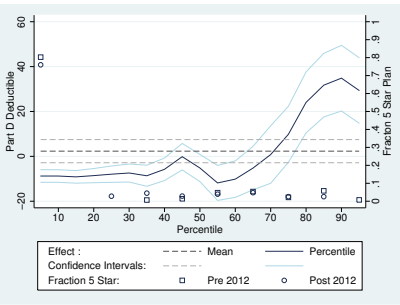
(b) Part D Premium



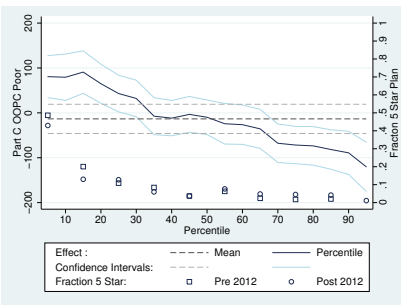
(c) Maximum OOP Part C



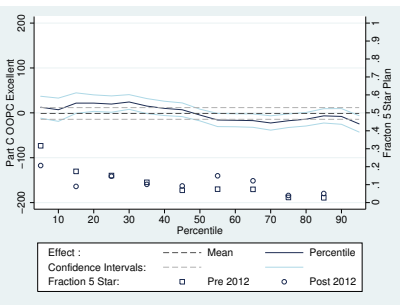
(d) Part D Deductible



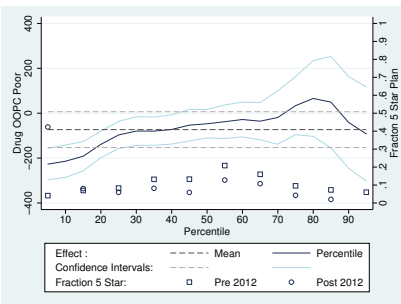
(e) Part C OOPC - Poor Health



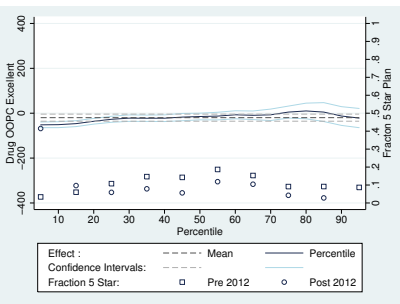
(f) Part C OOPC - Excellent Health



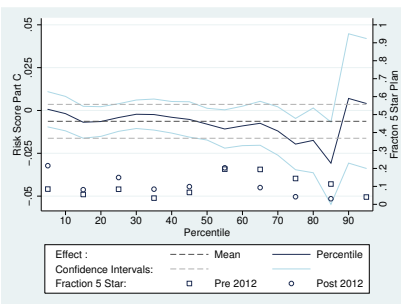
(g) Drug OOPC - Poor Health



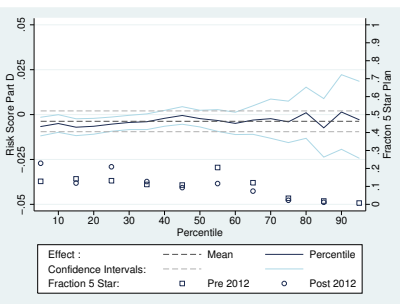
(h) Drug OOPC - Excellent Health



(i) Risk Score Part C



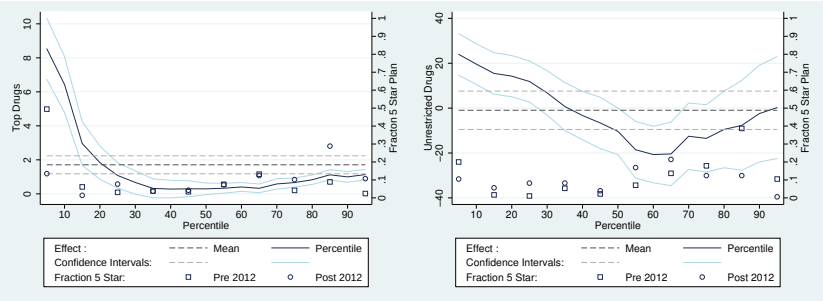
(j) Risk Score Part D



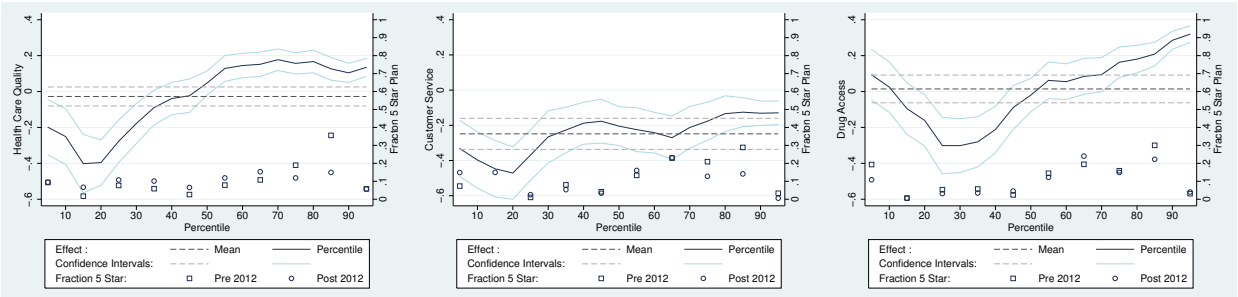
Notes: The solid, dark line is drawn using the coefficient estimated separately for each one of the quantiles ($\tau = 0.05, 0.1, ..., 0.9, 0.95$). The two slid lines around it show the 95% confidence interval. The dark, horizontal, dashed line shows the mean effect, the lighter lines denotes the 95% confidence interval. Squares measure the share of 5-star plans in the pre-policy period, while circles measure them in the post-policy period.

Figure 4: Quantile Regression Estimates for Plan Characteristics - Other Characteristics

(a) N. Top Drugs (b) N. Unrestricted Drugs



(c) Health Care Quality (d) Customer Service (e) Drug Access

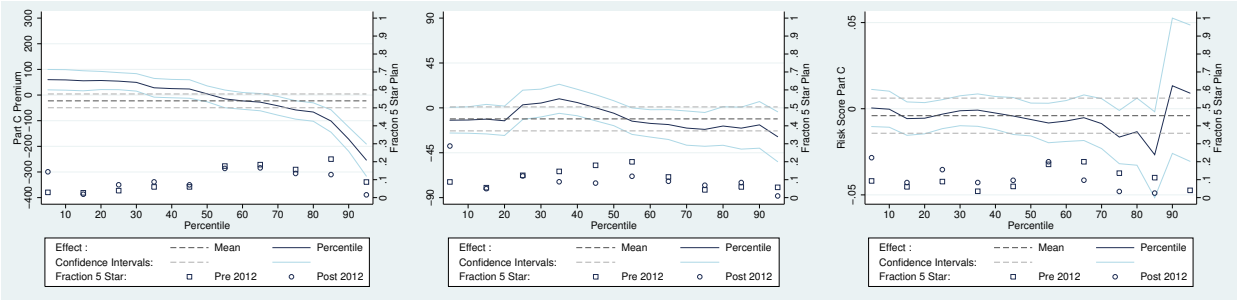


Notes: The solid, dark line is drawn using the coefficient estimated separately for each one of the quantiles ($\tau = 0.05, 0.1, ..., 0.9, 0.95$). The two slid lines around it show the 95% confidence interval. The dark, horizontal, dashed line shows the mean effect, the lighter lines denotes the 95% confidence interval. Squares measure the share of 5-star plans in the pre-policy period, while circles measure them in the post-policy period.

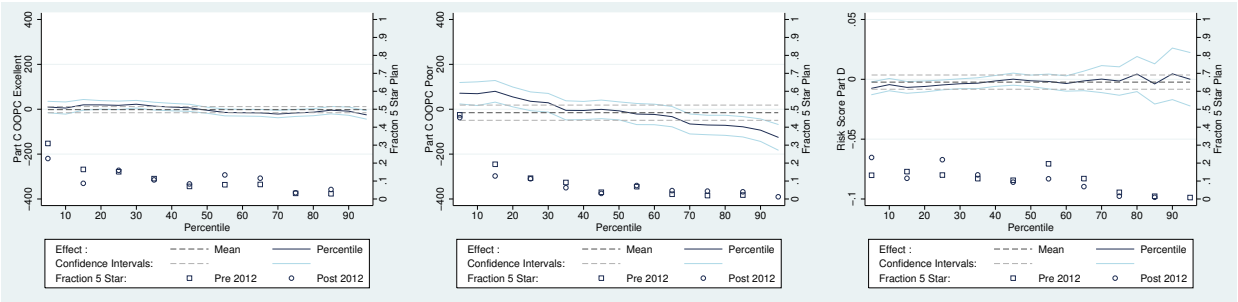
Figure 5: Quantile Regression Estimates - Monopoly and Duopoly Counties

Part I: 5-Star Monopoly Counties

(a) Part C Premium (b) Part D Premium (c) Risk Score Part C

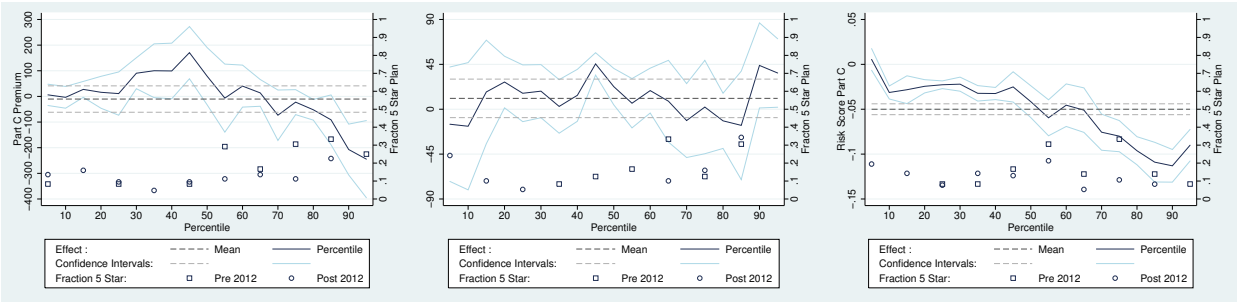


(d) Part C OOPC - Excellent Health (e) Part C OOPC - Poor Health (f) Risk Score Part D

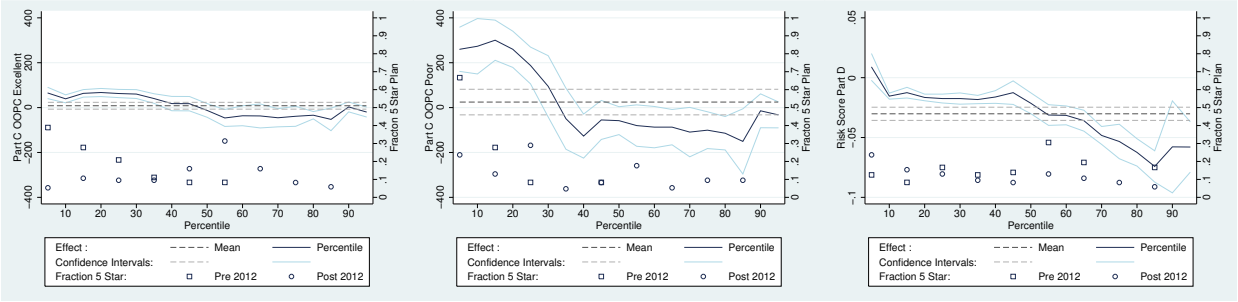


Part II: 5-Star Duopoly Counties

(g) Part C Premium (h) Part D Premium (i) Risk Score Part C



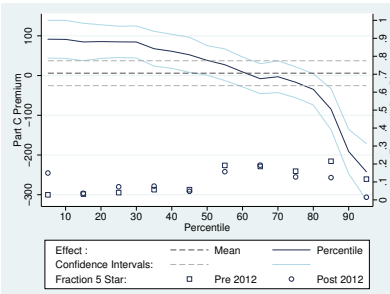
(j) Part C OOPC - Excellent Health (k) Part C OOPC - Poor Health (l) Risk Score Part D



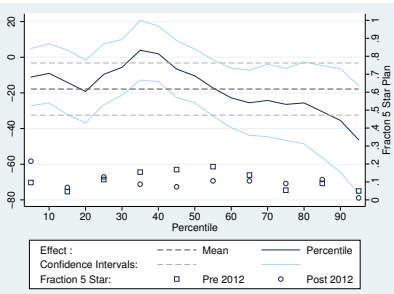
Notes: See note to previous table. Top panel includes as treated counties only those with 1 insurer offering all 5-star plans. Bottom panel includes as treated counties only those with 2 insurers offering all 5-star plans.

Figure 6: Quantile Regression Estimates for Plan Characteristics - Matched Samples

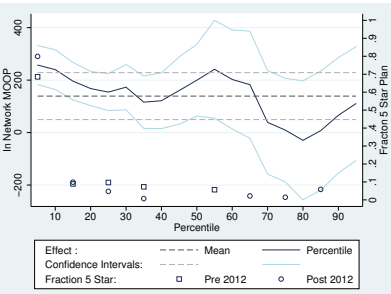
(a) Part C Premium



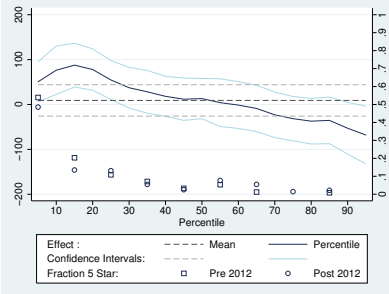
(b) Part D Premium



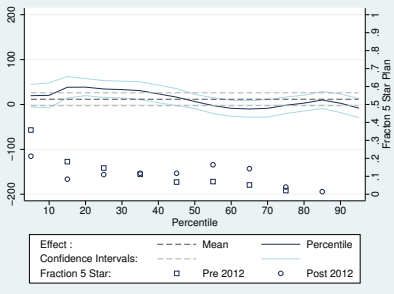
(c) Maximum OOP Part C



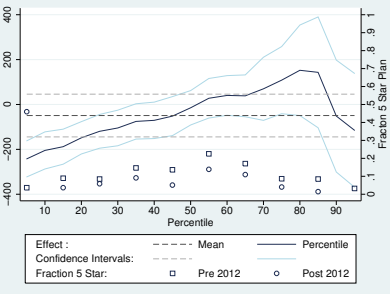
(d) Part C OOPC - Poor Health



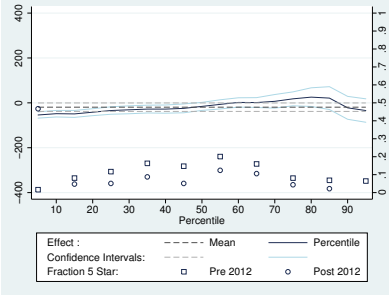
(e) Part C OOPC - Excellent Health



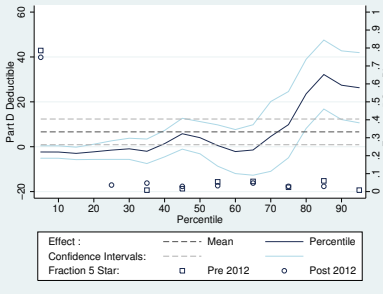
(f) Drug OOPC - Poor Health



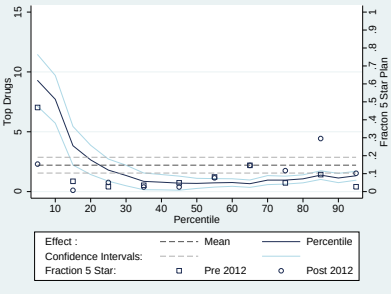
(g) Drug OOPC - Excellent Health



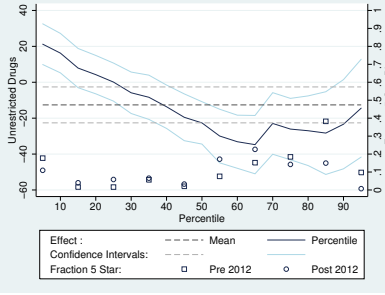
(h) Part D Deductible



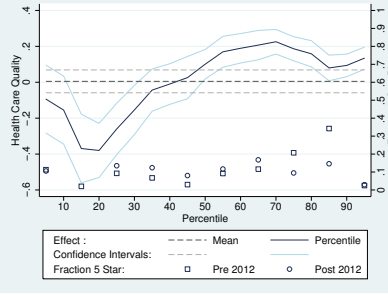
(i) N. Top Drugs



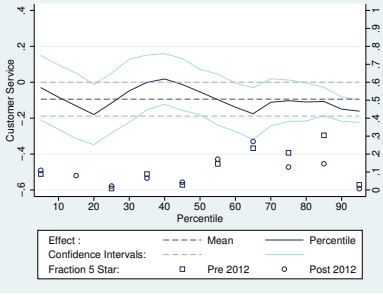
(j) N. Unrestricted Drugs



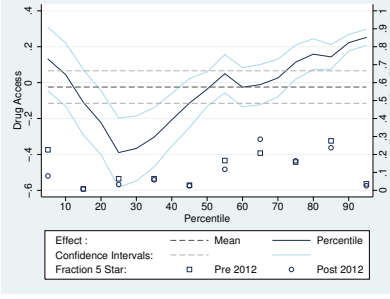
(k) Health Care Quality



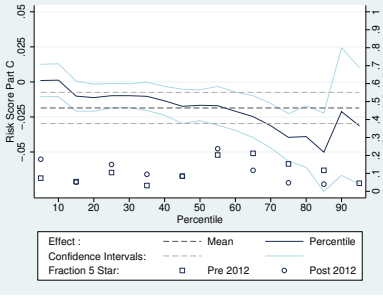
(l) Customer Service



(m) Drug Access



(n) Risk Score Part C



(o) Risk Score Part D

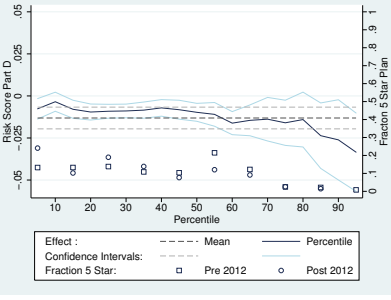
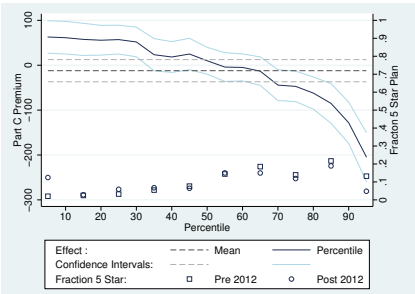
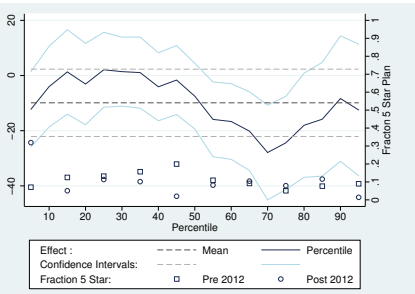


Figure 7: Quantile Regression Estimates for Plan Characteristics - Mean Characteristics

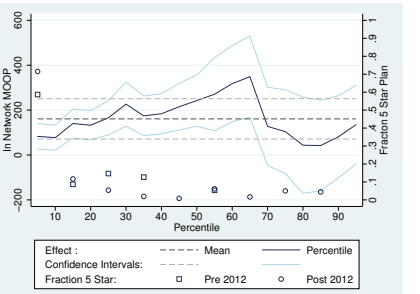
(a) Part C Premium



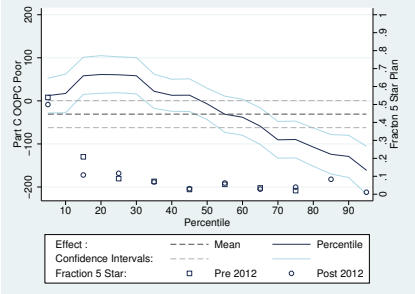
(b) Part D Premium



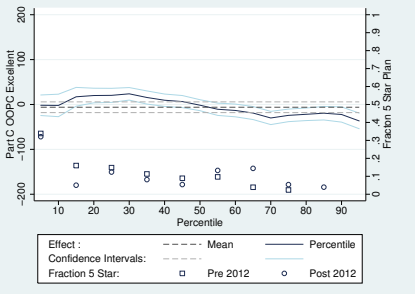
(c) Maximum OOP Part C



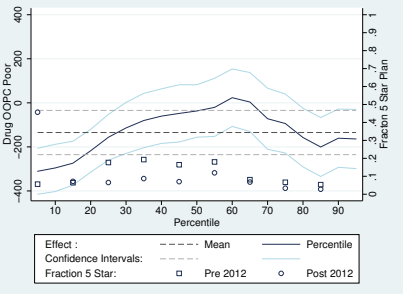
(d) Part C OOPC - Poor Health



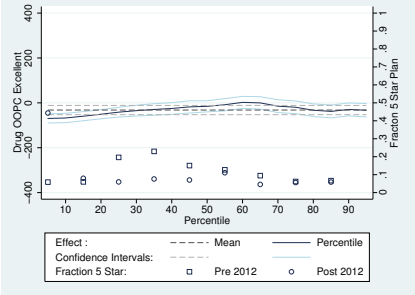
(e) Part C OOPC - Excellent Health



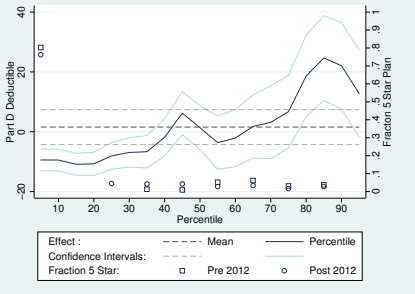
(f) Drug OOPC - Poor Health



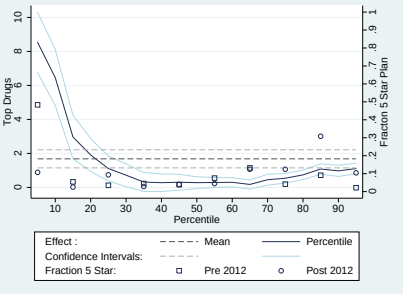
(g) Drug OOPC - Excellent Health



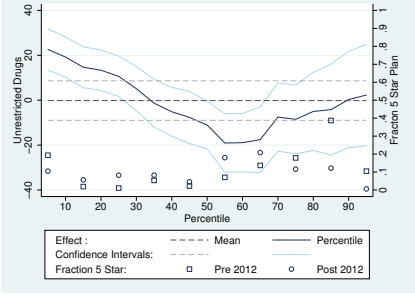
(h) Part D Deductible



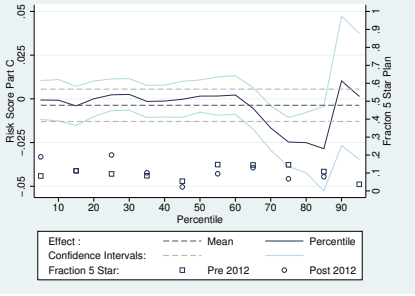
(i) N. Top Drugs



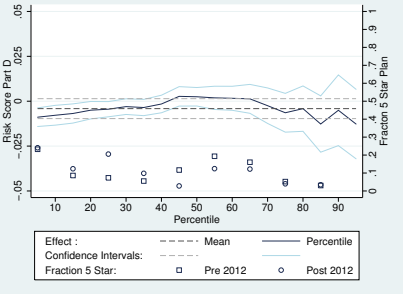
(j) N. Unrestricted Drugs



(k) Risk Score Part C



(l) Risk Score Part D



For Publication on the Authors' Web Page

Insurers Response to Selection Risk:
Evidence from Medicare Enrollment Reforms

Web Appendix

A. Data and Institutions

The dataset was assembled from data made publicly available by CMS (Center for Medicare and Medicaid Services). In particular, data on monthly enrollment for the years 2009-2013 at plan level was downloaded from:

`http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MCRAdvPartDEnrolData/index.html`.

The *Crosswalk Files* available from the same web site were used to link plans through the years. Premiums and plan financial characteristics are from the *Premium Files*:

`http://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovGenIn/index.html`.

Plans formulary and pharmacy network are from the FRF (*Formulary Reference Files*):

`https://www.cms.gov/PrescriptionDrugCovContra/03_RxContracting_FormularyGuidance.asp`

Part C and D performance data determining the star ratings were obtained from:

`https://www.cms.gov/medicare/prescription-drug-coverage/prescriptiondrugcovgenin/performancedata.html`

Demographic characteristics for the geographic areas are the only ancillary data source and were obtained from:

`http://ahrf.hrsa.gov/download.htm`.

The calculation of the star rating described in the main text is illustrated below in greater details for the case of the Part D rating for year 2012. A weighted average of the scores earned on each of the individual measures determines the final score.

Table A.1: Rating Calculation for Part D - Year 2012

Individual Measures			Domain Measures	Summary Measures
Definition	Type of Data	Weights		
D01 Call Center - Hold Time	Call Center Monitored by CMS	1.5	Domain 1 Drug Plan Customer Service	Summary Rating
D02 Call Center - Foreign Language Interpreter	Call Center Monitored by CMS	1.5		
D03 Appeals Auto-Forward	Independent Review Entity	1.5		
D04 Appeals Upheld	Independent Review Entity	1.5		
D05 Enrollment Timeliness	Medicare Advantage Prescription Drug System (CMS)	1		
D06 - Complaints about the Drug Plan	Complaint Tracking System (CMS)	1.5	Domain 2 Member Complaints, Problems Getting Services, and Choosing to Leave the Plan	
D07 - Beneficiary Access and Performance Problems	CMS Administrative Data	1.5		
D08 - Members Choosing to Leave the Plan	Medicare Beneficiary Database Suite of Systems (CMS)	1.5		
D09 - Getting Information From Drug Plan	CAHPS Survey	1.5	Domain 3 Experience with Drug Plan	
D10 - Rating of Drug Plan	CAHPS Survey	1.5		
D11 - Getting Needed Prescription Drugs	CAHPS Survey	1.5		
D12 - MPF Composite	Prescription Drug Event, Medicare Plan Finder, Health Management Plan System and Medispan	1	Domain 4 Drug Pricing and Patient Safety	
D13 - High Risk Medication	Prescription Drug Event	3		
D14 - Diabetes Treatment	Prescription Drug Event	3		
D15 - Part D Medication Adherence for Oral Diabetes Medications	Prescription Drug Event	3		
D16 - Part D Medication Adherence for Hypertension (ACEI or ARB)	Prescription Drug Event	3		
D17 - Part D Medication Adherence for Cholesterol (Statins)	Prescription Drug Event	3		

Notes: The table reports the details of how the 2012 summary rating is calculated for Part D. There are three sets of measures: individual measures (17 measures, reported in the first column), domain measures (4 measures, reported in the fourth column) and the final summary rating (fifth column). The third column describes the weights associated to each of 17 the individual measures in the calculation of the corresponding domain measures. The 4 domain measures are equally weighted in the calculation of the summary rating.

B. Baseline Framework: Details

This section reports the details of the baseline framework presented in the text. Given the assumptions on consumers utility stated in the text, in the pre-policy period, a consumer will choose B over the TM when $\mu - p_B + \alpha_i > -\gamma$, inducing a cutoff point $\alpha_{B>TM} = p_B - \mu - \gamma$. A consumer will choose A over B when $\mu - p_A + \gamma(\alpha_i + b) > \mu - p_B$, inducing a cutoff point $\alpha_{A>B} = -b + \frac{p_A - p_B}{\gamma}$. As regards insurers, we assume that for each firm the cost of enrolling a consumer is zero if he turns out to be healthy and c if sick. Firms set premiums to solve:

$$\max_{p_B} \pi_B = (\alpha_{A>B} - \alpha_{B>TM})(p_B - \gamma c) \quad \text{and} \quad \max_{p_A} \pi_A = (1 - \alpha_{A>B})(p_A - \gamma c)$$

Denoting the equilibrium prices as (p_B^*, p_A^*), the equilibrium cutoffs are $\alpha_{B>TM} = p_B^* - \mu - \gamma$ and $\alpha_{A>B} = -b + \frac{p_A^* - p_B^*}{\gamma}$. The top panel of Figure 1 describes the resulting market shares.

In the post-policy period, given that consumers are initially unaware of the policy change, the initial choice cutoffs $\alpha_{A>B}$ and $\alpha_{B>TM}$ are the same functions as above. However, once the policy is revealed consumers from the outside option will switch to A if $-\alpha_i - h_i < \mu - p_A + h_i(\alpha_i + b) - \phi_{TM\to A}$. Switching to A is a dominated choice for healthy consumers and, hence, the subset of TM enrollees switching to A is composed by those that turn out to be sick and who have $-\alpha_i - 1 < \mu - p_A + \alpha_i + b - \phi_{O\to A}$, inducing a cutoff $\alpha_{TM\to A} = \frac{p_A - b - \mu + \phi_{O\to A} - 1}{2}$.

Similarly, consumers from B find switching to A suboptimal when healthy, but sick consumers switch when their α is such that: $\mu - p_B < \mu - p_A - \phi_{B\to A} + \alpha + b$, inducing a cutoff point $\alpha_{B\to A} = p_A - p_B - b + \phi_{B\to A}$. Given this demand, firms set premiums to solve:

$$\max_{p_B} (\alpha_{B\to A} - \alpha_{B>TM})(p_B - \gamma c) + (1 - \gamma)(\alpha_{A>B} - \alpha_{B\to A})(p_B) \text{ and}$$
$$\max_{p_A} (1 - \alpha_{A>B})(p_A - \gamma c) + \gamma(\alpha_{A>B} - \alpha_{B\to A})(p_A - c) + \gamma(\alpha_{B>TM} - \alpha_{TM\to A})(p_A - c).$$

The ensuing equilibrium market shares can be found by inserting the resulting equilibrium prices into the four cutoff functions: $\alpha_{TM\to A}$, $\alpha_{B>TM}$, $\alpha_{B\to A}$ and $\alpha_{A>B}$.

C. Matched Sample: Probit Estimates

We report in Table A.2 the probit estimates used for the construction of the matched DID estimates. Table A.2 reports the estimates for four model specifications (i.e., columns 1-2, 3-4, 5 and 6) where we gradually increase the set of controls. All controls are county-level demographic characteristics collected from the AHRF files of the Health Resources and Services Administration. The estimates reported in column 2 and 4 differ from those in columns 1 and 3, respectively, for the sample of counties included: due to missing data for some characteristics, for columns 2 and 4 we use a smaller sample than that used for columns 1 and 3. The sample used for columns 2 and 4 is the same used for columns 5 and 6. The matched DID reported in the main text are based on the estimates in column 6 of Table A.2.

Table A.2: Probit Results - Probability of County Having 5 Star Plan

	(1)	(2)	(3)	(4)	(5)	(6)
	5 Star County	5 Star County	5 Star County	5 Star County	5 Star County	5 Star County
MA Enrollees	2.981***	2.334***	2.858***	2.268***	2.234***	2.255***
	(0.448)	(0.484)	(0.454)	(0.487)	(0.513)	(0.518)
Pop. Male > 65	0.000951***	0.00126***	0.000896***	0.00120***	0.00100*	0.00105*
	(0.000333)	(0.000461)	(0.000317)	(0.000456)	(0.000555)	(0.000600)
Pop. Female > 65	-0.000787***	-0.000973***	-0.000747***	-0.000921***	-0.000836**	-0.000878**
	(0.000245)	(0.000328)	(0.000236)	(0.000324)	(0.000392)	(0.000430)
Pop. White-Male > 65	-0.000890**	-0.00119**	-0.000851**	-0.00114**	-0.00111*	-0.00118*
	(0.000361)	(0.000489)	(0.000344)	(0.000484)	(0.000592)	(0.000645)
Pop. White-Female > 65	0.000573**	0.000780**	0.000542**	0.000739**	0.000653	0.000705
	(0.000255)	(0.000348)	(0.000242)	(0.000344)	(0.000413)	(0.000451)
Medicare Eligibles	8.13e-05***	6.55e-05***	8.25e-05***	6.47e-05**	0.000149***	0.000150***
	(2.38e-05)	(2.53e-05)	(2.46e-05)	(2.62e-05)	(3.80e-05)	(4.09e-05)
Unemployment			0.0519**	0.0488*	0.0305	0.0289
			(0.0254)	(0.0267)	(0.0285)	(0.0289)
Poverty Rate			-0.0321**	-0.0241	-0.0110	-0.0104
			(0.0148)	(0.0155)	(0.0159)	(0.0162)
# Medicare Cert Hosp.					0.216***	0.110
					(0.0660)	(0.256)
# Hosp. Med Patients					-2.32e-05***	-2.63e-05***
					(4.15e-06)	(4.87e-06)
# Outpatients Visits					1.50e-07	1.03e-07
					(2.17e-07)	(2.41e-07)
Hosp. Util. Rate 0-39						-0.0999
						(0.270)
Hosp. Util. Rate 40-59						0.144
						(0.262)
Hosp. Util. Rate 60-79						0.296
						(0.262)
Hosp. Util. Rate >80						0.330
						(0.283)
Constant	-1.762***	-1.588***	-1.756***	-1.681***	-1.960***	-1.922***
	(0.109)	(0.120)	(0.241)	(0.268)	(0.291)	(0.295)
Observations	987	841	987	841	841	841

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1