Incentivizing Entry in Insurance Markets: Evidence from Medicare Advantage*

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Appendix

Abstract

Firms in private markets have expertise in how to deliver services at lower costs. Additionally, competition creates incentives for these firms to further lower their costs and offer products with greater value to consumers. To capture these benefits, governments often subsidize private markets to deliver public goods. Medicare Advantage—the private insurance market for seniors—is one example. Designing the optimal subsidy policy to reap the promise of the private market in this setting is especially difficult given the challenges posed by adverse selection and competition from the public option. In this paper, I develop and estimate a model of firm entry and product offering decisions for Medicare Advantage firms. I use this model to evaluate counterfactual policies to regulate the market. I draw three conclusions. First, subsidizes are necessary to support the existence of the private market. Two, under current policies the program is not functioning as intended. Third, current policies overpay for outcomes. An alternative policy delivers comparable outcomes at lower government costs and distributes surplus more equitably across health states.

Keywords: competition, endogenous plan menus, entry, Medicare Advantage

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I Introduction

As of 2021, the U.S. government spends nearly $830 billion—10% of all spending—each year on healthcare for seniors in the Medicare program (Cubanski and Neuman, 2023). The majority of beneficiaries receive these benefits through Traditional Medicare (TM), the public insurance option. The remainder receive coverage through Medicare Advantage (MA), which are private insurance plans that are subsidized by the government. There are three policy rationales for subsidizing a private market for Medicare benefits. First, private firms have developed expertise in limiting moral hazard healthcare utilization, which allows these companies to deliver benefits at lower cost. The remaining two benefits stem from a competitive market. In this setting, competition creates incentives for firms to further lower their costs and offer insurance products with extra services or financial coverage to attract enrollees and increase profits. This structure for the private provision of public goods in the hopes of leveraging experience and the benefits of competition appears in other settings, including education and housing (see e.g., Baum-Snow and Marion, 2009; Hoxby, 2000; Neilson, 2021; Poterba, 1996).

Promoting entry and robust participation in insurance markets faces several challenges. Adverse selection—the tendency for sicker people to prefer more generous insurance plans—is the most salient. Concerns about selection may lead to firms offering plans with less generous coverage in markets with sicker patients or failing to enter these markets altogether—a behavior typically referred to as "cream skimming." Firms must also contend with the existence of the public option. Traditional Medicare offers baseline coverage—which has gaps and higher cost sharing—at a relatively low price. The private market must be competitive on both of these dimensions—coverage and price—to attract enrollment. These forces create challenges for the design of policies to support the private market. The policy must not only incentivize participation, it also needs to address selection and consumer price sensitivities. This is a difficult problem to solve because evaluating counterfactual policies requires a model that captures the complex interplay between policy, firm entry and product offering decisions, as well as consumer plan and healthcare utilization choices.

In this paper, I develop a model of firm entry and product offering decisions in health insurance markets. The framework captures how firms endogenously modify their participation decisions in response to changes in policy, competitive conditions, and consumer demand. I estimate the model using administrative data from the Medicare program. Included in these resources are the new Medicare Advantage Encounter data that allow me to measure healthcare utilization in these private plans.[1] I then use the model to run counterfactual simulations to evaluate the impacts of policies to promote participation in Medicare Advantage market. There are three key findings. First, subsidies are necessary to support the existence of this private health insurance market. If no subsidy is provided firms are unable to effectively compete against the public option and attract no enrollees. Second, Medicare Advantage is not functioning as intended. Current policies enroll healthier individuals instead of sicker ones that could benefit from the coverage and cost control measures offered by the private market. This pattern is driven in part by policies that equilibria that induce the least price sensitive individuals—who tend to be healthier—to enroll first. Third, current policies used in Medicare Advantage overpay for the outcomes they deliver. The overpayment is driven by a risk adjustment system that over (under) adjusts for enrolling sick (healthy) people. An alternate policy that resolves this overpayment can deliver comparable outcomes to current policies at lower costs to the government and create a more equitable distribution of surplus across healthy and sick individuals.

Medicare Advantage is an attractive setting to study the supply side of insurance markets. Private insurers administer and operate insurance plans that receive a subsidy that accounts for the health status of each beneficiary they enroll. Plans that report costs below cost benchmarks also receive additional payments to fund extra services or better cost sharing benefits for their enrollees. In two descriptive analyses, I show how this subsidy

[1] To my knowledge, this is the first paper in economics to leverage these data resources.

policy creates variation in plan menu generosity and how this variation separately identifies adverse selection and moral hazard. This feature enables me to develop a rich model of the supply side of this insurance market. My framework permits government policy and healthcare utilization driven by adverse selection as well as moral hazard to impact firm entry and product offering decisions.

Motivated by these features, I develop a model of firm entry and product offerings for health insurers. The model has two stages. In the first stage, firms choose which markets to enter and which insurance products to offer. These choices are made to optimize profits, taking into account the actions of their rivals, subsidies from the government, expected consumer demand, and the healthcare utilization of their enrollees. Demand and healthcare utilization are then realized in the second stage of the model. Access to administrative data allows me to capture rich levels of observable and unobservable heterogeneity in the estimation of consumer preferences and healthcare utilization. I estimate firm fixed costs using moment inequalities derived from revealed preference assumptions to rationalized observed entry and product offerings. As a result, my model can characterize equilibria resulting from different subsidy policies.

Model estimate indicate consumers are price sensitive and value their expected utility from healthcare consumption. In terms of magnitude the average disutility from premiums is larger than the expected utility from healthcare utilization. Low-income consumers display even higher sensitivity to price and marginally lower weight on their utilization utility. Consistent with managed care incentives, I find that MA plans have significant hassle costs to reduce the amount of healthcare their beneficiaries consume relative to TM. These hassle costs are also effective at limiting the amount of moral hazard utilization their enrollees consume. Individuals in this market display a modest amount of risk aversion, consistent with the high level of financial generosity of Medicare Advantage plans in terms of coinsurance rates and out-of-pocket maximums. My estimate for the identified set of firm fixed costs captures the costs of establishing a provider network, the efficiency of entering markets with existing networks, and per-plan regulatory costs. Finally, I perform a series of exercises that demonstrate how allowing for selection and endogenous participation impacts predictions from my model. My results illustrate how models without these features may overstate the effects of counterfactual policies.

I then use the model to weigh the tradeoffs of promoting choice in Medicare Advantage markets. The current policy in this market is to subsidize firms for each beneficiary they enroll. I start by assessing whether the government needs to subsidize a private market for Medicare benefits. I find that selection leads firms to rapidly raise their prices to points where nobody enrolls in Medicare Advantage. In other words, subsidies are necessary to prevent this market from unraveling. While this policy results in the lowest amount of government spending, it ignores many of the other benefits MA has for consumers in the form of insurance products that are more financially generous than the default public option TM.

Having established that subsidies are necessary to sustain the private market, I consider whether alternate systems can deliver better outcomes for the program. Of interest is whether these policies can improve how consumers sort between TM and MA as well as deliver cost savings to the government. In the first scenario, I eliminate the supply subsidy and transfer the average observed firm subsidy to consumers. This policy expands the size of the private market by drawing in health TM beneficiaries, exacerbating the positive selection into Medicare Advantage. Government spending increases commensurate with the expansion of the market. The observed policy and simulated untargeted demand subsidy attract the least price sensitive people into MA first. These individuals tend to be relatively healthier and the government realizes none of the potential savings from Medicare Advantage. In the second scenario, I simulate a targeted policy that addresses deficiencies in the observed policy and untargeted simulated policy. The target policy has three components: a reduction in supply side subsidy benchmarks, a means tested demand subsidy, and an improved risk adjustment formula for supply subsidies. This targeted approach delivers market outcomes similar to the observed policy that costs the government less money and improves the distribution of consumer surplus across beneficiary health statuses. This exercise shows that there is room to improve how this private insurance market is regulated and may be able to deliver on its promised cost savings.

This paper contributes to our understanding of promoting choice in health insurance markets by rigorously capturing the role of the supply side of the market. Prior work in this space has weighed the value of offering choice based on an analysis of consumer demand. Prominent examples are Marone and Sabety (2022) and Ho and Lee (2022). Both extend the framework of Einav, Finkelstein, Ryan, et al. (2013), which allows consumers to adjust their health spending based on their insurance coverage (i.e., moral hazard) to understand when consumer choice over insurance products with different levels of coverage is desirable. Both find there are limited gains to offering choice over different levels of financial coverage if a sufficient baseline level of coverage is offered.[2] My contribution extends these analyses by allowing a demand system of comparable richness to interact with a complete model of health plan supply—one that not only captures decisions about entry but also product variety. These features allow my framework to determine what plan menus will arise endogenously under different policy regimes and taking account of demand response. As a result, I can expand our understanding of the tradeoffs associated with promoting choice in competitive insurance markets.

My analysis also contributes to prior work on endogenous participation in insurance markets. Kong, Layton, and Shepard (2022) and Geddes (2022) focus on endogenous firm participation. Both papers study how policies to mitigate adverse selection can induce greater insurer entry into markets and allow enhanced competition to improve consumer welfare. Miller et al. (2021) focus on how firms endogenously alter their plan characteristics in response to subsidization policies, while holding participation fixed. My model builds

[2] Ho and Lee (2022) note that the gains from choice can improve if choice over financial and non-financial characteristics are offered. Wagner (2022) explores the conditions under which it is optimal to offer plan menus with plans differentiated in terms of their financial coverage and network types.

on this work by capturing both margins—firm participation and plan offering decisions are endogenous within my framework. These features are necessary to fully quantify how counterfactual policy may alter firm decisions and their impacts on consumers. For example, while a model that allows firms to endogenously reposition their product offerings to changes in policy, they rule out equilibria where it is optimal for the firm to exit the market altogether. This action may carry different implications for consumer welfare than the change in product characteristics induced by the policy change. A contribution of my analysis is to simulate a model that captures both of these margins for supply to respond.

My work also contributes to the literature studying the equilibrium effects of adverse selection and the design of health insurance markets. Examples include Einav, Finkelstein, and Tebaldi (2019), which develops a framework to weigh the tradeoffs of demand subsidies and risk adjustment within a joint framework. Tebaldi (2022) assesses the ability of targeted subsidies to alter selection patterns to improve market outcomes for consumers, and Polyakova and Ryan (2020) document imperfect competition can distort the efficiency of targeted demand subsidies. Closely related to my analysis, Curto, Einav, Levin, et al. (2021) studies the current regulatory framework used in MA—sometimes referred to as "manged competition"—as a model for insurance markets.[3] I extend these analyses by studying how managed competition in MA impacts firm participation and product offering decisions. As a result my model can answer whether managed competition generates sufficient entry or product offerings that are valuable to consumers and whether alternative regulatory schemes perform better at achieving these outcomes.

Finally, this paper relates to prior studies of product repositioning and firm entry. A common challenge for papers in these literatures stem from models with multiple equilibria.

[3]There is extensive literature on Medicare Advantage in economics that has some bearing on my paper. Examples include how insurers invest and compete over non-price characteristics captured by quality measures (Vatter, 2022); overpayments associated with the risk adjustment system (Geruso and Layton, 2020); whether risk adjustment has attenuated the incidence of risk selection between MA and TM (Brown et al., 2014 and Newhouse et al., 2015); the pass-through of plan subsidies to consumers (Cabral, Geruso, and Mahoney, 2018 and Duggan, Starc, and Vabson, 2016); and the impact of plan quality on mortality (Abaluck et al., 2021).

While Berry (1992) opted to model an outcome common to all equilibria, recent work has looked to partial identification methods to estimate the set of parameters consistent multiple model equilibria (e.g., Ciliberto and Tamer, 2009; Eizenberg, 2014; Fan and Yang, 2020, 2022; Wollmann, 2018; and Ciliberto, Murry, and Tamer, 2021). My own analysis relies on partial identification based on moment inequalities generated by revealed preference to account for multiple equilibria in the spirit of Pakes et al. (2015). Methodologically, I bridge the entry and product repositioning literatures by endogenizing plan menus that are geographically distinct. Moreover, my findings highlight the importance of accounting for endogenous participation when performing counterfactual analyses that alter firm entry incentives.

The paper proceeds as follows. In Section II, I present the empirical setting with a description of the Medicare Advantage program and the data I use in my analysis. Section III contains descriptive evidence of how policies used in Medicare Advantage lead firms to offer products with more financial coverage and how this variation in plan menu generosity can decompose selection from moral hazard. The model is presented in Section IV, along with a discussion of identification. I discuss estimation, results, and model fit in Section V. In Section VI I simulate how alternative policies impact plan menus and their associated welfare benefits and costs. Section VII concludes.

II Empirical Setting

Medicare Advantage is an ideal setting to study the supply side of competitive health insurance markets. The program dates back to the 1980s and has undergone several major reforms. Under the current structure, private firms agree to contract with the government to provide Medicare benefits to seniors. In return for administering these benefits, the government subsidizes firms directly for each beneficiary they serve. These subsidies incentivize firms to participate in the market, offer more generous health plans, and aim to combat firm concerns about adverse selection. In this section, I describe Medicare Advantage's institutional background and the data I use in my analysis.

II.A Medicare Advantage

Medicare Advantage currently features two distinct policies that incentivize entry and the provision of generous plans. The first are subsidies plans receive on a monthly basis for each beneficiary they enroll. The size of these subsidies are determined by a benchmark the government sets that reflects their costs of providing Traditional Medicare services in that market. Higher benchmarks give plans an incentive to enter a market as their marginal revenue per-beneficiary is greater. Plans that request subsidies below the government benchmark also receive a rebate payment that must be used to fund additional benefits for beneficiaries. The second policy is risk adjustment which scales the size of these subsidies based on the health of the beneficiaries the plan enrolls, offsetting potential differences in the costs of insuring sicker people.

Each year beneficiaries eligible for Medicare must choose between Traditional Medicare and Medicare Advantage to receive healthcare coverage. Traditional Medicare, composed of Medicare Part A and Part B, covers inpatient and outpatient services (e.g., hospital visits, doctor appointments, lab tests, etc.). Since Traditional Medicare is provided by the government, most healthcare providers accept it as payment under a fee-for-service system. Medicare Advantage (originally called Medicare Part C) are health insurance plans administered by private firms and subsidized by the government. The plans are required to cover the same services as Traditional Medicare at a minimum, but typically include additional services not covered by Traditional Medicare like vision, dental, and prescription drugs.[4] Since Medicare Advantage is private insurance, enrollees must navigate a network of acceptable providers unlike Traditional Medicare. While both Traditional Medicare and Medicare Ad-

[4] Traditional Medicare enrollees may supplement their coverage with a Medicare Part D plan, which covers the costs of prescription drugs.

vantage have out-of-pocket (OOP) costs for enrollees (e.g., premiums, deductibles, copays, etc.), they tend to be lower for Medicare Advantage plans.[5] Appendix Figure E.1 provides a more detailed breakdown of the Medicare program and the coverage options available to seniors.

Medicare Advantage uses a bidding system to determine the size and form of the plan subsidies.[6] Historically, the Centers for Medicare and Medicaid Services (CMS) administratively set payment rates for MA plans. This policy had mixed success. Insurers tended to participate in years when CMS offered higher payments or in specific geographies where the payments were greater or had healthier patients. Risk scoring was introduced in the late 1990s and early 2000s to address concerns about patient health risk. Policymakers sought to overhaul the system to address limited participation, provide more generous coverage to beneficiaries, and share cost savings with the government. The end result was a new subsidy system, which was first introduced in 2006 and amended slightly by the Affordable Care Act.

Medicare Advantage's subsidy system is organized around benchmarks. The benchmarks reflect the costs of providing coverage under Traditional Medicare to a typical beneficiary.[7] CMS sets these rates annually at the county-level and they are observed by insurers. CMS considers each county a distinct market and limits enrollees to choose among plans offered in their county of residence. Insurers submit estimates for their costs of providing Medicare coverage to that population for each plan they offer.[8] These submissions are evaluated against a plan benchmark, which is the average of the local benchmarks for each market in a plan's footprint weighted by expected enrollment. If a submission is below the plan benchmark, then the plan's payment per-beneficiary is equal to their submission multiplied by the beneficiary's risk score. Alternatively, when submissions are greater than or

[5] Traditional Medicare enrollees may purchase Medigap policies to cover some of these costs.

[6] While CMS uses the term "bidding system" and "bid" when discussing this process, they do not resemble auctions and I avoid using these terms when possible to prevent confusion.

[7] Specifically, the average beneficiary has a risk score equal to one.

[8] Insurers generally submit a single bid for each offered plan. Insurers are allowed to breakup a plan's footprint into multiple segments and submit separate bids for each segment. In practice the use of multiple segments is rare and I abstract from them in this paper.

equal to the benchmark, the plan's per-beneficiary payment is equal to the benchmark multiplied by the beneficiary's risk score. The Affordable Care Act lowered these benchmarks, limited how they could grow over time, and provided a bonus for high quality plans. Benchmarks provide clear incentives for entering a market and can directly impact the number of plans participating.

The firm subsidies also impact the premiums of Medicare Advantage plans. The premium a beneficiary pays is composed of three parts. The first is the Part B premium, which is also paid by Traditional Medicare enrollees and set by CMS annually. The second is the base premium which is equal to the difference between the subsidy the plan requested and the government benchmark if the requested subsidy is greater than the benchmark. If the requested subsidy is below the benchmark then the base premium is equal to zero. The third component is the supplemental premium which is equal to the revenue the plan requires to fund additional benefits not covered by TM. Plans may offset these costs with an additional payment they receive if their requested subsidy is below the benchmark. The size of this payment (called the "rebate") is a fraction of the difference between the requested subsidy and the benchmark.[9] By statute these rebates must be used to provide additional benefits and not kept as part of revenue. Thus, the premium for a Medicare Advantage plan relative to Traditional Medicare is equal to the sum of the base premium and supplemental premium.

Medicare Advantage uses a risk adjustment system to scale the subsidies paid to plans. These transfers to plans are adjusted linearly based on a beneficiary's risk score which is calculated by CMS (i.e., the subsidy for a beneficiary with a risk score 1.1 is 10% larger). Given this adjustment structure, enrollment in MA plans is typically weighted by beneficiary risk scores. The base risk score is the output of a CMS model that takes beneficiary demographics (i.e., age, gender, Medicare eligibility, and Medicaid status) and specific types of diagnoses from the prior year.[10] The base scores are then normalized by a factor based on

[9] The size of the fraction depends on the quality of the plan. Higher quality plans receive a larger fraction.

[10] The diagnoses that are included in the risk score calculation come from inpatient and outpatient hospital stays, physicians, and clinically trained non-physicians (e.g., psychologist, podiatrist, etc.). New beneficia-

TM costs such that the typical TM beneficiary has a risk score equal to one. Finally, risk scores for MA beneficiaries are scaled down to account for more intense coding of diagnoses for MA beneficiaries.[11]

II.B Data

My analysis uses information from 2016–2018 and primarily relies on three types of administrative data from the Medicare program. First, for every beneficiary eligible for Medicare, I observe their demographic information and choice of MA plan or TM. The second are medical claims for beneficiaries that enroll in TM. For a 20% random sample of TM beneficiaries each year I observe their inpatient, outpatient, and physician claims. I also have access to inpatient discharge records for 100% of the Medicare population. The third are records of encounters between MA beneficiaries and medical providers, which CMS recently made available for research. At a high-level these files contain information similar to medical claims except for service payments. The MA encounter data cover 100% of inpatient and outpatient records and physician encounters for a cohort of over 12 million beneficiaries, which covers roughly 52% of MA beneficiaries in my analysis sample. These data allow me to construct choice probabilities, risk scores, and county-level demographics for the Medicare population.

I supplement the administrative data with four additional sources. The first are characteristics for every MA plan offered including their premium, network type, and financial generosity as measured by expected out-of-pocket costs. The second are worksheets firms complete to receive their subsidies from the government. In particular, these files contain the specific subsidy amount the firm requested for the plan, how the plan's premium is broken down between the base and supplemental premium, how much supplemental revenue is

ries that do not have recorded diagnoses from the prior year use a different CMS model to calculate their base risk score.

[11] This pattern is referred to as "upcoding" and is pervasive among MA plans. This behavior costs the government more than $650 per-enrollee each year and is too large to be offset by the current adjustments used by CMS (Geruso and Layton, 2020).

required to fund extra benefits, and the allocation of rebate payments to cover these benefits. Third, from DRG InterStudy I observe county-level enrollment estimates for insurers by product type (i.e., commercial group, commercial individual, Medicaid managed care, etc.). Finally, I obtain information on provider supply and market characteristics from the Health Resources Services Administration, American Hospital Association, and Census Bureau. A detailed summary of every data set and its use within this paper is available in Appendix A.

There are two challenges to working with the MA encounter data. The first is the absence of payment information. I overcome this shortcoming by using a measure of healthcare utilization based on TM prices that was proposed by Jung et al. (2022) specifically for MA encounter data. I follow their implementation for deriving these standardized prices using all of the claims and encounter data available to me. I then merge these utilization metrics onto the MA encounter and TM claims data for consistency. The second challenge relates to the completeness of the encounter data that private insurers report to CMS. To attenuate this concern, I follow the procedures in Jung et al. (2022) to assess the completeness of the encounter data, which is based on comparing the encounter data to other sources that contain information about MA healthcare utilization (i.e., the Medicare Provider Analysis and Review (MedPAR) and the Healthcare Effectiveness Data Information System (HEDIS)). MA contacts have a high level of data completeness if they meet minimum thresholds for enrollment and the difference between the number of hospitalizations, ambulatory, or emergency department visits recorded in the encounter data and MedPAR or HEDIS. Appendix Table E.2, highlights that there are no systematic differences between MA beneficiaries enrolled in plans with a high degree of data completeness relative to those that are not.[12] Additionally, the utilization patterns I observe across TM and MA beneficiaries are consistent with other studies that do not rely on encounter data, which further mitigates concerns about encounter data completeness (Curto, Einav, Finkelstein, et al., 2019).[13]

[12] A similar exercise is presented in Appendix Table E.3 for TM beneficiaries. Individuals in the TM claims data are marginally more likely to be female or low income but the size of the difference is modest.

[13] Curto, Einav, Finkelstein, et al. (2019) find in 2010 for three MA insurers covering 40% of MA enrollees that the unadjusted difference in utilization in MA was 30% lower than TM. Since they also found that

Risk scores play an important role in my analysis. The risk scores that CMS calculates for each Medicare beneficiary are generally not produced in the files made available to researchers. However, CMS does provide the algorithms to generate these risk scores based on the demographic and diagnosis information that is made available. I lack the data to fully replicate the CMS risk scores because I do not have the all carrier claims or encounters. I address this challenge by approximating the CMS risk score using their published formula and diagnoses from inpatient claims, which I have for the universe of Medicare beneficiaries.[14] I first produce the base risk score using the CMS algorithm for the appropriate year with beneficiary demographics and prior year inpatient diagnoses. These base scores are then normalized by the average base score for all TM beneficiaries that year. Finally, risk scores for beneficiaries that were in a MA plan the previous year are deflated by the coding pattern adjustment reported by CMS.[15] To assess the quality of my approximated risk score, I aggregate my scores to levels where CMS reports average risk scores. Figure 1 plots the distribution of average risk scores at the county-level from 2017–2018 that I calculated against the values CMS reported for those counties. The means of the two distributions are nearly identical. The variance of the approximated risk score distribution is smaller relative to the true variance, consistent with the missing diagnoses. For a model of endogenous plan menus, approximating the risk score distribution well on average captures the first-order effects that impact whether a firm chooses to operate in a market. Any bias in the estimates of a firm's entry incentives from the reduced variance of the distribution is likely small.[16]

I restrict my analysis to beneficiaries eligible for Medicare due to age (i.e., non-disabled and non-ESRD) and are enrolled in TM or a MA HMO or Local PPO plan. Employer

MA plans paid prices similar to TM, this gap can be directly attributed to reduced utilization of healthcare services by MA beneficiaries. Once controls are added this gap becomes 9–25% lower than TM. Due to the large growth in MA penetration since 2010, it is intuitive that this gap has gotten smaller over time as more TM beneficiaries enroll into MA plans.

[14] Since I have 100% of TM inpatient discharges, I have all diagnoses recorded in the inpatient claims that I do not posses.

[15] These adjustments were 5.66% and 5.91% in 2017 and 2018 respectively.

[16] Appendix Figure E.2 plots the risk score distributions at the MA plan level using only inpatient diagnoses and all of the diagnoses necessary to compute risk scores.

sponsored, special needs plans, and Part B only plans are excluded. A small number of individuals are dropped because they are missing information necessary to calculate risk scores or are enrolled in a MA plan with missing characteristic information. See Appendix A for a detailed discussion of the sample criteria. After using the 2016 data to construct risk scores, my full sample for 2017–2018 contains 73,941,784 beneficiary-year observations and 40,141,182 unique beneficiaries. The utilization sample contains 4,424,824 beneficiary-years (2,410,546 beneficiaries). The full sample contains 3,702 plan-year observations for 2,263 unique MA plans I note that use of MA encounter data paired with plan-level subsidies is unique to this paper and is essential for implementing my model of endogenous plan menus.

Table 1 contains summary statistics for the Medicare Advantage markets in my sample. Beneficiaries typically face a premium of \$20 a month for MA plans, nearly all of which is used to fund supplemental benefits. MA plans are heavily subsidized by the government—the typical subsidy and rebate payments are approximately \$750 and \$66 per-beneficiary-per-month respectively—consistent with the benchmarks CMS sets for each market. CMS estimates that the average MA beneficiary will have \$140 per-month (\$1,680 annually) in out-of-pocket costs. The typical plan menu has seven plans offered by three firms. The majority of these plans are HMOs, which tend to have lower costs, narrower networks, and cost controls relative to Local PPOs. Roughly three of the plans in the menu are considered "high generosity" based on monthly out-of-pocket cost estimates. Despite having several plans, most plan menus are highly concentrated, which suggests plans may have considerable power in these markets.

III Descriptive Analysis

This section uses reduced form methods to highlight variation in my setting that is critical for the identification of my model health insurance supply and demand. First, I demonstrate how government policies influence the characteristics of MA plans in local markets. These policies act as source of plausibly exogenous variation in the financial generosity of the health insurance menus available to consumers in different markets throughout the country. I then demonstrate how this variation in plan menu generosity allows me to separately identify healthcare utilization driven by private health information from moral hazard—an essential feature to identified the model of healthcare utilization and demand.

III.A How policy influences plan characteristics

Firms offering Medicare Advantage plans receive two payments from the government. The first is a subsidy for every beneficiary they enroll and the second is a rebate that is paid to plans that request subsidies below the government's TM cost benchmarks. Rebates must be used to provide more generous benefits to enrollees. I demonstrate how firms respond to changes in these payments by leveraging a policy shock that was introduced by the Affordable Care Act (ACA).

The ACA directly altered both payments to Medicare Advantage plans. These changes were motivated in part to address concerns about over-payments to plans participating in the program. The ACA aimed to lower subsidy payments by lowering the TM cost benchmarks to better align them realized TM costs and limit how they could grow over time. The ACA sought to lower rebate payments by reducing the allowable fraction of the difference between the subsidy and the cost benchmark.[17] In general these reforms were successful in lowering the payments MA plans received and I quantify the size of these reductions in Appendix B.

To analyze how firms responded to the ACA reforms, I leverage the law's phased implementation from 2012–2016. Counties were given 2, 4, or 6 year transitions based on how far their current benchmarks were from the targets mandated by the ACA.[18] I leverage this plausibly exogenous shock to the benchmarks to quantify how the characteristics of MA

[17]Despite aiming to reduce these payments, the ACA also introduced quality adjustments that increased benchmarks and allowable rebate fractions for plans with higher star ratings. These limited the size of the payment reductions for these types of plans.

[18]Changes to the rebate fraction were phased in from 2012–2013 and did not vary by county or plan type.

plans responded to these reductions by comparing county-level values pre- and post-ACA implementation by estimating models of the following form:

$$Y_{mt} = \beta_0 + \beta_1 B_{mt} + \beta_2 \text{Post-ACA}_{mt} + \beta_3 B_{mt} \times \text{Post-ACA}_{mt} + \beta_m + \beta_t + \epsilon_{mt} \qquad (1)$$

where Y_{mt} is the market average characteristic, B_{mt} is the cost benchmark for market m in year t, Post-ACA$_{mt}$ is an indicator for whether county m has transitioned to ACA rates, and β_m and β_t are county and year fixed effects respectively. The sample for these regressions exclude counties that are mid-transition.

Table 2 reports the estimated effects of changes to benchmarks on three plan characteristics. The first column examines the effect on the subsidies MA plans request from the government. There is a positive and statistically significant relationship between benchmarks and subsidies. A $1 increase in benchmarks is associated with a $0.39 increase in MA plan subsidies. My estimates also indicate that the ACA's reduction in benchmarks also resulted in a statistically significant reduction in MA plan subsidies. The next column considers the effects of ACA reforms on MA plan prices. I find a significant inverse relationship between benchmarks and premiums, albeit relatively small in magnitude. This relationship is intuitive given how premiums are regulated in MA—where subsidy requests above the benchmark are passed to consumers as part of the base premium. However, I find no significant association between benchmarks after the ACA transmission and plan premiums. The final column considers the average amount of extra coverage MA provides relative to TM as measured by OOPC. Higher benchmarks are significantly associated with lower amount of extra coverage. Following the implementation of the ACA's lower benchmarks, the amount of extra coverage in MA plans increases significantly with benchmarks. This pattern is also intuitive. Results in column 1 show subsidy requests declined following the passage of the ACA. When MA plan's request lower subsidies they will increase the size of their rebate payments, which must be used to provide beneficiaries with extra benefits.

This analysis illustrates how exogenous policies impact the characteristics of MA plans consumers face in their local markets. As the cost benchmarks change each year, firms update their subsidy requests and collect rebate payments. These rebates are reinvested by the plans to provide additional benefits relative to TM. A result of this structure, variation in the cost benchmarks creates variation in the generosity of the health insurance menus different consumers face.

III.B Decomposing healthcare utilization

The previous section illustrated how government policy creates plausibly exogenous variation in the generosity of the health insurance plans available to consumers across markets. This section demonstrates how this variation in plan menu generosity can be used to decompose healthcare utilization driven by private health information and moral hazard. Quantifying and decomposing these patterns is important for motivating the structure of the equilibrium model of health plan demand that can account for selection on both health information and moral hazard.

To get a sense for the incidence of selection in Medicare Figure 2 plots average healthcare utilization along two margins. The left panel compares utilization among TM and MA beneficiaries unconditionally and conditional on the six most common groupings of observable characteristics.[19] TM beneficiaries tend to utilize more healthcare than MA beneficiaries unconditionally and conditional on observable characteristics. This pattern could be explained by either unobserved health differences or steps MA plans take to manage the amount of healthcare their enrollees consume. The right panel compares utilization among MA beneficiaries across plans with different levels of financial generosity. Utilization tends to be greater in MA plans with a high level of financial generosity unconditionally and conditional on observed characteristics. Greater health needs or moral hazard could rationalize

[19]These groupings summarize a beneficiary's risk score, age, gender, income, and their county's Medicare mortality and Medicaid eligibility rates.

the higher utilization in more financially generous MA plans.

Variation in plan menu generosity created by MA benchmarks is essential for separating moral hazard utilization from health driven utilization. The validity of this design requires that the generosity of plan menus is exogenous to unobserved factors that may impact the amount of healthcare an individual consumes. If this assumption holds then the extent to which observably similar beneficiaries facing health plan choice sets with differing levels of financial generosity use different amounts of healthcare can be attributed to moral hazard as opposed to private health information. The prior section documented how benchmarks are capable of generating variation in plan menu generosity. While the ACA was the last large scale reform to these payments, they are updated annually consistent with that legislation. Firms observe these new benchmarks each year and subsequently make their participation and plan offering decisions. To demonstrate how plan menu variation isolates moral hazard healthcare utilization I estimate the following model:

$$Q_{ijt} = \beta_0 + \beta_1 \text{Menu Gen}_{m_{(i)}t} + \beta_2 \mathbf{X}_{it} + \beta_3 \mathbf{K}_{m_{(i)}t} + \beta_4 \mathbf{C}_{j_{(i)}t} + \beta_t + \epsilon_{it} \tag{2}$$

where Q_{ijt} measures the healthcare utilization of beneficiary i in plan j during year t; Menu $\text{Gen}_{m_{(i)}t}$ measures the financial generosity of the plan menu in market m; $\mathbf{X}_{it}$, $\mathbf{K}_{it}$, and $\mathbf{C}_{it}$ are vectors of individual, market, and plan controls respectively; and β_t is a time fixed effect.

Estimates for this model are presented in Table 3. The table presents two different measures of plan menu generosity. The first is the average rebate CMS paid to MA plans in a beneficiary's market, which firms are required to use to increase the financial generosity of their plans. Thus larger rebates should be associated with plans that provide coverage for more services or better cost sharing—characteristics of more generous plan menus—and higher levels of healthcare utilization. The second generosity measure is the probability that a beneficiary enrolls in a plan with a high level of financial generosity (as measured by OOPC).[20] As the probability of enrolling in a generous MA plan increases, we would expect to see a positive relationship between this menu generosity measure and healthcare utilization to be consistent with a moral hazard interpretation.

My estimates support the hypothesis that plan menu variation can separately identify healthcare utilization driven by moral hazard from private health information. Absent controls MA plan rebate payments have a positive and statistically significant correlation with healthcare utilization. This finding is robust to the inclusion of controls for the observed characteristics of a beneficiary, their market, and chosen MA plan. While there is no significant unconditional correlation between healthcare utilization and the probability of enrolling in a generous MA plan, once controls for observable characteristics are included, the relationship is positive and statistically significant. I leverage this variation in plan menu generosity to identify moral hazard within my model of health insurance demand and utilization.

IV Empirical Model

To quantify the costs of promoting choice in competitive health insurance markets I develop an equilibrium model of supply—who enters and what products are offered—and demand—which plans are chosen and utilized. The model is static and has two stages. Figure 3 summarizes the timing, decisions, and information structure of the model. In Stage 1, firms observe their fixed cost shocks and the distribution of shocks they will face in Stage 2. Given this information, the firms simultaneously decide which plans to offer in each market within their service areas. Plans are defined as a network type-generosity bundle (i.e., HMO-High, HMO-Low, Local PPO-High, or Local PPO-Low). In Stage 2, firms choose their subsidies which determines the premiums for their plans. Individuals then choose whether to enroll in a MA plan offered in their market (i.e., county of residence) or TM. Individuals do not

[20] This probability is based on the observed market shares of MA plans in each market.

have complete information of their health state and must choose the plan that provides them with the highest expected utility. After choosing a plan individual's observe the realization of their health state and choose how much healthcare to utilize. Firm profits depend on individual enrollment and utilization decisions.

This model has a subgame perfect equilibrium (SPE) solution concept. A SPE requires that conditional on an outcome in Stage 1 of the model, Stage 2 results in a unique Nash Equilibrium in the subsidy decisions across firms. As a result multiple SPEs are possible for difference outcomes in Stage 1. In practice this multiplicity arises from different plans entering a market or plans entering with different characteristics (i.e., high or low generosity). An implication of this feature of the model is that parameters in Stage 1—which impact the fixed costs of entry—are partially identified while Stage 2 parameters—which influence demand and the health state distribution—are point identified. In the following sections I describe the details of the model. Consistent with the intuition for solving for SPE, they are covered in reverse order.

IV.A Demand

IV.A.1 Healthcare utilization

An individual i is defined by a bundle $(\mathbf{C}_i, \Upsilon_i)$, where $\mathbf{C}$ is a vector of observable characteristics (e.g., age, sex, income, etc.) and Υ is a vector of unobservable characteristics that influence healthcare consumption and plan choices. Individuals realize their health state h_{it} after choosing a health plan j for year t. Given this information they choose the optimal amount of healthcare to utilize Q^*_{ijt} by maximizing the tradeoff between their utility from consuming healthcare and the cost of that level of consumption given their chosen plan's cost structure.

$$\max_{Q_{ijt}} \quad u(Q_{ijt}; h_{it}, \omega_i, j) = v(Q_{ijt}, h_{it}, \omega_i) - \phi_{ijt} 1[Q_{ijt} > 0] - OOP_{ijt}(Q_{ijt}) \tag{3}$$

where

$$v(Q_{ijt}, h_{it}, \omega_i) = Q_{ijt} - h_{it} - \frac{1}{2\omega_i h_{it}}(Q_{ijt} - h_{it})^2 \tag{4}$$

$$\phi_{ijt} = \exp(\mathbf{X}^{\phi}_{ijt}\boldsymbol{\beta}^{\phi}) \tag{5}$$

Following Einav, Finkelstein, Ryan, et al. (2013) the value of healthcare utilization in Equation (4) is quadratic in the difference between the individual's healthcare utilization and health state. The parameter ω_i captures how responsive an individual's healthcare utilization decision is to its costs and is typically interpreted the individual's elasticity of demand for healthcare or moral hazard. Like Ho and Lee (2022), the moral hazard parameter is interacted with an individual's health state which implies that the effect of moral hazard is increasing in an individual's health need. Individuals face two costs associated with healthcare utilization. The first is a "hassle cost" captured by ϕ_{ijt}, which was first introduced by Ho and Lee (2022). This term captures the barriers individuals navigate to access care. As show in Equation (5), cost varies with the network type of the plan an individual has chosen (i.e., TM, MA-HMO, or MA-PPO). The second cost of utilization are the out-of-pocket costs which are represented by $OOP_{ijt}(\cdot)$ and varies by plan type (i.e., network type and generosity level). Details about these cost structures and the solution to the utilization problem are available in Appendix C.

IV.A.2 Health state distribution

The health state of individuals follows a log normal distribution $F_{it}(h)$:

$$\log h_{it} \sim \mathcal{N}(\mu_{it}, \sigma^2_{h,it}) \tag{6}$$

Variation in the parameters μ_{it} and $\sigma_{h,it}$ generates selection in the model by altering the amount of healthcare an individual chooses to consume. Consistent with the descriptive analysis, the model allows for selection to arise based on both observable and unobservable characteristics.

The mean of an individual's health μ_{it} and moral hazard ω_i are jointly normally distributed as follows:

$$\begin{bmatrix} \mu_{it} \\ \log \omega_i \end{bmatrix} \sim \mathcal{N}\left(\begin{bmatrix} \mathbf{X}_{it}^{\mu} \boldsymbol{\beta}^{\mu} \\ \mathbf{X}_{i}^{\omega} \boldsymbol{\beta}^{\omega} \end{bmatrix}, \begin{bmatrix} \sigma_{\mu}^2 & \\ \sigma_{\mu,\omega}^2 & \sigma_{\omega}^2 \end{bmatrix} \right) \tag{7}$$

where the means are a function of observable characteristics $\mathbf{X}_{it}^{\mu}$ and $\mathbf{X}_{i}^{\omega}$. Unobserved heterogeneity in μ_{it} and ω_i arise through the variance and covariance parameters of this joint distribution. The variance of the health state distribution $\sigma_{h,it}$ is modeled as a projection onto observable characteristics $\mathbf{X}_{it}^{\sigma}$:

$$\sigma_{h,it} = \mathbf{X}_{it}^{\sigma} \boldsymbol{\beta}^{\sigma} \tag{8}$$

Let θ_1 summarize the parameters of the health state distribution and hassle costs to estimate. This vector includes the mean shifters $\{\boldsymbol{\beta}^{\mu}, \boldsymbol{\beta}^{\omega}, \boldsymbol{\beta}^{\sigma}, \boldsymbol{\beta}^{\phi}\}$ and the variance-covariance parameters $\{\sigma_{\mu}, \sigma_{\omega}, \sigma_{\mu,\omega}\}$.

IV.A.3 Plan choice

Individuals must choose among the health insurance plans in their market's plan menu $\mathcal{J}_{mt}$. Markets are defined as a county-year pair, where counties are indexed by m. An individual chooses the health insurance plan $j \in \mathcal{J}_{mt}$ that maximizes their expected utility over their health state distribution.

$$\max_{j \in \mathcal{J}_{mt}} \quad U_{ijmt} = \int -\exp(-\psi \times l_{ijmt}(h)) dF_{imt}(h) \tag{9}$$

where ψ is the coefficient of absolute risk aversion common to all beneficiaries, where $\psi = \exp(\beta_{\psi})$. The term l_{ijmt} summarizes the plan and individual characteristics that contribute to the utility of plan j. The outside option is Traditional Medicare ($j = 0$) whose expected utility is normalized to one.

The factors that enter l_{ijmt} are noted in Equation (10). The first term is the mean utility of the plan common to all individuals in the market. This mean utility may depend on observable characteristics like the plan's star rating or provider network (X_{jmt}) and an unobservable demand shock ξ_{jmt}. The second is the plan premium p_{jt}, which may differentially impact beneficiaries with low-incomes (y_{it}). The third component is the individual's utility they will receive from the plan given their health state realization and the amount of healthcare they expect to utilize. These quantities depend on the amount of out-of-pocket costs and the hassle costs the individual will incur, which depend on the network type and generosity of plan j. The fourth component ι_{ijmt} captures the switching costs of changing from TM to MA. The switching cost is only incurred for beneficiaries changing out of TM from the prior year and not beneficiaries that pick a coverage option for the first time. The final component is the idiosyncratic logit taste shock ϵ_{ijmt}.

$$l_{ijmt} = \delta_{jmt} + \alpha_{it} p_{jt} + \beta_{it} u(Q_{ijt}; h_{it}, \omega_i, j) + \iota_{ijmt} + \epsilon_{ijmt} \tag{10}$$

where

$$\delta_{jmt} = \theta_2 X_{jmt} + \xi_{jmt} \qquad \alpha_{it} = \alpha_0 + \alpha_1 y_{it} \qquad \beta_{it} = \beta_0 + \beta_1 y_{it}$$

Based on their observed characteristics $\mathbf{C}_i$, individuals are classified into types which are indexed by $c \in C$, where C is the set of all possible combinations of observed characteristics. Let s_{cjmt} denote the probability that individuals in group c in market mt choose plan j.[21] The plan's market share s_{jmt} is obtained by integrating these choice probabilities over the distribution of observable types within the market. Finally, let θ_3 denote the parameters in the utility function that are independent of mean utility $\{\beta_\psi, \alpha_0, \alpha_1, \beta_0, \beta_1, \iota\}$.

[21]Individual of the same type have the same amount of expected healthcare utilization.

IV.B Supply

IV.B.1 Subsidy choice and plan premiums

After plans have entered markets within their service area (typically a state), firms choose their subsidies from the government.[22] A firm chooses the subsidy for each plan by maximizing their expected profits across all markets the plan entered within a service area. Let A_{jt} denote the set of counties plan j entered within service area A in year t. Firms choose the plan subsidy b_{jt} by solving.

$$\max_{b_{jt}} \quad \Pi_{jt} = \int \sum_{m \in A_{jt}} \sum_{c \in C} \left[\mathrm{MR}_{cjmt} - \mathrm{MC}_{cjmt}\right] s_{cjmt}(\mathbf{b};\theta) M_{cmt} dF_{ct}(h) \tag{11}$$

where M_{cmt} is the number of type c beneficiaries in market mt and MR_{cjmt} and MC_{cjmt} are specified as:

$$\mathrm{MR}_{cjmt} = \bar{r}_{cmt} \min\{b_{jt}, B_{jt}\} + p_{jt} \qquad \mathrm{MC}_{cjmt} = \Lambda_{jt} Q^{*}_{cjt}(h) + \lambda_{jt} \tag{12}$$

The marginal revenue for enrolling an individual of observed type c is denoted by MR_{cjmt}. Three items contribute to marginal revenue. The first is the subsidy payment the plan receives from the government, which is equal to the requested b_{jt} if the request is below the plan's cost benchmark $B_{jt} = \sum_{m \in A_{jt}} B_{mt} w_{mt}$, where w_{mt} are market size weights.[23] If the requested subsidy is above the benchmark, the plan's subsidy payment is equal to the benchmark. These payments from the government are risk adjusted based on the average risk score of beneficiaries of observed type c in the market $\bar{r}_{cmt}$. The second and third components of marginal revenue are the plan premium and residual rebate payment. These objects are discussed later in this section.

[22] In general service areas are states. A more detailed discussion of service areas is provided in Appendix C.

[23] In practice county-level benchmarks are weighted by the plan's projected enrollment. Market size weights ease the burdens for computing the model's solution. Market size is also strongly correlated with realized enrollment.

The marginal cost for a type c individual denoted by MC_{cjmt}. This cost is broken down into components. The first term captures how plan costs depend on the amount of healthcare they expect beneficiaries will consume. The term Λ_{jt} represents the price that MA plan j pays providers for the healthcare utilization of the beneficiaries in their plan. Since prior empirical work has documented that MA plans tend to pay similar prices to healthcare providers as TM.[24] Consistent with these fact patterns I assume $\Lambda_{jt} = 1$. The second term λ_{jt} is an unobserved cost that captures non-utilization contributions to marginal costs.

Medicare Advantage premiums are modeled consistent with the policy environment described earlier. They are primarily a function of the plan's subsidy request and the amount of additional benefits the plan offers relative to TM.

$$p_{jt} = \underbrace{\max\{b_{jt} - B_{jt}, 0\}}_{\text{base}} + \underbrace{\max\{\mathrm{SR}_{jt} - \mathrm{Rebate}_{jt}, 0\}}_{\text{supplemental}} + \varepsilon_{1jt} \tag{13}$$

where $\mathrm{Rebate}_{jt} = \max\{\kappa_{jt}(B_{jt} - b_{jt}), 0\}$ and the size of κ_{jt} depends on the star rating of the plan.[25]

The supplemental revenue MA plans need to provide additional benefits is denoted as SR_{jt}. Plans can offset these costs with rebate dollars. Plans with a rebate that exceeds the value of this supplemental keep that difference as revenue. The unobservable ε_{1jt} is an unobservable measurement error that rationalizes Equation (13) at observed subsidies. I project the amount of supplemental revenue onto a vector of plan characteristics W_{jt} that includes the plan's network type, quality rating, and generosity level. The unobservable ε_{2jt} is an efficiency shock the plan receives to the amount of revenue required to fund these extra benefits. This structure allows me to model how the amount of supplemental revenue a plan

[24] See e.g., Curto, Einav, Finkelstein, et al. (2019), Pelech (2020), and Trish et al. (2017).

[25] The levels of κ_{jt} are 0.50 if the plans has 3 stars or fewer, 0.65 if the plan has 3.5 or 4 stars, and 0.70 if the plan has 4.5 or 5 stars.

requires for high vs low generosity plans may change under counterfactual plan menus.

$$\text{SR}_{jt} = \theta_4 W_{jt} + \varepsilon_{2jt} \tag{14}$$

IV.B.2 Fixed costs of entry

Firms are endowed with CMS contracts that define the set of possible plans they may offer within a service area A. Each year firms decide which plans they will offer in each market within the service area. The primary fixed cost of entry into a market is establishing a new or updating an existing network of providers enrollees may use to receive healthcare services. A Medicare Advantage plan's provider network must annually certify that it meets network adequacy and access criteria established by CMS. Given this institutional setting it is useful to think of the entry decision as reoccurring each year, which abstracts from distinctions between sunk vs fixed costs of entry.

I assume that a firm's fixed cost for offering MA plans is additively separable across markets and has an observable and unobservable component. For expositional ease I drop the year subscripts t. Let A_n denote the set of markets that firm n has chosen to enter within service area A. The fixed cost for insurer n to offer MA plans in service area A is:

$$F_{nA} = \sum_{m \in A_n} \left[F_{nm} + \nu_{2nm} \right] \tag{15}$$

The observable component of the fixed cost of entering market m has three parts. The first measures the number of plans the firm has chosen to enter into market m. The second and third components are measures of provider supply. Specifically, H_m measures the number of hospital systems in the market and P_m denotes the number of primary care physicians active in the market. These terms are intended to capture—in a reduced form manner—the costs of bargaining with providers to join the firm's network. I allow the parameters on these terms to vary based on whether firm n has an existing provider network in the market from another insurance segment (e.g., commercial group, individual, exchange etc.). This feature captures efficiencies some insurers may have that eases entry into Medicare Advantage.

$$\begin{aligned} F_{nm} &= \rho_1 1[\text{Number of plans}]_{nm} + \rho_{2n} H_m + \rho_{3n} P_m \\ \text{where} \qquad \rho_n &= \rho_{\text{net}} 1[\text{Other presence}]_{nm} + \rho_{\text{none}} \left(1 - 1[\text{Other presence}]_{nm}\right) \end{aligned} \tag{16}$$

The unobserved component of fixed costs are denoted by ν_{2nm}, which are independent over time. These costs are observed by firms when making their Stage 1 decisions and the selection problem they create is discussed more in Section V. After observing ν_{2nm}, firms simultaneously choose which plans to enter into a market by weighing their expected profits against their fixed costs of entry. Firms calculate their expected profits over the joint distribution of the Stage 2 unobservables $e = (\xi, \varepsilon_1, \varepsilon_2)$. I assume that firms know the form of this distribution but not the realizations they will face. Finally, ν_{1A} denotes a mean zero expectation error, which implies firms accurately predict their variable profits across all markets within a service area. Thus a firm will add plan j to the set of products it offers in the service area $\mathcal{J}_{nA}$ if the expected profits of offering the plan exceed its fixed costs:

$$\underbrace{\sum_{j \in \mathcal{J}_{nA}} \mathop{\mathbb{E}}_{e} \left[\Pi_{jA}(A_n; e)\right] + \nu_{1jA}}_{\text{expected variable profits}} - \underbrace{\sum_{m \in A_n} \left[F_{nm} + \nu_{2nm}\right]}_{\text{fixed costs}} \geq 0 \tag{17}$$

IV.C Identification

The objects to identify in this model are the joint distribution of individual health states, moral hazard, and willingness to pay associated with vertically and horizontally differentiated health plans. Each year, CMS updates the county-level benchmarks for the cost of providing TM benefits. Based on these revised benchmarks firms make their entry and subsidy decisions, which creates variation in plan menus. I observe how individual health plan and utilization choices respond to these changes in plan menus, which enables me to identify the objects of interest. The three identification concerns are (i) distinguishing the unosbservable components of the health state distribution from plan specific decreases in utilization, (ii) distinguishing healthcare utilization driven by health status from moral hazard, and (iii) potential endogeneity between unobserved demand shocks and plan premiums. Each of these concerns are addressed below.

As shown in Figure 2 there are differences in healthcare utilization among observably similar consumers by TM and MA enrollment. This wedge can be explained by unobservable differences in the mean of the health state distribution or through the plan effects within the hassle costs of utilizing healthcare. Plan effects are identified from variation in utilization by observably similar individuals across different plan types. Unobservable heterogeneity in the health state distribution is identified variation in utilization over time among observably similar individuals. The extent to which observably similar individuals within the same type of plan utilize different amounts of healthcare each year helps pin down these parameters. Given the relatively short panel in my data the identification of the unobserved heterogeneity parameters is aided by the functional form assumption for this unobserved heterogeneity.

Figure 2 also highlights that healthcare utilization is higher in more generous MA plans unconditionally and conditional on observables. This pattern could be explained by greater health needs (adverse selection through h_{it}) or moral hazard (ω_i). I exploit variation in plan menus induced by the CMS benchmarks to distinguish these channels. Plan menu variation is typically used to separately identify utilization driven by private health information from moral hazard (Einav, Finkelstein, Ryan, et al., 2013; Marone and Sabety, 2022; and Ho and Lee, 2022). Observably similar beneficiaries face plan menus with different levels of generosity across markets. Variation in their realized utilization identifies moral hazard from utilization driven by health need. By similar logic, healthcare consumption driven by health need is identified by observably similar beneficiaries different types of plans when facing plan menus with similar generosity levels. As discussed previously, panel variation in utilization identifies unobserved heterogeneity in moral hazard and the health state mean.

I observe the same individuals making different plan and utilization choices as plan menus respond to changes in CMS benchmarks each year. Variation in these choices over time identifies these parameters.

A novel aspect of my model is that it features a supply side in addition to the rich treatment of individual health plan and utilization decisions. A standard concern is the potential correlation between unobservable plan characteristics and the choices made by firms. To address this endogeneity problem I rely on instrumental variables. I use functions of CMS benchmarks, marginal revenue around the benchmark, and the demographics in the markets of a plan's competitors as instruments.[26] The benchmarks and marginal premium revenue correlate with the plan's subsidy choice, which are an important determinant of the plan's premium. The intuition for the market demographics instruments follows Fan (2013). Healthcare utilization is correlated with observable characteristics. Thus, the demographics fo the Medicare population in a county influence the costs of offering a MA plan. Suppose there are two plans A and B, which overlap in market 1 while only plan B is present in market 2. The demographics of market 2 directly impact plan B's choices and indirectly impact plan A's choices through the competition channel in market 1. Thus the demographics from market 2 can serve as an instrument for plan A's choices in its markets.

Given the multiple equilibria of the model, I partially identify the fixed cost parameters. I rely on moment inequalities derived from a revealed preference assumption in the style of Pakes et al. (2015) to estimate the identified set. The specific construction of the moment inequalities is addressed in the next section. It is important to note that the derivation of these inequalities relies on my ability to point identify the other parameters of the model. This feature allows me to solve the counterfactual equilibria that could have arisen but were not observed in data.

[26]The marginal revenue around the benchmark is determined by κ_{jt}. The size of κ is determined by a plan's star rating, which is exogenous within the model.

V Estimation and Results

I estimate the model using moment equalities and inequalities. I search for the set of Stage 2 parameters to match moment equalities targeted to observed healthcare utilization patterns, type level choice probabilities, and the IV restriction. I also constrain the plan level market shares predicted by the model to match those observed in the data. A discussion of the moment equalities used to estimate the Stage 2 parameters is available in Appendix C. Unobserved marginal costs are recovered analytically using the Stage 2 parameter estimates and data on MA plan profit margins. The Stage 1 parameters are set identified using moment inequalities derived from revealed preference. This section discusses the derivation of the moment inequalities and their use for inference followed by model estimates.

V.A Moment inequality derivation and inference

Derivation. To derive the moment inequalities I need the distribution of Stage 2 shocks and resolve the selection bias introduced by the unobserved fixed costs. The Stage 2 distribution of unobservables $e = (\xi, \varepsilon_1, \varepsilon_2)$ is required to calculate a plan's expected variable profits. I recover this empirical distribution given estimates for the Stage 2 model parameters $\Theta = \{\theta_1, \theta_2, \theta_3, \theta_4\}$. The unobserved fixed costs ν_{2nm} create a selection problem because firms observe these costs when maxing their entry decisions. This feature will introduce bias to the estimates for the identified set if unaddressed. I use two assumptions to eliminate this bias. First, I assume that the ν_{2nm} costs are additively separable across each plan the firm offers in market m:

$$\nu_{2nm} = \sum_{j \in \mathcal{J}_{nm}} \nu_{2njm} \tag{18}$$

Second I assume the same plan offered in adjacent markets within a service area has the same unobserved fixed cost ν_2. This assumption is supported when viewing the unobserved fixed costs as regulatory compliance, business intelligence, and marketing, which are unlikely to vary meaningfully across markets. Firms likely rely on common personnel for these tasks and the amount of resources devoted to them likely scales with the number of markets a particular plan enters. Moreover, since product characteristics (including provider networks) are fixed across a MA plan's footprint they are likely to attract similar consumers in each market. As a result the plan will incur similar costs from their utilization across markets.

Unbiased moment inequalities are derived based on revealed preference and the ν_2 assumptions. Revealed preference requires that the entry and product offering decisions observed in data are optimal relative to the other choices that the firm *could* have made. Let A_n and $\mathcal{J}_{nA}$ denote the observed market and product offerings decisions firm n made in service area A and A'_n and $\mathcal{J}'_{nA}$ denote their unobserved analogs. Revealed preference implies:

$$\sum_{j\in\mathcal{J}_{nA}} \mathop{\mathbb{E}}_{e}[\Pi_{jA}(A_n;e,\Theta)]+\nu_{1jA}-\sum_{m\in A_n}[F_{nm}+\nu_{2nm}] \geq \sum_{j\in\mathcal{J}'_{nA}} \mathop{\mathbb{E}}_{e}[\Pi_{jA}(A'_n;e,\Theta)]+\nu_{1jA}-\sum_{m\in A'_n}[F_{nm}+\nu_{2nm}] \tag{19}$$

Suppose the firm removes plan j from market m such that $A'_n = A_n \setminus m$. I rearrange the terms in Equation (19) such that:

$$\Delta \sum_{j\in\mathcal{J}_{nA}} \mathbb{E}[\Pi_{jA}(A_n, A'_n)] + \Delta\nu_{1jA}(A_n, A'_n) - F_{nm} - \nu_{2nm} \geq 0 \tag{20}$$

where $\Delta X(A_n, A'_n) = X(A_n) - X(A'_n)$.

The assumption that ν_{2nm} is separable across plans isolates a specific plan's ν_{2njm} shock for that market with this initial difference. To address the lingering unobserved cost I rely on the assumption that $\nu_{2njm} = \nu_{2njm'}$ if m and m' are adjacent. I combine two versions of Equation (20) such that:

$$\underline{\Delta}\sum_{\mathcal{J}_A} \mathbb{E}[\Pi(m,m')] + \underline{\Delta}\nu_1(m,m') - \underline{\Delta}F(m,m') - \underbrace{(\nu_{2njm} - \nu_{2njm'})}_{\approx 0} \geq 0 \tag{21}$$

where $\underline{\Delta} X(m,m') = \Delta X(A_n, A'_n) - \Delta X(A_n, \hat{A}_n)$ and $\hat{A}_{n'} = A_{n'} \setminus m'$.

It remains to address the approximation errors ν_1. Recall that these errors are mean zero across all markets within a service area. This error is eliminated by averaging over all the pairwise combinations of Equation (21) for each market within a service area. This procedure yields a set of unbiased moment inequalities for plan j.

$$\mathbb{E}[m_j(\theta)] = \mathbb{E}[\underline{\Delta} F(m,m') - \underline{\Delta} \sum_{\mathcal{J}_A} \mathbb{E}\,\Pi(m,m') - \underline{\Delta}\nu_1(m,m')] \leq 0 \tag{22}$$

where the expectation is taken over adjacent market combinations within a service area.

I generate additional inequalities by multiplying each plan inequality with a set of "instruments" that are independent of the unobservable ν terms. Specifically, I leverage the independence over time assumption and use lagged counts of markets with existing provider networks and provider supply counts as instruments. These two types of moment inequalities form the null hypothesis for the inference procedure I use to construct an estimate for the identified set of fixed cost parameters.

Inference. I use these inequalities to conduct inference on the identified set of fixed cost parameters. I follow the inference procedure proposed by Chernozhukov, Chetverikov, and Kato (2019), which is well suited for models with many moment inequalities. Their procedures are built around a studentized test statistic that detects violations of the moment inequalities.

$$T = \max_{1 \leq k \leq K} \frac{\sqrt{D}\varphi_k}{\varsigma_k} \tag{23}$$

where k indexes the moment inequalities, K denotes the total number of inequalities, and φ and ς are the mean and standard deviation of the moment inequalities.

I implement the self-normalized one step procedure, which has a closed form for its critical values. This feature lowers the procedure's computational burden relative to multi-step or bootstrap alternatives. The tradeoff is that the identified sets may be more conservative.

Additional details related to the computation of the moment inequalities and the inference procedure are presented in Appendix C.

V.B Results

Table 4 report demand estimates and quantities of interested implied by the model from my preferred specification. The underlying parameter estimates for the health state distribution are difficult to interpret on their own and are available in Appendix Table E.5.[27]

The top panel of Table 4 contains the demand parameter estimates. Demand slopes down in price, with lower income beneficiaries having a higher degree of price sensitivity. The magnitude of this estimate is consistent with the low premiums observed in the data. Over 53% of MA plans in the analysis sample have a premium of $0 and the average annual premium in thousands of dollars is $0.24. Individuals value the utility they expect to receive from utilizing healthcare in their chosen plans. This quantity takes into account the value of the healthcare they plan to utilize given their realized health state net of hassle and OOPCs. The relative size of this coefficient is smaller then the premium coefficient, suggesting that consumers primarily respond to immediate changes in price then changes in their expected utilization and its associated costs. This tradeoff is strongest for lower income individuals that are more price sensitive and place less weight on their utilization stage utility.

The bottom panel of Table 4 presents quantities implied by the demand and utilization model. To test the size of moral hazard spending within the model I quantify the percent change in healthcare utilization as the coninsurance rate moves from 100% to 0% holding deductibles and out-of-pocket maximums fixed. The changes in utilization are greatest for beneficiaries enrolled in TM (14.69%) relative to individuals in a MA plan (5.31%–6.97%).[28] The different magnitude of the moral hazard effects between TM and MA is consistent with

[27] Estimate for the supplemental revenue regression are available in Appendix Table E.6.

[28] Other studies have estimated similar amounts of moral hazard: Dickstein, Ho, and Mark (2023) 22% and 11%; Ho and Lee (2022) 26.3% and 3.5%; Marone and Sabety (2022) 24% and 14%; and Einav, Finkelstein, Ryan, et al. (2013) 30%.

MA plans taking measures to limit the amount of healthcare their enrollees utilize, which are not present in TM. These effects are captured by the hassle cost parameters, whose implied dollar values are about \$150 for TM, \$1,230 of MA PPOs, and \$1,610 for MA HMOs. These implied MA hassle costs are inline with estimates from Ho and Lee (2022) which ranged from \$550–\$1,710. Switching costs between TM to MA are large ranging from \$530–680. The estimated CARA coefficient implies an individual would be indifferent between earning nothing and a 50-50 gamble where they win \$100 or lose \$99.89.[29] The estimated CARA coefficient implies more risk neutral behavior, which could reflect the low financial risk seniors in the model face given the generous cost sharing and low out-of-pocket maximums of MA plans.[30]

Table 5 contains estimates for the identified set of fixed cost parameters. For computational reasons, I used a subset of moment inequalities from 20% of service areas. The identified set does not contain zero for any of the fixed cost parameters and their signs have intuitive interpretations. For example, fixed costs increase with the number of plans offered within a market. This estimate appears consistent with the significant amount of regulatory compliance Medicare Advantage plans must satisfy and complete before entering the marketplace. My estimates suggest that fixed costs are substantially lower (roughly 75% based on the median of the intervals) in markets where the firm has an existing provider network. This finding is consistent with firms having to devote fewer resources to establish a provider network for their Medicare Advantage offerings.

V.C Model Fit

Figure 4 presents a subset of the data moments targeted in estimation alongside their model predicted counterparts. The first panel contains the unconditional mean and variance of

[29]The literature has produced similar estimates for the average level of risk aversion: Dickstein, Ho, and Mark (2023) \$99.32 and \$97.40; Ho and Lee (2022) \$99.97; Marone and Sabety (2022) \$91.70; Handel (2013) \$91; and Einav, Finkelstein, Ryan, et al. (2013) \$84.

[30]Recall MA plan characteristics used in estimation are calibrated from the data on all offered MA plans.

the utilization distribution, which the model almost perfectly matches. The second panel shows the mean and variance of the utilization distribution conditional on risk score, which are a strong predictor of utilization. The model closely fits these moments as well with a modest under-fit of the mean and variance for the first two risk score quartiles. The final panel presents the fit for the probability of not utilizing healthcare by plan type. The model under-fits the moments for high-generosity plans and over-fit the low-generosity plans. However, this pattern is consistent with the model having a common hassle cost parameter for each network type.

Figure 5 presents non-targeted data moments alongside their model analogs. The left panel shows average utilization by plan type and the right panel shows the variance of utilization by plan type. The model slightly over-predicts utilization in MA plans and under-predicts TM utilization. The model does replicate relative differences in observed utilization by plan types. For example, utilization is higher in TM then MA—consistent with hassle costs—and utilization is higher in more generous MA plans—consistent with more generous cost sharing. Capturing these patterns is important as they allow the model to reflect the selection patterns observed in Medicare and the supply side considerations firms face when deciding which markets to enter and types of products to offer.

Overall, the model fit is reasonable. On average the model closely matches observed utilization patterns by demographic characteristics. It slightly over-predicts the mean and variance of utilization in MA plans while under-predicting these quantities for TM. That said, the model accurately reflects sorting and utilization dynamics by plan types, which are key features for the supply side of the model.

VI Counterfactuals

In this section I use my estimated model to quantify the tradeoffs of promoting choice in competitive insurance markets. I describe the simulation setting and details in Section

VI.A. To build intuition for later results, in Section VI.B I demonstrate how my modeling assumptions impact equilibrium outcomes. Then in Section VI.C, I simulate the effects of four distinct subsidy policies for promoting choice in this competitive insurance market and quantify their tradeoffs.

VI.A Simulation setup

My simulations focus on the 2018 Massachusetts service area, which is summarized in Table 6. Like most MA markets, Massachusetts is highly concentrated. The top two firms—Blue Cross Blue Shield of Massachusetts (BCBS) and Tufts Health Plan (Tufts)—controlled over 56% of all MA enrollment in 2018. Tufts is the market leader and offers HMO plans of high and low generosity in 8 markets. BCBS primarily offers PPO plans of high and low generosity in 11 markets. The remaining share of the market is spread across five firms which primarily offer HMO plans.[31]

For the simulations I make two assumptions for tractability. These assumptions can be relaxed as computational resources allow and do not alter the underlying model. First, I assume that BCBS and Tufts are endogenous players that choose which markets to enter and which products to offer. Each firm is restricted to offering plan types that align with their observed network offering (i.e., HMO or PPO) but can choose the level of financial generosity of the plans they offer. The other firms are treated as a competitive fringe whose choices are taken as exogenous. Thus, the choice set for an endogenous firm is to offer no plan, a low generosity plan, a high generosity plan, or both. Second, I assume that entry decisions are made at the Combined Statistical Area (CSA) level. CSAs are groupings of counties used by the US government for adjacent communities that demonstrate economic or social linkages.[32] Massachusetts has two CSAs; based around Boston and Springfield. I group all other counties in Massachusetts into a third pseudo-CSA. This assumption is

[31]One of the these firms offers PPO and HMO plans but has a state-wide market share of 1%.

[32]In practice CSAs can span states. The service areas defined in model do not span states. As a result, I focus on CSA groupings of counties within a state if the CSA spans multiple states.

supported by observed entry patterns in Massachusetts. Firms that enter one of the markets within a CSA typically enter the others as well. Thus, an endogenous firm must decide for each plan they offer whether to enter no markets, Boston-area markets, Springfield-area markets, other markets, or a combination of these markets. Given the number of players in the game, the size of their choice sets, and draws necessary to calculate expected profits, I need to compute 40,960 pricing equilibria for each counterfactual.

To solve for the equilibria of the model I follow the procedure proposed by Lee and Pakes (2009). This method has been used by other papers that solve models with multiple equilibria (see e.g., Wollmann, 2018). At a high-level the procedure uses a best response iteration approach to find the entry and product offering equilibria that are consistent with Stage 1 necessary conditions in Equation (17). To compute fixed costs, I evaluate the observed fixed costs at the median values from the estimated identified set. Given these estimates, I recover ranges for the unobserved fixed cost ν_2 that are consistent with the moment inequalities for the endogenous firms. I take 100 random draws from a normal distribution with a mean and variance calibrated from these ranges and recover the equilibria associated with each fixed cost realization. Additional details on how I compute equilibria of the model are available in Appendix D.

I define consumer surplus as an individual's expected certainty equivalent utility from enrolling in a plan. The literature has used similar measures of consumer welfare (see e.g., Einav, Finkelstein, Ryan, et al., 2013; Ho and Lee, 2022). Thus the consumer surplus for individual i is:

$$CS_{ijmt} = \int \frac{1}{-\alpha_i} \log \left[1 + \sum_{j \in \mathcal{J}_m} \exp(U^{CE}_{ijmt}) \right] dF \tag{24}$$

where dF denotes the distribution of unobserved heterogeneity in the health states and moral hazard. The certainty equivalent utility U^{CE}_{ijmt} is discussed in Appendix C.

I define net welfare (NW) as the sum of consumer surplus (CS) and firm profits (Π) net of government spending on Traditional Medicare and Medicare Advantage (G_{TM} and

G_{MA} respectively):

$$NW = CS + \Pi - \upsilon \times (G_{TM} + G_{MA}) \tag{25}$$

where υ is the social cost of government spending. Following Polyakova and Ryan (2020) I assume this is \$0.30.[33]

VI.B Model assumptions

The results presented in this section build intuition for how features of my model impact equilibrium outcomes. To do this, I simulate the effect of lowering payments made to Medicare Advantage plans, a common counterfactual exercise in the literature. I start by simulating a baseline under standard model assumptions with constant marginal costs or endogenous participation decisions. I then iteratively introduce these features to see how they alter the model's predictions. Every version of the model averages over draws from the Stage 2 shock distribution.[34]

Table 7 presents results for a simulation that lowers Medicare Advantage benchmarks by \$1,200 annually (\$100 per-beneficiary month). The first column reports predictions from a "Baseline" model where selection does not impact firm costs and entry and product offering decisions are fixed before any policy changes. These predicted outcomes closely align to the outcomes observed for the Massachusetts service area in 2018. The second column uses the Baseline model to simulate the impact of the benchmark reduction. Consistent with prior work I find that reducing benchmarks leads to lower enrollment in Medicare Advantage plans and by extension consumer surplus and firm profits. These effects manifest through larger premiums and the high level of consumer price sensitivity. The individuals that left MA for TM were relatively higher cost, so average MA utilization declines. However, these

[33]Estimates for the social cost of government spending generally range from \$0.30–0.50 (Heckman et al., 2010; Hendren and Sprung-Keyser, 2020).

[34]Appendix Table E.7 does a similar exercise without using expected profits and holds unobservable shocks fixed at their observed values. Results are similar and consistent with comparable policy simulations in the literature.

individuals were relatively healthier than the TM population leading average TM utilization to fall. The third column reports predictions from the "Selection" model where firm costs depend on their enrollee population. Relative to the Baseline model, MA enrollment increases and average MA utilization falls. This effect highlights the role of selection within the model. Healthier consumers tend to opt into MA, which translates into lower utilization and costs for the plans, enabling them to charge lower prices. These lower prices and increased enrollment translate to higher profits and consumer surplus relative to the Baseline model. An additional implication of the selection channel is average TM utilization increases as relatively healthier people switch back to MA.

The last two columns report results for the "Entry" model that allows firms to alter their product offerings and entry decisions. The fourth column reports the average value across all model equilibria while the final column reports the range of values across all equilibria. Relative to models with fixed entry decisions, the entry model predicts the total number of markets entered falls as does the average number of markets entered per plan. This behavior could be consistent with firms avoiding markets with sicker populations (i.e., cream skimming). Despite the change in entry patterns, average MA utilization increases. This pattern arises from the change in plan cost benchmarks. Plans can increase their overall cost benchmark by exiting markets with low benchmarks. A higher cost benchmark increases a plan's rebate payment and allows them to charge lower premiums. As plan prices fall, MA attracts more price sensitive beneficiaries that tend to have greater health needs. This interpretation is supported by the increase in average government MA spending per-beneficiary from the Selection model. The Entry model also predicts the highest level of overall government spending and lowest net welfare. This pattern highlights how endogenous firm entry and product offering decisions may undercut savings from policy simulations that hold market participation as fixed.

These simulations underscore the close connection between selection and consumer price sensitivity in my model. MA plans can attract more enrollment when they are able to operate profitably without charging consumer high prices. These conditions are satisfied when the government heavily subsidizes plans or MA plans target markets where they increase their subsidy payments. These channels are important for understanding the mechanisms behind the results in the next section that explore the effects of alternate subsidy systems.

VI.C Alternate subsidy policies

In this section I use the model to explore the effects of alternative subsidy policies that could be used to regulate a competitive insurance market. The results are presented in Table 8. The first column simulates the effects of the current system where firms are directly compensated for each beneficiary they enroll and the size of the payment is adjusted by the beneficiary's risk score. The average across all equilibria indicate the program generates \$390 in consumer surplus and \$870 in firm profits per-person. However, this welfare does not exceed the total per-person government spending on Medicare Advantage. Since the social cost of government spending is not 1:1 with consumer and producer surplus, the program generates positive net welfare.

The first counterfactual I consider is a system where no subsidy is provided to firms. Under this scenario the government allows private firms to offer insurance plans that meet quality thresholds but the plans receive no other assistance. I find that absent subsidies, the private market unravels. Private plan entry is possible for large realization of fixed cost shocks but the plans set prices so high that consumers opt to remain in TM. This counterfactual predicts the lowest amount of government spending but generates no welfare for consumers. While this policy is extreme and unlikely to be implemented it provides a sense for how strong the market is and demonstrates that government intervention is necessary to sustain it.

The second alternate system is presented in column 3 of Table 8. Under this policy, consumers receive an untargeted subsidy to purchase MA plans if they opt out of TM. The only revenue firms collect is in the form of premiums paid by beneficiaries that enroll in their plans. The size of the untargeted subsidy is equal to the average subsidy paid to firms observed in the data—roughly \$786 (\$9,430) per-beneficiary-month (-year). Relative to the baseline scenario, this policy encourages more entry and enrollment in MA. Average MA penetration grew from roughly 17% in the baseline scenario to about 29.5%. Most of this enrollment growth is attributable to relatively healthier individuals switching from TM into MA. Total welfare grows due to increases in both firm profits (\$1,240 per-person) and consumer surplus (\$780 per-person). Consumers also capture a larger share of surplus generated by the program, up to 39% from 31% under the current policy. This policy leads to an increase in government spending on MA, consistent with the increase in enrollment. Government spending on TM falls slightly but does not offset the expansion in MA spending. Finally, relative to the supply-side policy average net welfare increases to \$250 per-beneficiary.

These results indicate how Medicare Advantage is not functioning as originally intended. Under the baseline and untargeted subsidy policies MA attracts healthier enrollees than TM. This sorting arises because these consumers are the least sensitive to price. The healthier types then benefit from utilizing healthcare at lower costs then what they would pay under TM. Neither policy is wholly effective at offsetting consumer price sensitivity or attempting to target sicker populations to enroll in MA. However, each policy has distinct advantages—the supply subsidy gives firms a primary revenue source independent of premiums, while direct subsidies give consumers a clear incentive to enroll in MA. Risk adjustment also plays a role in the supply subsidy. Under current regulations, CMS adjusts payments based on each beneficiary's risk score. The scores are intended to capture differences in health relative to the typical TM beneficiary. However, the current risk score formula is imperfect and is subject to manipulation by firms (e.g., "upcoding" beneficiaries to make them appear sicker). Noisy risk scores distort firm entry incentives and can cause government spending to proliferate unnecessarily as MA firms enroll sicker beneficiaries.

The last policy I simulate draws from the strengths of both subsidy systems and eliminate the distortions they create. The targeted policy has three components. The first preserves supply subsidies but lowers cost benchmarks by $1,200. The second piece passes along some of these savings to consumers in the form of a means tested subsidy. Low income seniors receive a $600 payment if they enroll in a MA plan, while all other seniors get a $300 payment for enrolling in a MA. The third part generates risk scores that perfectly align a beneficiary's model expected healthcare utilization in MA to their utilization in TM. In general, this change results in relative increases in the risk scores for healthy individuals and decreases in the risk scores for sicker ones. This policy produces entry patterns similar to baseline scenario. Average MA utilization falls, consistent with sicker beneficiaries shifting out of MA as plans raise prices in response to benchmark reductions. Rising prices also explain why average consumer surplus and the size of MA market falls under this policy. However, the minimum values for consumer surplus and MA enrollment are larger under this policy then the baseline. Notably, average total government spending under the targeted policy is lower then the baseline and untargeted policies. Thus the targeted policy can deliver similar outcomes as the status quo but at lower costs to the government.

Finally, I explore the distributional consequences of these policies in Table 9. The table reports consumer surplus under each counterfactual policy by observable beneficiary characteristics. Under the current policy, the oldest seniors as well as individuals with risk scores in the second and fourth quantiles have the average highest surplus. This pattern likely reflects the value MA plans can deliver for these groups. For individuals with moderate health needs, MA provides lower costs in the form of more generous cost sharing. For the sickest individuals—who tend to be older—MA plans limit their medical bills by offering out-of-pocket maximums that do not exist in TM. When the MA market unravels under the no subsidy policy all consumers have no surplus. The untargeted demand subsidy raises welfare for everybody, consistent with the uniform cash transfer. However the healthiest individuals benefit the most as these individuals tend to be the least price sensitive and shift from TM to MA first. Under the targeted policy, low income beneficiaries benefit the most—consistent with means tested demand subsidy. Despite this policy lowering welfare because prices rise, surplus is more equally distributed across risk score quantiles.

VII Conclusion

This paper studies competition and participation in Medicare Advantage insurance markets. I developed and estimated an equilibrium model of health plan supply and demand that captures the feedback between government policy, firm entry and product offering decisions, and consumer sorting and utilization of health insurance plans. My model accounts for multiple equilibria that may arise in firm decisions about which markets to enter and products to offer. I then use this model to assess the optimality of different government policies to regulate choice and competition in these markets.

My findings indicate policymakers face tradeoffs when deciding how much choice to promote. Subsidies are necessary to sustain the private market. However, current subsidy policy is not letting the program deliver on its stated goals. Medicare Advantage plans tend to attract healthier individuals to enroll and the government overpays when sicker individuals are covered. Supply subsidies give firms more flexibility to set lower prices and attract relatively sicker individuals into MA. However, they are unable to bring in the sickest TM beneficiaries into the program. An untargeted demand subsidy increases MA enrollment but this policy disproportionately benefits healthier seniors that are not price sensitive. I find that a targeted policy that leverages the benefits of supply and demand subsidies is capable of delivering similar outcomes but at lower costs to the government. Additionally, the surplus this policy generates is distributed more equitably across health statuses.

Future work could consider the dynamic implications of entry into health insurance markets. Inertia plays a prominent role in these markets and exacerbates the impacts of selection. Unpacking the extent to which inertia allows firms to engage in dynamic pricing or cost sharing reductions is important for designing policy to protect consumers and regulate plan quality in insurance markets.

Tables and Figures

Tables

Table 1: Market level summary statistics, 2017–2018

	Mean	SD	P10	P90
Monetary characteristics				
Premium	19.6	18.3	0.7	43.9
Base premium	0.6	2.7	0	0.8
Supplemental premium	18.9	17.2	0.7	42.9
Subsidy	750.0	47.2	695.1	808.7
Rebate	66.0	31.1	30.1	103.8
Benchmark	843.2	45.8	798.9	896.8
Average OOPC	140.5	16.6	119.9	160.5
Plan menus				
Firms	3	2	1	6
Plans	7	6	2	15
High generosity plans	2	3	0	6
HMOs	4	4.5	0	10
Market size	14,535	36,214	1,259	32,529
Plan enrollment	915	2,897	21.1	1,907
Market				
MA penetration	15.0	13.0	1.9	33.8
Market share	5.4	4.5	0.9	10.4
Market share | MA	46.7	25.8	18.4	92.2
HHI	195.8	309.5	2.6	541.3
HHI | MA	6,502.8	2,556.3	3,325.0	10,000

Notes: This table contain market-level summary statistics for the 4,845 markets in the analysis sample. Markets are defined as county-year pairs. Plan characteristics are weighted by within market enrollment. "Average OOPC" measures the average expected monthly out-of-pocket costs in a Medicare Advantage plan across health states. The "high generosity plans" earn this designation based on this cost measure.

Table 2: Impact of ACA benchmark reforms on plan characteristics, 2008–2017

	(1) Subsidy request	(2) Plan premium	(3) Extra coverage
Average Benchmark	0.39***	-0.05***	-0.07***
	(0.02)	(0.01)	(0.02)
Post-ACA Transition	104.50***	-24.00***	33.55***
	(14.80)	(6.54)	(12.49)
Post-ACA Transition × Average Benchmark	-0.19***	0.01	0.12***
	(0.02)	(0.01)	(0.02)
Year FEs	✓	✓	✓
County FEs	✓	✓	✓
Mean of dependent variable	679.63	24.58	230.00
R^2	0.79	0.74	0.91
Observations	15,056	15,056	15,056

Notes: $***p < 0.01$; $**p < 0.05$; $*p < 0.1$. Standard errors clustered at the county-level. This table reports estimates for the impact of changes to MA county benchmarks induced by the ACA impact plan characteristics. An observation is a county-year. Monetary values are converted into 2008$. The sample contains counties in my analysis sample prior to 2012 and counties that completed their transition to the complete post-ACA benchmarks (counties had either 2, 4, or 6 years to transition). Outcomes are calculated as enrollment weighted averages.

Table 3: Moral hazard in MA average annual utilization, 2017–2018

	(1)	(2)	(3)	(4)	(5)	(6)
Market Avg Rebate ($)	4.31***	6.76***	6.27***			
	(0.31)	(0.34)	(0.35)			
Prob Enroll Gen Plan				-53.25	220.64***	207.44***
				(81.61)	(88.38)	(90.01)
Year FE		✓	✓		✓	✓
Individual Controls		✓	✓		✓	✓
Market Controls		✓	✓		✓	✓
Plan Controls			✓			✓
Mean of Dep Var	8,415.18	8,415.18	8,415.18	8,415.18	8,415.18	8,415.18
Observations	6,309,253	6,309,253	6,309,253	6,309,253	6,309,253	6,309,253

Notes: $***p < 0.01$; $**p < 0.05$; $*p < 0.1$. Robust standard errors are in parentheses. This table reports estimates from OLS regressions of observable individual, market, and plan characteristics onto average annual healthcare utilization measured in standardized dollar units proposed by Jung et al. (2022). "Market Avg Rebate" measures the average rebate paid to all Medicare Advantage plans in a beneficiary's market. "Prob Enroll Gen Plan" measures the probability of enrolling in a high generosity plan based on market shares. Individual controls include the their age and indicators for risk score quantiles, female, and low income status. Market controls include measures of how rural the county is, the share of the population with a college degree, the mortality rate of the Medicare population, and the share of the Medicare population that is eligible for Medicaid. Plan controls include indicators for star ratings (at half star intervals) and whether the plan is a HMO.

Table 4: Demand estimates and model implied quantities

			Estimate	95% CI
Demand	Premium (α_i)	Mean	-12.59	[-13.09, -12.08]
		Low income	-3.55	[-3.79, -3.30]
	Utilization utility (β_i)	Mean	11.57	[11.07, 12.07]
		Low income	-0.15	[-0.17, -0.13]
		Contract	✓	
	Fixed effects (θ_2)	Year	✓	
		Star rating	✓	
Quantities	Moral hazard (ω_i)	TM	14.69	[14.46, 14.90]
	Pct. change in utilization	PPO-Low	5.83	[5.78, 5.90]
	from 100% to 0% coins.	PPO-High	5.50	[5.44, 5.65]
		HMO-Low	6.97	[6.92, 6.99]
		HMO-High	5.31	[5.14, 5.47]
	Hassle costs (ϕ)	TM	0.15	[0.14, 0.15]
	($1,000)	PPO	1.23	[1.21, 1.24]
		HMO	1.61	[1.60, 1.62]
	Switching costs (ι)	Coefficient	-8.62	[-8.87, -8.37]
	($1,000)	Mean	0.68	[0.68, 0.69]
		Low income	0.53	[0.53, 0.54]
	Risk aversion (ψ)	CARA coefficient (10^{-5})	1.08	[0.57, 2.04]
	($)	Cohen and Einav (2007) gamble	99.89	[99.80, 99.94]
Beneficiary-year observations			73,941,784	
Plan-year observations			3,702	

Notes: This table reports estimates for demand parameters and quantities implied by the demand and healthcare utilization model. Estimates are obtained from a two-stage GMM procedure that targets observed utilization and plan choice decisions and IV restrictions. Confidence intervals are constructed from standard errors obtained from the variance-covariance matrix of the GMM estimator. Detailed parameter estimates and standard errors are available in Appendix Table E.5.

Table 5: Fixed cost identified set estimates

	Identified set
Number of plans	[612.7, 1,333.1]
Existing network	
Total hospital systems	[110.5, 252.0]
Total doctors	[1.5, 2.2]
No network	
Total hospital systems	[515.7, 981.6]
Total doctors	[6.2, 9.0]
Moment inequalities	124

Notes: This table reports the estimated identified set for the fixed cost parameters. Costs are reported in $1,000 units. Sets are constructed by inverting the test statistics from Chernozhukov, Chetverikov, and Kato (2019). The self-normalized one step procedure is used with $\alpha = 0.05$.

Table 6: Summary of Massachusetts Medicare Market, 2018

			Market share	
Firm	Offered plans	Markets	All	MA only
Tufts Health Plan	HMO (L-H)	8	3.38	32.90
Blue Cross-Blue Shield of Mass.	PPO (L-H), HMO-H	11	2.38	23.21
United Health	HMO (L-H)	7	2.03	19.74
Baystate Health	HMO (L-H)	4	1.03	10.08
Harvard Pilgrim	HMO (L-H)	7	0.68	6.64
Fallon Community	HMO (L-H)	4	0.66	6.40
Aetna	PPO-L, HMO-L	7	0.11	1.02
Medicare Advantage		12	10.26	–
Traditional Medicare		14	89.74	–
Total markets/beneficiaries		14	790,406	81,086

Notes: This table reports the observed market structures for Massachusetts in 2018.

Table 7: Impact of modeling choices on equilibrium outcomes

	No change	Cut benchmarks $1,200			
	Baseline	Baseline	Selection	Entry	
Endogenous firms					
Markets entered	11	11	11	8.41	[0, 14]
Plans entered	3	3	3	3	[0, 4]
Enrollment (1,000)	30.62	8.29	16.14	17.60	[0, 24.05]
Enrollment share (%)	3.87	1.05	2.04	2.23	[0, 3.04]
Markets entered by plan	10	10	10	7.26	[0, 10]
Utilization ($1,000)	2.58	2.08	2.02	2.70	[0, 4.02]
Profit ($1,000)	0.80	0.37	0.40	0.53	[0.08, 0.99]
All products					
MA share (%)	10.5	1.34	2.02	2.52	[0.36, 3.30]
MA utilization ($1,000)	2.55	1.57	1.86	2.35	[0.41, 3.39]
TM utilization ($1,000)	5.20	4.97	4.99	4.98	[4.94, 5.00]
Consumer surplus ($1,000)	0.22	0.03	0.05	0.04	[0.00, 0.07]
Government MA spending ($1,000)	1.05	0.11	0.20	0.23	[0.02, 0.31]
Government TM spending ($1,000)	4.65	4.90	4.88	4.86	[4.83, 4.92]
Total government spending ($1,000)	5.69	5.01	5.08	5.09	[4.94, 5.15]
Net welfare ($1,000)	0.25	0.03	0.06	0.01	[0, 0.02]

Notes: This table reports how simulated quantities from the model change as different features are added. The first column lists predicted outcomes before a policy change from a model where selection does not impact firm costs and firm participation decisions are fixed ("Baseline"). The other columns simulate the impacts of cutting Medicare Advantage benchmarks by $1,200 annually. The second column reproduces predictions from the Baseline model. The third column allows selection to impact firm costs while holding entry decisions fixed ("Selection"). The final columns allows selection to impact costs and for firms to alter their entry decisions. The fourth column reports the average for all model equilibria, while the fifth column presents the minimum and maximum values consistent with all the equilibria of the model. The top panel produces quantities for the endogenous firms. The bottom panel reports quantities across all products in the model. Utilization, profit, spending, and welfare figures are per-beneficiary averages.

Table 8: Equilibrium outcomes under alternative subsidy systems

	Baseline		No subsidy		Untargeted		Targeted	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Endogenous firms								
Markets entered	12.18	[6, 14]	13.51	[0, 14]	14	[14, 14]	12.26	[8, 14]
Plans entered	3.38	[1, 4]	3.54	[0, 4]	3.3	[1, 4]	3.48	[1, 4]
Enrollment (1,000)	89.79	[6.16, 97.68]	0	[0, 0]	160.31	[154.20, 163.59]	60.28	[26.01, 70.78]
Enrollment share (%)	11.36	[0.78, 12.36]	0	[0, 0]	20.28	[19.51, 20.70]	7.63	[3.29, 8.96]
Markets entered by plan	8.94	[3, 10.25]	8.87	[0, 14]	10.72	[6.67, 14]	8.88	[5, 11]
Utilization ($1,000)	3.61	[2.40, 4.29]	0.09	[0, 4.09]	1.47	[1.41, 1.51]	1.95	[0.98, 3.06]
Profit ($1,000)	0.87	[0.19, 1.00]	0	[0, 0]	1.24	[0.85, 1.36]	0.82	[0.03, 1.20]
All products								
MA share (%)	16.99	[8.64, 17.75]	0	[0, 0]	29.45	[28.76, 29.83]	13.40	[9.81, 14.53]
MA utilization ($1,000)	3.26	[2.58, 3.44]	0.10	[0.02, 4.08]	2.29	[2.27, 2.30]	2.53	[2.23, 3.01]
TM utilization ($1,000)	5.27	[5.13, 5.29]	4.93	[4.93, 4.93]	5.96	[5.93, 5.98]	5.28	[5.15, 5.31]
Consumer surplus ($1,000)	0.39	[0.16, 0.43]	0	[0, 0]	0.78	[0.76, 0.80]	0.30	[0.23, 0.36]
Government MA spending ($1,000)	1.79	[0.84, 1.86]	0	[0, 0]	2.78	[2.71, 2.81]	1.24	[0.91, 1.35]
Government TM spending ($1,000)	4.37	[4.35, 4.69]	4.93	[4.93, 4.93]	4.20	[4.19, 4.23]	4.57	[4.53, 4.66]
Total government spending ($1,000)	6.16	[5.53, 6.21]	4.93	[4.93, 4.93]	6.98	[6.94, 7.01]	5.81	[5.56, 5.88]
Net welfare ($1,000)	0.098	[0.003, 0.120]	0.0	[0.0, 0.0]	0.25	[0.17, 0.27]	0.06	[0.0, 0.08]

Notes: This table reports how simulated equilibrium outcomes change as the delivery system for Medicare Advantage subsidies changes. For each simulation the "Range" column reports the minimum and maximum value across all the recovered equilibria of the model, while the "Mean" column reports average value across equilibria. "Baseline" refers to the current system, which is a supply side subsidy that is scaled by a beneficiary's risk score. "No subsidy" refers to a system where the government does not provide any subsidy to Medicare Advantage plans but regulates the plans meet their minimal coverage standards. "Untargeted" simulates a system that gives the observed enrollment weighted average risk adjusted pre-beneficiary subsidy for Massachusetts (approximately $9,432 per year) to consumers to offset the costs of a Medicare Advantage plan. "Targeted" cuts CMS cost benchmarks by $1,200, offers a demand subsidy of $600 to low income beneficiaries that enroll in Medicare Advantage plans and $300 for non-low income MA enrollees, and replaces CMS calculated risk scores with risk scores implied by the model based on the ratio of expected MA healthcare utilization and TM utilization.

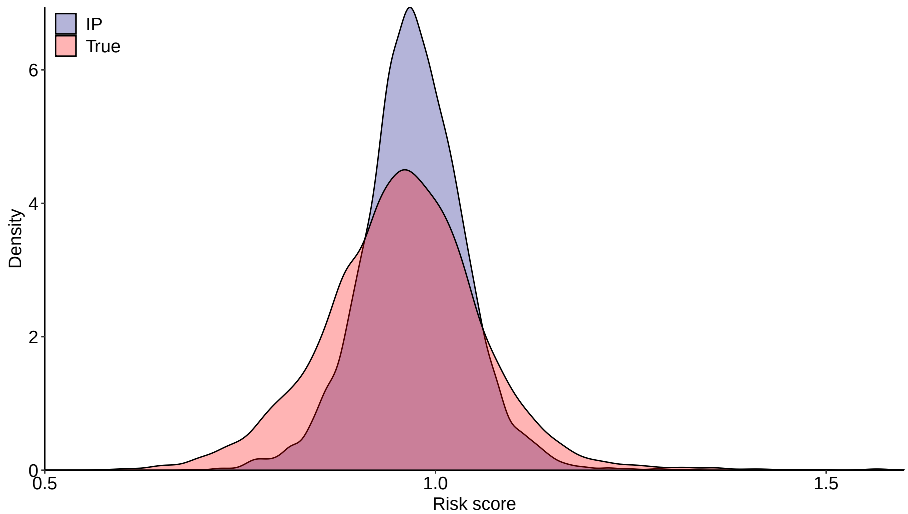
Table 9: Consumer surplus by observables under alternative subsidy systems

	Baseline		Untargeted		Targeted	
	Mean	Range	Mean	Range	Mean	Range
Age >= 86	0.43	[0.18, 0.45]	0.65	[0.62, 0.67]	0.31	[0.22, 0.35]
Female	0.40	[0.16, 0.42]	0.79	[0.76, 0.80]	0.33	[0.23, 0.36]
Low income	0.27	[0.09, 0.28]	0.82	[0.80, 0.83]	0.56	[0.44, 0.60]
High Medicaid county	0.40	[0.19, 0.42]	0.81	[0.78, 0.83]	0.35	[0.26, 0.38]
Risk score Q1	0.37	[0.17, 0.40]	0.94	[0.92, 0.95]	0.33	[0.21, 0.35]
Risk score Q2	0.42	[0.16, 0.44]	0.82	[0.79, 0.83]	0.31	[0.21, 0.34]
Risk score Q3	0.39	[0.15, 0.41]	0.77	[0.75, 0.78]	0.32	[0.21, 0.35]
Risk score Q4	0.43	[0.18, 0.44]	0.65	[0.62, 0.67]	0.35	[0.25, 0.38]

Notes: This table reports how consumer surplus is distributed across observable characteristics under different subsidy policies. For each simulation the "Range" column reports the minimum and maximum value across all the recovered equilibria of the model, while the "Mean" column reports average value across equilibria. "Baseline" refers to the current system, which is a supply side subsidy that is scaled by a beneficiary's risk score. "Untargeted" simulates a system that gives the observed enrollment weighted average risk adjusted pre-beneficiary subsidy for Massachusetts (approximately $9,432 per year) to consumers to offset the costs of a Medicare Advantage plan. "Targeted" cuts CMS cost benchmarks by $1,200, offers a demand subsidy of $600 to low income beneficiaries that enroll in Medicare Advantage plans and $300 for non-low income MA enrollees, and replaces CMS calculated risk scores with risk scores implied by the model based on the ratio of expected MA healthcare utilization and TM utilization.

Figures

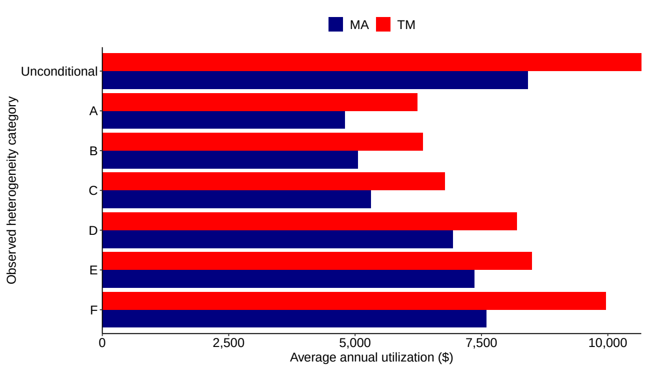
Figure 1: Average market risk scores 2017–2018



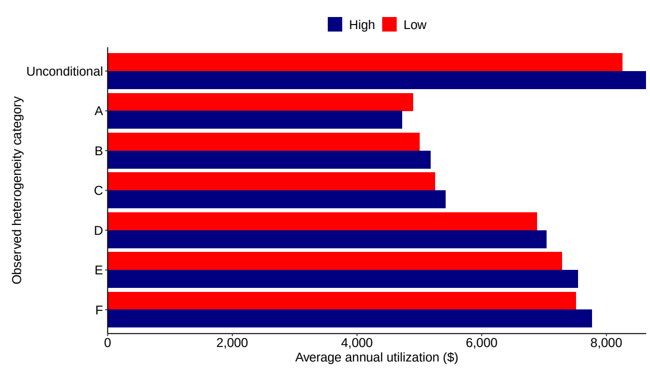
Notes: This figure compares the distribution of risk scores at the market-level. Markets are defined as a county-year pair. The red distribution is the true risk score reported by CMS. The blue distribution comes from the risk scores that I calculate using only inpatient diagnoses. These individual risk scores are averaged across all beneficiaries in the market to construct the distribution.

Figure 2: Average Healthcare Utilization, 2017–2018

(a) TM vs. MA

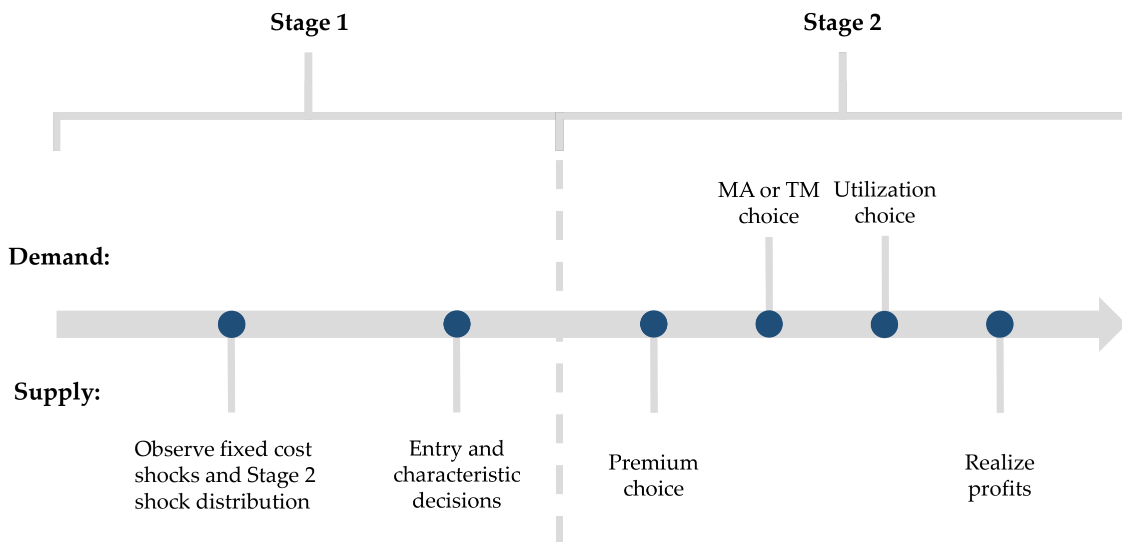


(b) High vs. Low Generosity MA Plans



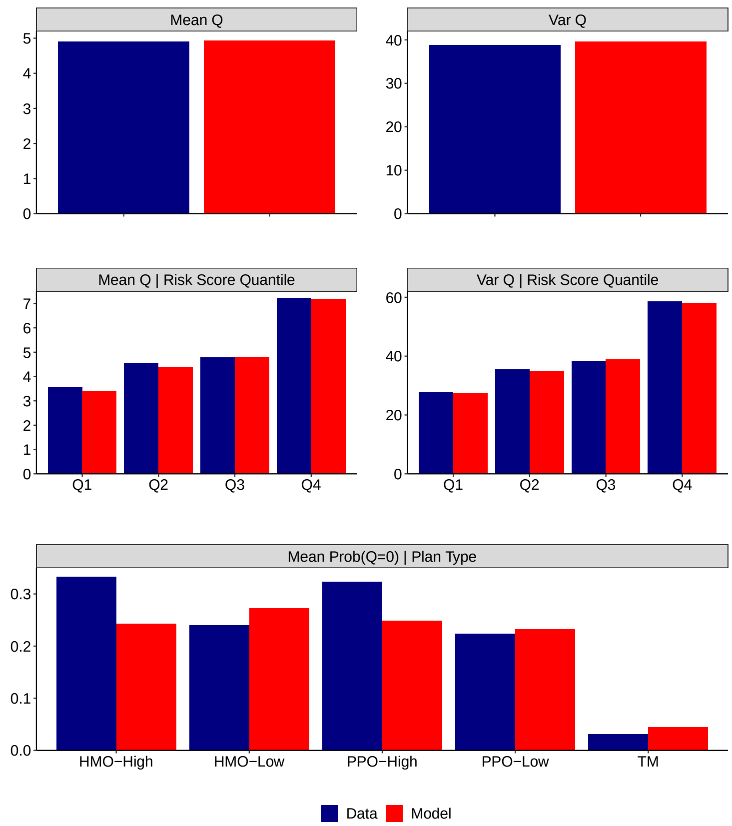
Notes: This figure compares the average annual healthcare utilization of Medicare beneficiaries. The averages are presented unconditionally and for the six most common groupings observable heterogeneity. Observable categories summarize a beneficiary's risk score, age, gender, income, and their county's Medicare mortality and Medicaid eligibility rates.

Figure 3: Model summary



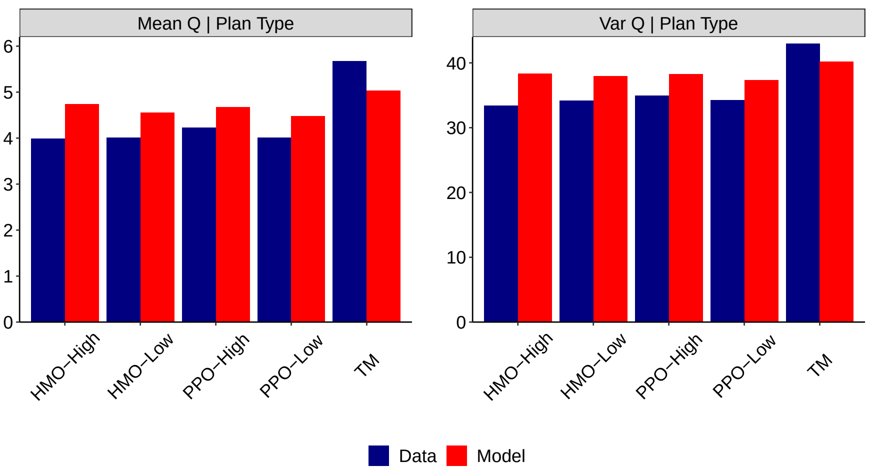
Notes: This figure summarizes the timing and decisions made in the model. Firm decisions are below the central line and correspond to the supply side of the model. Beneficiary decisions are above the central line and correspond to the demand side of the model.

Figure 4: Targeted moment fit



Notes: This figure plots a subset of the targeted moments used to estimate the health state distribution and demand parameters. The targeted moments included in the figure are the unconditional mean and variance of the utilization distribution, the mean and variance of the utilization distribution conditional on risk score quartiles, and the probability of utilizing no healthcare conditional on plan type.

Figure 5: Untargeted moment fit



Notes: This figure plots untargeted data moments and their model analogs. The moments included in the figure are the mean and variance of healthcare utilization conditional on plan type.

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