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MULTIMARKET CONTACT IN HEALTH INSURANCE: EVIDENCE FROM MEDICARE ADVANTAGE

Haizhen Lin
Ian M. McCarthy

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ABSTRACT

Many industries, including health insurance, are characterized by a handful of large firms competing against each other in multiple markets. Such overlap across markets, defined as multimarket contact (MMC), may facilitate tacit collusion and thus reduce the intensity of competition. We examine the effects of MMC on health insurance prices and quality using comprehensive data on the Medicare Advantage (MA) market from 2008 through 2015. Our identification strategy exploits two plausibly exogenous changes to MMC: 1) out-of-market consolidations, which affect MMC but are not likely driven by local market heterogeneity; and 2) reimbursement policy changes in a subset of markets, which encourage additional entry and therefore affect MMC even in markets otherwise unaffected by the policy itself. Across a range of estimates and alternative measures of MMC, our results consistently support the mutual forbearance hypothesis, where we find that prices are significantly higher and hiqh-quality plans become less pervasive as MMC increases. These results suggest MMC as one potential channel through which cross-market consolidations and regulatory policies could alter competitiveness in local markets otherwise unaffected by the merger or policy.

Haizhen Lin
Department of Business Economics and Public Policy
Kelley School of Business
Indiana University
1309 East Tenth Street
Bloomington, IN 47405
and NBER
hzlin@indiana.edu

Ian M. McCarthy
Department of Economics
Emory University
Rich Memorial Building, Room 319
Atlanta, GA 30322
and NBER
immccar@emory.edu

An online appendix is available at http://www.nber.org/data-appendix/w24486

1 Introduction

A large literature in management and economics suggests that competition between firms may be softened as a result of multimarket contact (MMC) (Karnani & Wernerfelt, 1985; Bernheim & Whinston, 1990; Evans & Kessides, 1994; Prince & Simon, 2009; Ciliberto & Williams, 2014). The possibility that MMC could promote anticompetitive outcomes was first articulated by Edwards (1955): "The multiplicity of firm contacts may blunt the edge of their competition." Bernheim & Whinston (1990) offered one of the first theoretical models of MMC. They showed that under the assumption of asymmetry, tacit collusion is sustainable due to the threat of retaliation in overlapped markets. The intuition is that MMC serves to pool firms' incentive constraints across markets, and asymmetry allows firms to transfer incentive constraints across markets.[1] Collusive outcomes are therefore easier to sustain in markets with higher levels of MMC. This potential softening of competition due to MMC is referred to as the mutual forbearance hypothesis.

Given the natural concerns surrounding collusion and its effects on market outcomes, understanding the empirical effects of MMC is critical in designing appropriate antitrust and regulatory policy. Subsequently, there has been strong interest among strategy researchers and industrial economists in testing the mutual forbearance hypothesis.[2] In this paper, we extend the mutual forbearance hypothesis to studying both product prices and quality in health insurance, specifically the Medicare Advantage (MA) market. To the best of our knowledge, we are the first in studying MMC in the U.S. health insurance market.

Our focus on the MA market is highly policy-relevant. First, this market is a large and growing component of the U.S. healthcare system, with over 24 million individuals (34% of the Medicare population) currently enrolled in an MA plan for their health insurance benefits.[3] MA is also a prime example of managed competition in which insurers' behaviors are highly influenced by federal policy. Empirical evidence of MMC in the MA market therefore has the opportunity to

[1] Other works have identified additional mechanisms by which MMC could enhance collusion, such as concavity of the profit function (Spagnolo, 1999) and imperfect monitoring (Matsushima, 2001; Kobayashi & Ohta, 2012).

[2] The presence of MMC and mutual forbearance has been examined empirically across several industries, including airlines (Evans & Kessides, 1994; Prince & Simon, 2009; Ciliberto & Williams, 2014), cement (Jans & Rosenbaum, 1997), banking (Molnar *et al.*, 2013), movies (Feinberg, 2015), and radio (Waldfogel & Wulf, 2006), among others. More recently, Schmitt (2018) examines the role of MMC in hospital markets, and Wilson (2019) examines MMC in the internet service provider market.

[3] This reflects nearly a four-fold increase since the Medicare Modernization Act of 2003. Kaiser Family Foundation 2019 MA Spotlight, available at https://www.kff.org/medicare/issue-brief/medicare-advantage-2019-spotlight-first-look/.

directly inform policy in MA and other settings relying heavily on managed competition, including Medicaid HMOs and the health insurance exchanges created under the Affordable Care Act. More generally, there has been little regulatory activity regarding mergers and acquisitions that do not affect local market concentration but actually lead to changes in multimarket contact. Our study therefore has potential policy implications for such out-of-market mergers and acquisitions, which have become increasingly common in the health care setting.

In addition to policy relevance, the MA market offers a textbook environment for the examination of the mutual forbearance hypothesis for two reasons. First, a critical condition for mutual forbearance is a firm's ability to detect deviations from collusion (Thomas & Willig, 2006). Failing to meet this condition might cause researchers either to underestimate the effect of MMC or (incorrectly) fail to detect mutual forbearance. Our setting has a compelling advantage over existing studies in that price and quality information are publicly available, transparent to competing firms once information is posted during open enrollment, and constant within a calendar year. This transparency intuitively allows for sustained collusion and offers a clearer opportunity to study the effects of MMC. Second, the existing empirical and theoretical research on MMC prioritizes price as the main outcome of interest.[4] The richness in available data on the MA market allows us to extend the mutual forbearance hypothesis to product quality, which is critical when considering firms' non-price behavior and the broader implications for consumer welfare.

To briefly explain our empirical strategy, we follow the literature in calculating MMC as the average number of pairwise market overlaps among all competing firms in a given market. We also consider several alternative measures of MMC in our sensitivity analyses, including measuring MMC at the firm-market level. Note that MA plan "prices" derive from a competitive bidding process, which we discuss in more detail in Section 2.1. We measure prices using both bids and monthly premiums. The plan bid captures the total payment to insure a single individual, and the premium represents the portion of the total payment that is paid directly by the enrollee. We measure quality using the star rating system introduced by the Centers for Medicare and Medicaid Services (CMS) in 2009, following Curto *et al.* (2015), Duggan *et al.* (2016), and others.

For both prices and quality, MMC is arguably endogenous. We therefore pursue an instrumental variable strategy by taking advantage of two plausibly exogenous changes in MMC. The first

[4]Prince & Simon (2009) provide an important exception in studying quality of service in the US airline industry, as does Wilson (2019) in his analysis of MMC and internet service providers.

source exploits out-of-market merger activities. Specifically, we form an instrumental variable that measures the merger-induced change in pairwise overlaps in markets that are otherwise not directly affected by the merger. The second source of exogenous variation derives from changes in MA reimbursement policies that increased CMS payments to MA plans in selected markets. These policy changes incentivize additional entry into affected markets (Layton & Ryan, 2015; Duggan *et al.*, 2016) and therefore affect MMC even in markets otherwise unaffected by the policy itself.

Our results largely support the mutual forbearance hypothesis. From our preferred specifications, we find that a one standard deviation increase in MMC (4.5) leads to between a $16 and $18 (2.2% and 2.5%) increase in Part C bids, which is the component of Medicare Advantage that covers inpatient and outpatient care. Similarly, when moving from the 25th to 75th percentile in MMC (5.7), we estimate an increase in Part C bids of 3.2%. These magnitudes are comparable to those found in other studies. For example, Ciliberto & Williams (2014) find that moving from the 25th to 75th percentile in MMC leads to a 2% increase in pricing, and Evans & Kessides (1994) estimate a slightly larger effect of 5%. We also find some evidence of an increase in Part D (prescription drug coverage) bids.[5]

With regard to quality, we find evidence that increasing MMC reduces the prevalence of high-quality (four-star rated and above) contracts. Within a contract, we find an increase in MMC of one standard deviation leads to approximately a 12 percentage point reduction in the probability that a contract receives a high overall rating. We also consider quality adjustment through insurers' selection of plan offerings across markets, where we find an even larger effect. For example, a one standard deviation increase in MMC leads to one fewer high-rated contract available in an average market, reflecting a 30% decrease in high-quality plans. These results are large compared to the existing evidence from the airline industry, where Prince & Simon (2009) find that an increase in MMC from the 25th to the 75th percentile leads to quality decreases of between 5% and 15%, depending on the quality measure used. Our findings therefore suggest quality provision as an important channel through which firms respond to changes in MMC.

Our paper contributes to the existing literature on MMC in three important ways. First, we offer one of the first studies of MMC in health insurance where overlap across markets appears to be an important characteristic. Our results suggest MMC as one potential channel through which MA policy and cross-market consolidation could alter competitiveness in local markets otherwise

[5]More details regarding institutional differences between Part C and Part D are discussed in Section 2.1.

unaffected by the policy or merger.

Second, with the exception of Prince & Simon (2009) and Wilson (2019), the majority of studies of MMC focus on prices. We extend our understanding of the impact of MMC by examining both pricing and product quality. While the magnitude of our estimated price effects is similar to the prior literature, the estimated reduction in quality is relatively large. This could be due to differences in the transparency of our quality measures versus those in Prince & Simon (2009). Regardless, our findings suggest that ignoring non-price attributes is likely to underestimate consumer welfare loss due to MMC.

Third, while the standard approach of identification relies on market fixed effects, our identification further exploits out-of-market consolidations and exogenous MA policies, which helps to remove variation in MMC driven by time-varying unobservables also correlated with prices and quality. Similar identification strategies have been used in the hospital setting, including Dafny *et al.* (2012, 2017) and Schmitt (2018). In this way, our paper is closest to Schmitt (2018) who examines the impact of MMC on estimated hospital prices; however, Schmitt (2018) adopts an event study approach measuring how prices respond to out-of-market mergers, with the assumption that out-of-market mergers capture exogenous changes in hospital MMC. Our identification strategy instead exploits changes in local pairwise overlaps due to out-of-market mergers as an instrument, adapting the simulated change in local market concentration employed in Dafny *et al.* (2012). This allows us to directly quantify the impact of MMC on market outcomes and offers a direct comparison to existing studies such as Evans & Kessides (1994), Prince & Simon (2009), and Ciliberto & Williams (2014), although we also consider the reduced-form effects of out-of-market mergers as a supplemental analysis in Section 6.

2 Institutional Background

The Balanced Budget Act of 1997 (BBA) introduced private health insurance options known as Medicare + Choice plans (M+C, or Medicare Part C). Medicare Part C, including Medicare Part A for inpatient care and Medicare Part B for outpatient care, was then revised as part of the 2003 Medicare Modernization Act and renamed Medicare Advantage (MA), which allowed additional plan types such as Regional PPOs and Special Needs Plans as well as Part D coverage (prescription drug). MA plans, like the preceding Medicare Part C plans, are provided by private insurers who contract with CMS annually. Insurers generally operate multiple contracts across (and perhaps within) markets, and there is typically more than one individual plan offered under a single contract, which differ in plan characteristics such as premiums, copayments, and deductibles. By choosing an MA plan, beneficiaries no longer receive the traditional benefits of Medicare Fee-for-Service (FFS) but must still enroll in Medicare Parts A and B and pay the Part B premium. CMS requires that MA plans offer at least what the beneficiary could receive from Medicare FFS.

2.1 Medicare Advantage Bidding

Premiums for MA plans are determined by a competitive bidding process. For Part C services (under most plan types), MA insurers submit bids to CMS intended to reflect the anticipated cost of the plan to cover Medicare Parts A and B benefits. These bids, which we denote by $b_{c(j)t}$ for plan j under contract c at time t, are then compared to a local benchmark payment rate, denoted B_{mt} for market m. For $b_{c(j)t} < B_{mt}$, CMS pays the insurer the risk-adjusted bid for enrollee i, $\alpha_i \times b_{c(j)t}$. CMS also pays these insurers a percentage of the difference between the bid and benchmark in the form of a rebate, denoted $\gamma_{c(j)t}$;[6] however, rebates must be transferred to beneficiaries in the form of added benefits. Therefore, in the case of $b_{c(j)t} < B_{mt}$, the insurer's effective price received for enrollee i is simply $\alpha_i \times b_{c(j)t}$. Conversely, if insurers submit bids in excess of the benchmark, CMS pays the plan $\alpha_i \times b_{c(j)t} - \left(b_{c(j)t} - B_{mt}\right)$, and enrollees pay the bid-benchmark differential in the form of monthly premiums (in addition to the usual Medicare Part B premiums and any Part D premiums). The additional monthly premium offsets the reduction in per-enrollee payments made by CMS, such that the insurer again receives an effective price of $\alpha_i \times b_{c(j)t}$ for enrollee i. The price ultimately received by the insurer for Part C services is therefore the plan's risk-adjusted bid amount, regardless of whether this bid amount is paid fully by CMS or in-part by the enrollee.

MA plans that also offer prescription drug coverage (MA-PD plans) undergo a similar bidding process for Part D benefits but with at least two important differences. First, since traditional Medicare does not cover prescription drugs, CMS relies on the national average bid as a benchmark

[6]Since 2012, the benchmark rates were adjusted based on the contract's star rating, with contracts of 4 stars or more receiving a 5% increase in their benchmark rates. New contracts also received a 3.5% increase in benchmark rates. In addition, for the years 2012-2014, the percentage received as a rebate was a function of the contract's star rating, with contracts of 4.5 or 5 stars receiving a 70% rebate, contracts of 3.5 or 4 stars receiving a 65% rebate, and contracts of 3 stars or below receiving a 50% rebate. Contracts deemed "too new" for a star rating were assigned a default rating of 3.5-4 stars for rebate calculations (65% of the difference between the bid and benchmark). In all other years, plans receive a set rebate of 75%.

comparison for a given plan's bid, and this comparison dictates the final monthly premium for a given plan. Second, the Part D program includes a handful of subsidies paid by CMS to the insurer, including subsidies for low-income enrollees and additional payments for high cost enrollees. Insurers can also self-subsidize their Part D premiums using their Part C rebates. Due to the differences in the bidding process between Part C and Part D components of MA, we examine the impact of MMC on Part C and Part D pricing separately.

2.2 Medicare Advantage Quality Ratings

In 2007, CMS launched a star rating program by which contracts were rated from 1 to 5 stars in each of five different domains.[7] Beginning in 2009, CMS began assigning an overall star rating to each MA contract, ranging from 1 to 5 stars in half-star increments. This overall star rating is clearly presented to potential enrollees in official CMS documentation and is designed to reflect the quality of each plan.

Both the overall and the domain-specific star ratings are calculated based on dozens of individual measures.[8] Over our time period, 55 different measures were used at some point in calculating a contract's star rating, and among those, 9 measures arguably reflect an objective assessment of plan quality and are available in every year from at least 2009 through 2015.[9] These 9 measures correspond to one of three domains defined by CMS: 1) staying healthy, which captures the percentage of enrollees receiving specific tests and screenings; 2) managing chronic conditions, which captures the percentage of enrollees with appropriate "management" of their chronic condition (e.g., osteoporosis, diabetes, high blood pressure, or rheumatoid arthritis); and 3) handling of

[7]These domains initially were: 1) "helping you stay healthy"; 2) "getting care from your doctors and specialists"; 3) "getting timely information and care from your health plan"; 4) "managing chronic conditions"; and 5) "your rights to appeal." Since 2007, the individual measures and domains have changed nearly every year. For example, CMS expanded the "rights to appeal" domain in 2010 to include measures on complaints and the number of beneficiaries leaving the plan, among others. Also in 2010, the "timely information" domain was replaced by "customer service".

[8]The data underlying the star ratings for each individual metric are collected one or two years prior to each given open enrollment and based on a variety of data sources, including the Healthcare Effectiveness Data and Information Set (HEDIS), the Consumer Assessment of Healthcare Providers and Systems (CAHPS), the Health Outcomes Survey (HOS), the Independent Review Entity (IRE), the Complaints Tracking Module (CTM), and CMS administrative data.

[9]A total of 16 individual measures are available from 2009 through 2015. We drop 7 of those measures, 2 belonging to the "staying healthy" domain and the remainder belonging to the domain of "ratings of health plan responsiveness." We drop these 7 measures because they rely on beneficiaries' self-reported assessments of their change in health or of the quality of service and care received. For example, one of these measures asks, "using any number from 0 to 10, what number would you use to rate all your health care in the last 6 months?" We drop these variables due to the subjective nature of these measures, but results are largely consistent if including them.

appeals, which measures the timeliness with which plans reviewed any appeals following denial of a claim as well as the "fairness" of those decisions as determined by CMS review. We employ the overall star rating as well as these domain-specific measures in our analysis of quality. These 9 individual measures and associated domains used in our analysis of quality are discussed in more detail in the supplemental appendix.

2.3 Definition of Market and Product

We define the market as a county because competition and an enrollee's choice set differ at the county level. The appropriate definition of a product, however, may vary depending on the outcome of interest. For example, since bids and premiums differ at the plan level, a natural delineation of products is by unique plan ID; however, approval by CMS to provide Medicare benefits applies at the contract level. For this latter reason, authors sometimes adopt the contract as the definition of a unique product (Town & Liu, 2003; Dafny & Dranove, 2008; Curto *et al.*, 2015). Star ratings are also calculated at the contract level. A case can therefore be made for defining a unique product either at the plan level or at the contract level. For completeness, we present pricing results for both.

2.4 Medicare Advantage Data

We collect data on MA market shares, contract/plan characteristics, and market area characteristics from several publicly available sources from 2008 through 2015. The set of available plans in each county is constructed from the Medicare Service Area files, which list all approved MA contracts within a county/month/year.[10] To these records, we merge enrollment and plan information at the contract/plan level from the MA enrollment files as well as county-level MA penetration information.[11] We exclude plans with missing or fewer than 11 enrollees as all such enrollments are masked in the data. Next, we merge the contract's overall summary star measure, plan premium and rebate information at the contract/plan/county/year level, and county-level census demographic and socioeconomic information from the American Community Survey (ACS). Finally,

[10] We begin with the Service Area files because the CMS enrollment files include enrollees that move and keep their MA coverage despite the fact that a particular MA contract may not be approved in the new market area.

[11] Plan-level enrollments are available monthly, but there is little variation in enrollments across months due to the nature of the open enrollment process. We therefore measure plan enrollments as the average enrollment across months in a given year.

we incorporate county-level hospital discharge data from the annual Healthcare Cost Reporting Information System (HCRIS) database as well as Part C benchmark rates and average FFS costs by county. Additional details of our data construction are available in the supplemental appendix.

We present summary statistics for our plan/contract-level independent variables as well as our county-level variables in Tables 1 and 2, respectively. Note that we observe from the MA payment files the average Part C payments made by CMS to a given plan as well as any rebates paid for Part C bids below the relevant benchmarks. Along with the observed Part C premium, we can estimate each plan's risk-adjusted Part C bid as either: 1) the observed Part C payment for plans with a positive rebate (i.e., bids below the benchmark); or 2) the sum of the Part C payment and any observed premium for plans with \$0 rebates.[12] For Part D bids, we observe the CMS "direct subsidy" payment as well as the Part D premium for basic prescription drug coverage (net of any reduction from Part C rebates). Since we do not observe how much of a Part C rebate is used to pay down the Part D basic premium, we cannot directly estimate the Part D bid. We nonetheless consider the net Part D bid (net of any reduction from Part C rebates), estimated as the sum of the CMS direct subsidy payment and the Part D basic premium. Summary statistics of the estimated plan bids are also included in Table 1.

Tables 1 and 2

At least four salient features of the MA market emerge from these summary statistics. First, the MA market has become increasingly concentrated in recent years, with a spike in the total number of plan/county observations in 2009 and dropping by more than 33% by 2015, with similar trends in the total number of plans per county. Consistent with these trends, average plan market share increased from 5.7% in 2009 to over 8% in 2011 though 2015. Enrollment per plan similarly increased from 215 enrollees per month in 2009 to nearly 500 beneficiaries per plan per county in 2015. Second, the types of plans available have become more homogeneous in many respects. For

[12]The Part C premium observed in the data includes both a "basic" Part C premium, which would cover the cost of traditional Medicare FFS benefits and would only be positive if the plan's bid exceeded the benchmark, as well as any premium for "mandatory supplemental benefits," which are benefits not covered under traditional Medicare FFS. When the Part C bid exceeds the benchmark, the differential would be passed on to enrollees as the "basic" Part C premium, which we do not observe separately from any premium for mandatory supplemental benefits. Our calculation of bids as the sum of the Part C premium and the Part C payment is therefore an upper bound of the bid; however, note that this calculation only applies to around 15% of plans with \$0 rebates (i.e., plans that we observe to have bid above the benchmark).

example, in 2008, approximately 35% of plans were managed care (HMO or PPO) and around 62% offered prescription drugs. In 2015, over 90% of plans were managed care and 81% of plans offered prescription drug coverage. Third, plan prices have been relatively stable since 2010. Monthly consolidated premiums, for example, increased less than 6% from $48 per month in 2010 to $51 per month in 2015. Decomposing these premium changes between Part C and Part D, the observed increase in premiums has been driven by an increase in Part D premiums while Part C premiums have remained around $28 per month since 2010.[13] Finally, there has also been an increase in average contract quality (as measured by CMS star ratings), with the majority of contracts receiving less than a 3-star rating in 2009 through 2011, over 60% of contracts receiving a 3 to 3.5-star rating in 2012-2014, and 56% of contracts receiving a rating of 4 to 5 stars in 2015 (compared to just 31% in 2014 and 18% in 2013).[14] These movements are consistent with CMS' increased efforts to discourage beneficiaries from choosing plans with ratings below 3 stars.[15]

3 Conceptual Framework

The theory of multimarket contact (MMC) has mainly focused on identifying conditions and circumstances under which interdependencies across markets could promote collusive outcomes. In their seminal work, Bernheim & Whinston (1990) showed that perfect observability and asymmetry are necessary for mutual forbearance. In our setting of the Medicare Advantage market, both conditions are satisfied due to CMS' annual publication of price and quality information and the observed asymmetry across markets (such as differences in local market structure). Although subsequent theoretical studies have relaxed these assumptions and identified additional circumstances under which multimarket contact facilitates tacit collusion (Spagnolo, 1999; Matsushima, 2001; Kobayashi & Ohta, 2012), we abstain from testing these competing theories.

Of our particular interest is whether MMC promotes collusive outcomes. From the literature, the impact of MMC on prices is intuitively straightforward. Since MMC tends to soften competition, we expect price to increase following increases in MMC. The majority of empirical studies support this prediction. For example, Evans & Kessides (1994) offer one of the first empirical

[13]These average premiums are based on all plans and therefore include many $0 premium plans.

[14]Note that thes average star ratings in Table 1 are at the contract/county level rather than just the contract level, reflecting an average star rating weighted by prevalence across counties.

[15]For example, contracts receiving a rating of below 3 stars are listed with a large warning box online which asks potential enrollees to double-check whether they want to enroll in that plan.

studies of MMC using data from the U.S. airline industry. They find that airlines charge higher prices on routes with a higher level of MMC. Ciliberto & Williams (2014) also examine the airline industry. They identify underlying conduct parameters using variation in MMC, therefore directly linking MMC to the degree of coordination. More recently, Schmitt (2018) studies MMC in the hospital setting and finds that hospitals exposed to out-of-market mergers (thus with increased MMC) charge higher prices.

In our setting of the Medicare Advantage market, we expect a higher level of MMC would lead to higher prices in terms of both firms' bids and premiums, which are adjusted annually via a competitive bidding process. We consider bids as our main price measure for the following reasons. First, a plan's bid captures revenue per enrollee from an insurer's point of view, and it also reflects the total health insurance payment for an individual of baseline risk paid by both CMS and the individual enrollee. Second, most plans (about 85%) charge zero "basic" Part C premiums. As we discussed in Section 2.1, premiums will be $0 whenever the Part C bid falls below the market benchmark, but increases in bids still reflect an increase in the cost of health insurance from CMS' perspective as well as a reduction in benefit generosity for enrollees in terms of rebates. Examining plan bids therefore allows us to explore variation in pricing which is not captured by premiums. We also study premiums because they represent the part of the payment directly paid out by the enrollee.[16]

More importantly, we extend our analysis of MMC to consider its effect on quality. Given the literature's focus on prices, we derive our intuition for the likely effect of MMC on quality from the broad literature on market power and firms' strategic behavior. Such literature applies given that MMC could confer market power via mutual forbearance. However, theoretical research in this area is largely inconclusive regarding the effect of market power on quality, especially in a setting where firms choose both price and quality (Dorfman & Steiner, 1954; Spence, 1975; Mussa & Rosen, 1978; Dana Jr & Fong, 2011). For example, if competition changes the elasticity of demand with respect to quality more (less) than the elasticity with respect to price, we should expect quality to fall (increase) with softened competition. Mirroring this theoretical ambiguity, existing empirical studies of the effects of market power on quality offer mixed results (Berry &

[16] We study premiums rather than other cost-sharing provisions such as copayments and co-insurance rates because those financial features a relatively stable over time within the same plan and because consumers primarily respond to premiums (Stockley *et al.*, 2014; Curto *et al.*, 2015). Moreover, other cost-sharing provisions such as copayments or co-insurance rates will tend to differ across health care services for the same plan.

Waldfogel, 2001; Sweeting, 2010; Fan, 2013; Crawford *et al.*, 2018). Those mixed results have also been found in a health care setting, primarily in the hospital market, as in Kessler & McClellan (2000), Gowrisankaran & Town (2003), and Kessler & Geppert (2005).[17]

Given its theoretical ambiguity, empirical investigation on the relationship between MMC and quality is particularly important; however, existing evidence is scarce. Prince & Simon (2009) measure quality using airline on-time performance, finding that MMC increases airline delays (i.e., decreases quality), but delays are one of many dimensions of quality in this market and may not be fully transparent or predictable in a given purchasing decision. More recently, Wilson (2019) finds that MMC decreases download speeds among internet service providers. In our setting, we highlight two possible channels through which insurers could adjust quality provision in response to changes in MMC. First, quality adjustment could occur within a contract. For example, insurers could offer a more comprehensive provider network to increase quality. They can also process appeals of their beneficiaries in a more timely manner. Second, quality adjustment could occur through an insurer's selection of which contracts to offer in which counties. Indeed, we observe a large amount of entry and exit of contracts in the data, suggesting that insurers might adjust the quality of their offerings through strategically limiting or expanding contracts across markets.

4 Empirical Strategy

We discuss first our construction of the MMC measure before turning to our model specification and identification strategy.

4.1 Multimarket Contact

Quantifying MMC is a key step toward studying its empirical effects. In any given market, there exists some variation in pairwise overlaps of participating firms with their competitors, and all such pairwise comparisons collectively determine the level of coordination and thus affect the prevalence of any collusive behavior. To offer a simple example, consider extending the standard Bertrand-Nash framework to incorporate MMC and tacit collusion. An increase in pair-specific

[17] These empirical investigations have largely examined how clinical outcomes vary with market Herfindahl-Hirschman Index. More recent studies, such as Cutler *et al.* (2010), Gaynor *et al.* (2013), and Bloom *et al.* (2015), tend to find that increased hospital competition leads to higher quality. See Gaynor (2006) for an extensive review of this literature.

MMC would tend to enhance the degree of coordination not only for the affected firms but also for other incumbent firms in the same market due to interdependence among rival firms. As a result, a firm's aggressiveness towards its competitors depends on the pairwise overlaps of each firm-pair in a given market. It is therefore natural to take into account all of the pairs of participants in a market environment and average the MMC across these pairs. Indeed, this is a common approach to measuring MMC in the empirical literature (Evans & Kessides, 1994; Jans & Rosenbaum, 1997; Ciliberto & Williams, 2014; Schmitt, 2018).[18] Following this literature, we calculate MMC as the average number of pairwise market overlaps among all firms in a given market:

$$\begin{aligned} MMC_{mt} &= \frac{1}{N_{mt}(N_{mt}-1)} \sum_{i=1}^{N_{mt}} \sum_{j=1, j\neq i}^{N_{mt}} \mathbb{1}\left[i, j \in N_{mt}\right](mmc_{ijt}-1) \\ &= \frac{1}{N_{mt}} \sum_{i=1}^{N_{mt}} \frac{1}{N_{mt}-1} \sum_{j=1, j\neq i}^{N_{mt}} \mathbb{1}\left[i, j \in N_{mt}\right](mmc_{ijt}-1) \\ &= \frac{1}{N_{mt}} \sum_{i=1}^{N_{mt}} MMC_{imt}, \end{aligned} \tag{1}$$

where mmc_{ijt} denotes the total number of markets in which firms i and j overlap in year t. With a slight abuse of notation, N_{mt} denotes the set of all firms operating in market m at time t as well as the total number of firms in a market. The indicator function, $\mathbb{1}\left[i, j \in N_{mt}\right]$, is set to 1 if both firm i and j operate in market m at time t and 0 otherwise.[19] Note that an equivalent expression for MMC_{mt} is averaging insurer-level MMC measures (MMC_{imt}) in a given market and year. This alternative expression in terms of insurer-level MMC is useful when we exploit exogenous variation at the insurer and market level in order to identify the effects of MMC, as discussed in detail in Section 4.3.

To better understand the construction of our MMC_{mt} variable, Table 3 presents the count of pairwise market overlaps among the top 10 insurers in MA in 2015. We see from the diagonal that Humana is the largest insurer (in terms of markets served), with a presence in over 2,400 markets. UnitedHealth, Blue Cross Blue Shield (BCBS), Aetna, and Wellcare round out the top

[18] Some existing studies have taken a different approach by measuring MMC at the firm-market level, including Fernandez & Marin (1998) and Prince & Simon (2009). We show in the supplemental appendix that our results are consistent if using this approach to define multimarket contact.

[19] There are 3,102 market/year observations with just one insurer in our data. These markets are relatively small on average, with just 165 enrollees per market compared to an average of over 800 MA enrollees in other markets. We drop these markets in our analysis in Section 5.

5 insurers in MA as of 2015. Note that we treat all Blue Cross Blue Shield plans and affiliates as BCBS following Dafny (2015).[20] Table 3 reflects a substantial amount of market overlap across insurers. For example, out of the 1,222 markets in which BCBS operated in 2015, the insurer overlapped with Humana in 1,080 of those markets (88%). Similarly, of the 1,370 markets in which UnitedHealth operated, the insurer overlapped with BCBS in 531 of those markets (39%).

Table 3

To examine variation in MMC across markets and over time, we present box plots of MMC by year in Figure 1 as well as a kernel density estimate of the change in MMC from 2008 to 2015 in Figure 2. In 2008, the mean MMC across all markets is just over 880, which means that insurers overlapped in over 880 counties on average. This number is large but is reflective of the dominance of a few large insurers in the MA market. For example, a market with one of the larger MMC values in 2008 was Hardy County, West Virginia. In that year, 4 insurers (Humana, Coventry, Universal, and BCBS) operated in Hardy County. Universal (the smallest insurer in that market) overlapped with BCBS in 1,110 markets, with Humana in 1,535 markets, and Coventry in 1,189. With Harden County as the reference market, Universal therefore overlapped with some other insurer in 1,278 markets on average. Accounting for the remaining overlaps between other insurers, the resulting average MMC for this market was 1,371 in 2008.

Note that our measure of MMC in the MA market is significantly larger than that of the U.S. hospital market (Schmitt, 2018), but compares to other settings such as the airline industry (Evans & Kessides, 1994; Ciliberto & Williams, 2014). As is evident from Figure 1, mean MMC first increases from 2008 to 2009 and then falls gradually through 2011 before leveling off after 2012. From Figure 2, we also observe strong heterogeneities in changes in MMC over time. In particular, among nearly 2,200 counties with a sufficient MA market in both 2008 and 2015, MMC decreased by over 1,000 in the lowest 5% of markets and increased by over 380 in the top 5% of markets. The observed decrease in average MMC over time is therefore characterized by differential changes across markets rather than an overall shift in the distribution of MMC, which offers additional variation with which to identify the effects of MMC on MA prices and quality.

[20] We also include Anthem in our BCBS designation; however, results are qualitatively unchanged when treating Anthem separately.

Figures 1 and 2

In addition to measuring MMC based on Equation 1, we also consider several alternative measures. Specifically, we consider a weighted measure of MMC with weights given by the relative market size of each overlapped market, and similarly a weighted measure where weights are given by each market's HHI (Jans & Rosenbaum, 1997; Fernandez & Marin, 1998; Prince & Simon, 2009). We also consider MMC measured at the insurer-market level (i.e., MMC_{imt} in Equation 1). Finally, we consider MMC calculations in which we focus only on the top 5 insurers. Results from these alternative measures are presented in the supplemental appendix.

4.2 Empirical Specification

We estimate effects of MMC on prices with a series of linear regressions of the form

$$y_{c(j)mt} = \beta x_{c(j)mt} + \nu_m + \tau_t + \gamma_c + \alpha MMC_{mt} + \varepsilon_{c(j)mt}, \tag{2}$$

where $x_{c(j)mt}$ denotes a vector of time-varying product/market characteristics for plan j operating under contract c, ν_m denotes county fixed effects, τ_t denotes year fixed effects, γ_c denotes contract fixed effects, and MMC_{mt} denotes multimarket contact. We include in $x_{c(j)mt}$ the following variables: 1) county demographics such as total population, the percent of the population ages 18 to 34, 35 to 64, and 65 or above, the percent of the population classified as Caucasian and percent African American, the percent of the population with household incomes between $50,000 and $75,000, between $75,000 and $100,000, between $100,000 and $150,000, and above $150,000, the percent of the population with a high school degree and percent with a bachelor's degree, and the percent of the population that is employed full time; 2) hospital variables including the total number of discharges in the county, total number of hospitals, and the hospital HHI; 3) an indicator for prescription drug coverage; and 4) MA variables including average FFS costs and the MA benchmark rate. Many other plan characteristics, such as whether the plan is HMO or PPO, do not vary within a contract over time and are therefore absorbed in the contract fixed effect. Coefficient estimates are derived from the generalized within-estimator as described in Correia (2016) and implemented in Correia (2017), which is a refinement of the techniques in Guimaraes *et al.* (2010) and Gaure (2013).

4.3 Addressing Endogeneity of MMC

MMC is likely to be correlated with unobservables that affect market structure and prices. For example, a market that is experiencing increased demand for MA plans may attract more entry, therefore generating increased overlap among competing firms. Such a market might simultaneously experience an increase in premium growth. Ignoring such endogeneity would lead to erroneous conclusions regarding how MMC affects market prices. To address this concern, we pursue an instrumental variables analysis in which we exploit two plausibly exogenous changes thought to influence MMC: 1) "simulated" increase in pairwise overlaps due to out-of-market mergers; and 2) exposure to changes in reimbursement policies including the introduction of the urban floor policy in 2001 and double-bonus policy in 2012. We discuss these instruments in more detail below.

Simulated Merger Effects

Our simulated merger instrument derives from changes in pairwise overlaps due to out-of-market mergers. To form this instrument, we exploit 8 relatively large mergers/acquisitions over our study time frame. We refer to all mergers and acquisitions simply as mergers for brevity. These mergers were first identified by changes to the parent organization observed in the data, and then confirmed through various sources, including Irving Levin's annual health care acquisition reports from 2005 through 2015, press releases, and coverage in the news media.[21] A list of all such mergers along with supporting documentation is presented in Table 4.

Table 4

For each merger, we form the instrument by taking the count (before the merger is finalized) of all market overlaps between a non-merging insurer and a merging insurer. For example, consider the merger between Bravo and HealthSpring finalized in November 2010. This merger event would cause changes in the pairwise overlap for *all* markets where either Bravo or HealthSpring operate. In markets where Bravo operates prior to the merger, our IV measure for insurer i is the count of all markets in which insurer i overlaps with HealthSpring (in the year prior to the merger) but not

[21] To make sure that we have captured all the large merger and acquisition events, we rely on the annual report from the Irving Levin's health care acquisition reports, which offers detailed information regarding all the announcement of proposed merger events. This data source has been used in other studies identifying merger events such as Schmitt (2018).

Bravo. This is because insurer i's overlap with HealthSpring is caused by the merger, while insurer i's overlap with Bravo is not. In this way, our merger-based instrument is intuitively similar to the simulated change in HHI used in Dafny *et al.* (2012). The instrument is calculated based on each insurer's market presence prior to the merger but takes its value in the years after the merger was finalized. For example, in the case of the merger between Bravo and HealthSpring, the instrument is based on market presence in 2010 but takes its value in 2011-2015, which we also interact with year dummy variables.

To better describe our strategy, consider an industry with four insurers (A, B, C, and D) and four markets. Assume that insurer C acquires D. Before the merger, Market 1 (the reference market) consists of insurers {A,B,D}; Market 2 consists also of {A,B,D}; Market 3 consists of {A,B,C}; and Market 4 consists of {A,B,C,D}. For the reference market prior to the merger, insurer A overlaps with insurer B in 3 markets and overlaps with insurer D in 2 markets, for a total pairwise overlap of 5. The merger generates an increase in insurer A's overlap, resulting from A's overlap with C in Market 3 prior to the merger. Our merger-induced change in pairwise overlaps for insurer A in the reference market therefore takes a value of 1 beginning in the first full year after the merger was finalized. Extending this example to Market 3, the instrument for insurer C takes the value of the sum of all merger-induced pairwise overlaps for insurer A and B. Effectively, by acquiring insurer D, insurer C introduces additional overlaps with insurers A and B (from Markets 1 and 2).[22]

It is important to note that our identification relies on out-of-market mergers (i.e., mergers between insurers that do not perfectly overlap across all markets). Had all the merger events occurred within markets, our merger-induced instruments would all be zero. We instead see in the data that there is substantial opportunity for our identified merger events to affect local market MMCs. For example, out of a total of 20,190 market-year pairs in the data, 40% were exposed to an out-of-market merger at some point during our time frame.

[22] It is not immediately clear how to treat markets in which both merging insurers operated prior to the merger (Market 4 in our example) since prices might be directly affected in such markets. Including these markets may call into question the standard exclusion restriction, although the exclusion restrictions for our other policy instruments likely still hold. We include such markets in our initial analysis and set the merger-related instrument to 0. We also consider an alternative analysis in the supplemental appendix where we drop all these markets (about 7% of the main sample), with little change in our results.

Exposure to Urban Floor and Bonus Counties

As discussed in detail in Zarabozo & Harrison (2009) and examined in Duggan *et al.* (2016), the "urban floor" policy was introduced in 2001 as part of the State Children's Health Insurance Program (SCHIP) Benefits Improvement and Protection Act (BIPA). This policy placed a lower bound on the reimbursement paid to MA plans in urban counties, defined as counties in MSAs with at least 250,000 people. Since, at the time, reimbursement was otherwise based on average FFS costs, counties exposed to the urban floor had relatively low FFS costs and were relatively large in terms of population. Beginning in 2004, the Medicare Modernization Act again adjusted MA payment rates by instituting a universal payment floor of 100% of Medicare FFS costs in the county. In counties with higher FFS costs, MA benchmarks were set at the prior year's benchmark plus the average national growth rate for FFS costs (or 2% if the growth rate was less than 2%). Therefore, although a separate payment formula did not apply formally to urban floor counties beyond 2004, the effects of the urban floor policy persisted beyond 2004 (Duggan *et al.*, 2016).

In our analysis, we identify urban floor counties based on FFS costs and population size as of 2004. This was the last year that the policy was officially in place and the largest set of counties directly impacted by the policies. An indicator for these urban floor counties is directly observed from publicly available data on CMS payments to MA plans. We then create an insurer-county measure of urban floor exposure as the count of all other counties in which an insurer operated prior to the urban floor program (in year 2000) that were ultimately treated by the urban floor policy by 2004.[23] We also interact this exposure measure with year dummies to allow effects to dissipate over time.

We similarly exploit the introduction of "double-bonus" counties in 2012 as an additional source of exogenous variation. This policy was intended as a reward system in which the standard bonus paid to high-quality MA contracts (above 3-stars) was doubled for selected counties. Importantly, Layton & Ryan (2015) find that the double-bonus program generated an influx of plans in affected markets. Counties were selected for the double bonus program based on: 1) urban floor county as of 2004; 2) at least 25 percent of eligible beneficiaries were enrolled in an MA plan as of 2009;

[23] Our MA data include information on the effective date of each contract. We can therefore identify an insurer's presence in a market in 2000 based on the effective date of all contracts offered in 2008 (the earliest year for which we have complete data on enrollments and approved MA service areas). Since we define exposure at the insurer level (rather than the contract level), our measure of baseline exposure will capture all counties for which the insurer maintained at least one contract in 2000 and 2008, even if some specific contracts or plans were ultimately dropped in those counties.

and 3) Medicare FFS costs in that area were lower than the national average. The double-bonus counties are therefore a subset of the urban floor counties. We also observe in the CMS payment data whether a given county qualified for the double-bonus payment. Similar to our calculation of exposure to the urban floor policy, we calculate exposure to the double-bonus policy as the count of other markets in which a given insurer operated prior to the policy (in year 2011) that were ultimately selected by CMS to receive double-bonus payments.[24] By construction, our measure of exposure to the double-bonus policy is set to 0 prior to 2011 and maintains the same value for the same insurer over time, which we again interact with year dummies.

Generated IV Approach

With the above-mentioned instruments, we account for endogeneity of MMC_{mt} with a preliminary prediction of MMC_{imt}, from which we derive an estimate of MMC_{mt} as the simple average across insurers in market m and year t based on Equation 1. We then employ the estimated MMC, $\widehat{MMC}_{mt}$, as an instrument in a standard fixed effects instrumental variables (FE-IV) estimator. Specifically, we denote our set of instruments by Z_{imt}, which consists of all variables created from out-of-market mergers as well as the introduction of the urban floor and bonus county policies. Our generated instrument regression model is then

$$MMC_{imt} = \delta Z_{imt} + \omega_{imt}. \tag{3}$$

This approach allows us to incorporate insurer- and market-level instruments and therefore exploits all of the available variation in our instrument set. We estimate Equation 3 with ordinary least squares (OLS), from which we obtain predicted values $\widehat{MMC}_{imt}$ and, subsequently,

$$\widehat{MMC}_{mt} = \frac{1}{N_{mt}} \sum_{i=1}^{N_{mt}} \widehat{MMC}_{imt}.$$

Finally, we use $\widehat{MMC}_{mt}$ as a generated instrument for MMC_{mt} in estimating Equation 2. Our generated instrument exploits the available information at the appropriate "level" of the data and

[24]We also included indicators for double-bonus counties, interacted with time dummies, directly in Equation 2 since those markets are directly affected by the double-bonus policy. Controlling for the double-bonus policy in this way does not change our results.

acts simply as linear combination of exogenous instruments, Z_{imt}.[25] Results for our generated instrument regression in Equation 3 are presented in the supplemental appendix.

4.4 Additional Specifications

We also consider additional specifications in order to address specific concerns regarding the effect of MMC on prices and quality. First, contract pricing and quality will naturally depend on the competitiveness of any given market. We have excluded such measures from our main specification due to endogeneity concerns regarding market-level measures of competitiveness. Note that our instruments are arguably exogenous to local market competitiveness, in which case excluding measures of local market competitiveness should not contaminate our identification of the effect of MMC. Nonetheless, we consider a specification where we include the county-level HHI among MA insurers as an additional covariate. Second, larger insurers may be able to raise prices directly, regardless of MMC, but will also tend to overlap with more firms in other markets. Failing to account for insurer prevalence across markets may therefore incorrectly attribute these direct pricing effects to MMC. We account for this with a specification in which we also control for the number of other markets in which the insurer operates. Finally, we have excluded from the pricing specification any measure of contract quality since quality may also be an outcome related to MMC, but we recognize that higher quality contracts are also higher priced on average. We therefore consider a final specification where we include a set of indicator variables capturing the plan's overall star rating.

5 Results

5.1 Multimarket Contact and Prices

We focus first on the plan-level results, in which a product is defined as a unique plan ID. In this analysis, the effect of MMC on price is identified from within-contract variation across plans as well as variation over time for the same plan. Plan-level regression results are summarized in Table

[25] A similar approach in which authors estimate a preliminary regression at a different level of the data and employ predicted values as instruments has been used in the trade and labor literatures. See, for example, Wolf (2000), Friedberg (2001), Frankel & Rose (2005), and Chintrakarn & Millimet (2006). As discussed in Wooldridge (2010), "we can ignore the fact that the instruments were estimated in using 2SLS for inference."

5, with effects for different outcomes presented across the rows and with different specifications along the columns. Panel 1 presents the fixed effects (FE) estimates based on Equation 2, and panel 2 presents the fixed effects instrumental variable (FE-IV) estimates when using predicted MMC as an instrument. All standard errors are clustered at the county level.

Table 5

The results are consistent with the mutual forbearance hypothesis, where higher values of MMC lead to higher bids and premiums. Specifically, the estimated effect on Part C bids of 3.568 in Panel 2 implies that an increase of one standard deviation (4.5) in MMC leads to an increase in Part C bids of about \$16 on average (or 2.2%). Note that we measure MMC in 100s in the estimation. We also estimate an increase of at least \$2 (or 7%) in Part C Premiums from a one standard deviation increase in MMC. Finally, we estimate very small (and insignificant) effects on Part D bids and premiums.

Table 6 presents results at the contract level. Here, premiums and bids are averaged across plans under the same contract in a given market. The structure of the table is otherwise analogous to the plan-level results in Table 5, with effects for different outcomes presented along the rows and with different specifications along the columns. The results again provide empirical evidence in support of the mutual forbearance hypothesis. Based on the FE-IV estimates in Panel 2 of Table 6, a one standard deviation increase in MMC leads to an \$18 (or 2.5%) increase in Part C bids and just under a \$3 (or 10%) increase in Part C premiums (from specification 1 in column 1). Different from the plan-level results, we find a larger effect on Part D bids. For example, a one standard deviation increase in MMC leads to an \$1.20 (or 1.8%) increase in Part D bids. Consistent with the results on Part C and Part D bids, we also find that MMC leads to higher premiums.

Table 6

The results in Tables 5 and 6 are largely consistent if we control for local market competitiveness (column 2), insurer prevalence (column 3), and quality star ratings (column 4). It is also interesting to note that we find stronger results if we control for underlying star rating for each contract. This is intuitive if increased MMC also depresses product quality, which we specifically examine in the next section.

Taken together, we find consistent evidence that MMC tends to increase Part C bids and premiums. To put our estimates in perspective, we consider a scenario of moving from the 25th to 75th percentile in MMC and estimate an increase in Part C bids of 3.2%. These magnitudes are comparable to those found in other studies. For example, Ciliberto & Williams (2014) find that an increase of MMC from the 25th to the 75th percentile leads to a 2% increase in airline pricing, and Evans & Kessides (1994) estimated a slightly larger effect of 5%. As a back-of-the-envelope calculation, our estimated effects on Part C bids suggest a reduction in annual consumer welfare of $5 billion from a one standard deviation increase in MMC.[26] We also find some evidence that MMC increases Part D bids, although not much for Part D premiums. Finally, although results are excluded for brevity, we note that our estimates are unchanged when weighting plans by the number of enrollees.

5.2 Multimarket Contact and Quality

We measure quality with a series of indicator variables for whether a contract is 4-star rated or higher. We form this indicator separately for the overall rating as well as the 9 individual measures. We then combine the 9 individual measures into their respective 3 domains, as indicated in the supplemental appendix. Collectively, we therefore consider 4 measures of quality for each contract: an indicator for whether the contract received a high rating (4-stars or higher) and indicators in each of our domains set to 1 if at least half of the underlying metrics in that domain received a high rating.

Analogous to our analysis of contract-level prices, we first consider within-contract variation in quality ratings over time. This analysis estimates Equation 2 for each of our contract-level quality outcomes, and we again consider different specifications designed to assess the sensitivity of our results to the market-level HHI as well as the insurer's prevalence across other markets. Results are summarized in Table 7.

[26]This calculation assumes a total of 20 million MA beneficiaries with an increase of $16 in Part C bids, which suggests a welfare loss of $3.84 billion in terms of increased prices (20 million*$16*12), and reduced benefits of $1152 million (10million*0.6*$16 assuming 50% purchased contracts with zero Part C premiums and CMS pays 60% of the bid-benchmark differential as rebates).

Table 7

The FE-IV estimates in panel 2 of Table 7 suggest that a one standard deviation increase in MMC leads to approximately a 12 percentage point reduction in the probability that a contract receives a high overall rating. Among the measures for which we have data available throughout our panel, this reduction is concentrated in the domains of "keeping patients healthy" and "appeals", and offset somewhat by increases in the "managing chronic disease" domain. Our contract-level results are therefore somewhat mixed, with a decrease in overall quality but an increase in quality among some specific measures. This finding is perhaps unsurprising. Note that a typical contract operates in multiple markets but receives the same quality rating across all operated markets. This suggests within-contract adjustment might need to take into account changes in MMC in all affected markets. As a result, firms might be constrained in manipulating their star rating for a given contract in the wake of changes in MMC to a particular local market.

In addition to within-contract quality adjustment, an insurer could also manipulate quality provision through selecting contracts into local markets. To capture this mechanism, we examine quality at the market level.[27] We aggregate our quality measures to the county level by taking the count of the high-quality contracts where high-quality is defined analogously to the contract-level analysis. We then use these count measures as outcomes in estimating Equation 2 at the market level. As before, we present the standard FE results as well as our preferred FE-IV results using predicted MMC as our instrument. Note that, due to the timing of CMS approvals, it is not possible for insurers to know which contracts will be offered in their market at the time they submit their initial applications.[28] We therefore use lagged MMC in our market level analysis, and lagged predicted MMC as our instrument. These results are presented in Table 8.

Table 8

[27]For completeness, we also present market-level pricing results in the supplemental appendix, along with additional discussion of the entry and exit of contracts over our panel.

[28]For more details on the timing of insurer bids and approvals, see the Medicare Advantage Applications available at https://www.cms.gov/Medicare/Medicare-Advantage/MedicareAdvantageApps/index.html. In general, insurers seeking changes to existing products or seeking to expand into new markets must first submit applications to CMS for approval. It is recommended that they submit a notice of intent to apply at the end of the prior calendar year but no later than mid-January, with final applications due in February. Conditionally approved contracts must then prepare plan bids and cost-sharing details of all plan benefit packages, which are reviewed by CMS and ultimately approved or denied in August of a given calendar year. Final contracts are executed in September, just prior to the beginning of the open enrollment period.

Panel 1 presents results based on the FE within-estimator, and panel 2 presents the FE-IV results. Effects on different quality measures are presented along the rows, with alternative specifications presented along the columns. The estimated effects on the number of high-rated contracts (based on the overall star rating) are presented in row 1 of both panels, where we estimate an economically meaningful decrease in the prevalence of high-rated contracts as MMC increases. Specifically, the estimated coefficient of -0.242 on MMC_{t-1} from the FE-IV estimator suggests that a one standard deviation increase in MMC in year $t-1$ leads to one fewer high-rated contract in year t. To put this estimate in context, we observe 2.7 high-rated contracts per market in 2015. Our estimated reductions therefore reflect around a 30% reduction in the prevalence of high-rated contracts in an average market.

Rows 2-5 in each panel of Table 8 present the results on the counts of high-rated contracts in the specific quality domains. Here, we continue to estimate large negative effects of MMC on the prevalence of high-rated contracts. The largest effects are in the "keeping patients healthy" and the "managing chronic diseases" domains, with smaller (albeit still negative) effects in "appeals." Altogether, our results generally suggest that quality decreases in response to an increase in MMC, at both the individual contract level and aggregated market level. Our estimated magnitude of effects is also large compared to the existing literature. For example, Prince & Simon (2009) find that an increase in MMC from the 25th to the 75th percentile leads to quality decrease by 5% to 15%, depending on the quality measure used; however, our measures of quality are more transparent and arguably more manipulable by insurers, especially through contract entry and exit from local markets.

6 Robustness

In this section, we gauge the sensitivity of our results to various concerns regarding our identification strategy and measurement of MMC. We also discuss a series of additional sensitivity analyses, the results of which are presented in the supplemental appendix.

6.1 Estimates based on Out-of-market Mergers

We first propose an alternative identification strategy where we directly exploit out-of-market mergers in which a given insurer is exposed to additional market overlaps due a competitor merging with another insurer outside of the reference market. Revisiting our example from Section 4, consider an industry with four insurers (A, B, C, and D) and four markets, and assume that insurer C acquires D. Before the merger, Market 1 (the reference market) consists of insurers {A,B,D}; Market 2 consists also of {A,B,D}; Market 3 consists of {A,B,C}; and Market 4 consists of {A,B,C,D}. When C acquires D, insurers A and B in the reference market are each exposed to one additional overlap due to pre-existing overlap with insurer C in Market 3. Since only one of the merging parties operates in the reference market, this is an out-of-market merger in which the average pairwise overlaps changed due to the merger.

Similar to Schmitt (2018), we adopt the following specification

$$y_{c(j)mt} = \beta x_{c(j)mt} + \nu_m + \tau_t + \gamma_c + \alpha \times \mathbb{1}\left(t > \tau_{im}\right) + \varepsilon_{c(j)mt}, \tag{4}$$

where $\mathbb{1}\left(t > \tau_{im}\right)$ is a post-treatment indicator variable set to one in the years after an insurer i was exposed to a change in MMC in market m due to an out-of-market merger.[29] The rest of the variables in Equation 4 are as defined previously. We also consider a simplified specification in which we exclude $x_{c(j)mt}$ from the regression.

To separate our estimates from any direct effects due to the merger itself, we exclude all observations associated with insurers that were ultimately part of a merger (e.g., in the context of our example above, insurers C and D would be dropped from our analysis in all years). We also exclude all markets in which both merging insurers existed prior to the merger.[30] The estimates therefore reflect the change in prices or quality from a plausibly exogenous increase in MMC driven by an out-of-market merger. We again present results at both the plan and contract levels.[31]

[29]Since we define τ_{im} as an out-of-market merger that changes an insurer's count of pairwise overlaps, we set the indicator to 0 if there was no change in MMC due to the merger. For example, if a fifth insurer (insurer E) operated only in the reference market in our example above, the indicator would be 0 since insurer E's overlap with other insurers is unchanged, even though they compete in the reference market with an insurer that was part of the acquisition. Results are unchanged if we instead exclude these insurers from the analysis.

[30]We further exclude observations in which an insurer first enters market m in the year a merger was finalized, since we do not have pre-merger prices for such observations.

[31]The specification in Equation 4 does not directly extend to the market level. If we instead re-define the treatment variable as the average of insurer-level indicators in the county, and estimate results are the market level, we find results similar to those in Section 5.2.

Results are summarized in Table 9.

Table 9

Our results are largely consistent with our main findings in Section 5. Across all specifications, we find Part C bids increase due to MMC.[32] We also estimate relatively smaller but significant increases in Part D bids, consolidated premiums, and Part D premiums. With regard to quality, we again estimate significant reductions in the prevalence of high-rated contracts.

Note that the sample of contracts underlying the estimates in Table 9 differs from our prior results – in particular, three of the largest insurers in Medicare Advantage (Humana, UnitedHealth, and Wellcare) are part of a merger during our time period and therefore excluded from this analysis. Nonetheless, the results generally yield similar conclusions to our original analysis, with changes in MMC from out-of-market mergers leading to an increase in prices and a reduction in quality.

6.2 Additional Robustness Checks

We also examine the sensitivity of our estimates to variation in samples across outcomes and specifications. One large source of variation is missing premium and payment information in the raw data. In the supplemental appendix, we address this concern by restricting the sample only to contract/county observations (or plans operating under such contracts) for which all price variables are non-missing in all available years and re-estimating our preferred specification for all outcomes. We also consider the sensitivity of our main results to the presence of markets in which both merging insurers operated prior to a merger. We do this by excluding all observations for counties in which both merging insurers existed together in any year prior to the merge. This restriction reduces the plan-level sample size by just under 10,000 plan/county/year observations, or about 7%. Finally, we consider alternative measures of MMC as discussed in Section 4.

Results for these additional analyses are provided in the supplemental appendix. Across all sensitivity analyses, our results are generally consistent with those presented in Section 5. We conclude from these additional analyses that the positive effect of MMC on Part C bids and

[32] In our main specification, we do not differentiate between insurers exposed to one or many out-of-market mergers over time. We nonetheless re-estimated Equation 4 after excluding all insurers/markets exposed to multiple out-of-market mergers. The results are almost identical to those in Table 9.

premiums is significant and persistent, as is the negative effect of MMC on the prevalence of high-quality contracts. Collectively, our results therefore offer strong evidence in support of the mutual forbearance hypothesis in the Medicare Advantage market.

7 Discussion

Tacit collusion driven by contact with the same competitors across markets has been examined across several industries, often with a focus on prices. In this paper, we extend the literature on MMC to the study of health insurance markets. We also consider another important dimension by which MMC may influence firm behavior – namely, product quality. Our results consistently support the mutual forbearance hypothesis, where we find that existing insurers tend to place higher bids and are less likely to offer high-quality contracts when competing against the same insurers across multiple markets. Our results also suggest that ignoring the effect of MMC on product quality might lead researchers to underestimate the loss in consumer welfare driven by increases in MMC.

Note that we do not interpret increases in MMC as an increase in collusion for the same market. Rather, we interpret increases in MMC as an increase in the probability of collusion. For example, if markets have some latent and heterogeneous threshold beyond which MMC may facilitate collusive behavior, an increase in the continuous MMC measure reflects an increase in the number of markets for which tacit collusion may now occur.

Our findings offer several central takeaways. First, a firm's ability to detect deviations from collusion seems critical in assessing mutual forbearance and MMC. In our setting, both perfect observability and asymmetry conditions are satisfied, allowing us to find strong evidence in support of the mutual forbearance hypothesis. Our findings also suggest tacit collusion as a potential unintended consequence of price transparency. Second, the effect of MMC in Medicare Advantage appears to also reduce plan benefits and quality, in addition to directly affecting prices. This interpretation in terms of "plan benefits" follows from the institutional details of the bidding process, wherein the rebated percentage of the bid-benchmark differential (for bids below the benchmark) must go to enrollees in the form of expanded benefits. Since this differential is decreasing due to MMC, this suggests a reduction in plan benefits, although we do not observe the precise dimensions by which benefits are changed. Third, in addition to within-plan or within-contract changes over time, we estimate large effects of MMC via selection of contracts offered across markets. These effects clearly emerge in our analysis of market-level quality.

We conclude with two policy implications. First, as the Medicare Advantage market becomes increasingly characterized by relatively few national insurers, our results suggest that the incentives to collude due to MMC may play an increasing role. This further informs future MA policy in that expanded "choice" may have less effect on competitiveness when such expansion derives from large, national insurers. MA policy may instead attempt to counter these forces by encouraging entry from smaller or regional insurers for which MMC is less prevalent. Such a strategy would not only maintain choice but also minimize the incentives to collude due to MMC.

Second, existing antitrust enforcement procedures tend to overlook anti-competitive effects of increased MMC (or pro-competitive effects of reduced MMC). However, mergers that have no impact on local market concentration (e.g., cross-market mergers) could potentially lead to large changes in MMC and, through this mechanism, affect the overall intensity of competition. Our results support this hypothesis and suggest that MMC should be given more careful consideration when assessing changes in competition from mergers/acquisitions, especially in settings where national players tend to overlap in multiple markets.

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Tables and Figures

Figure 1: Range of MMC by Year

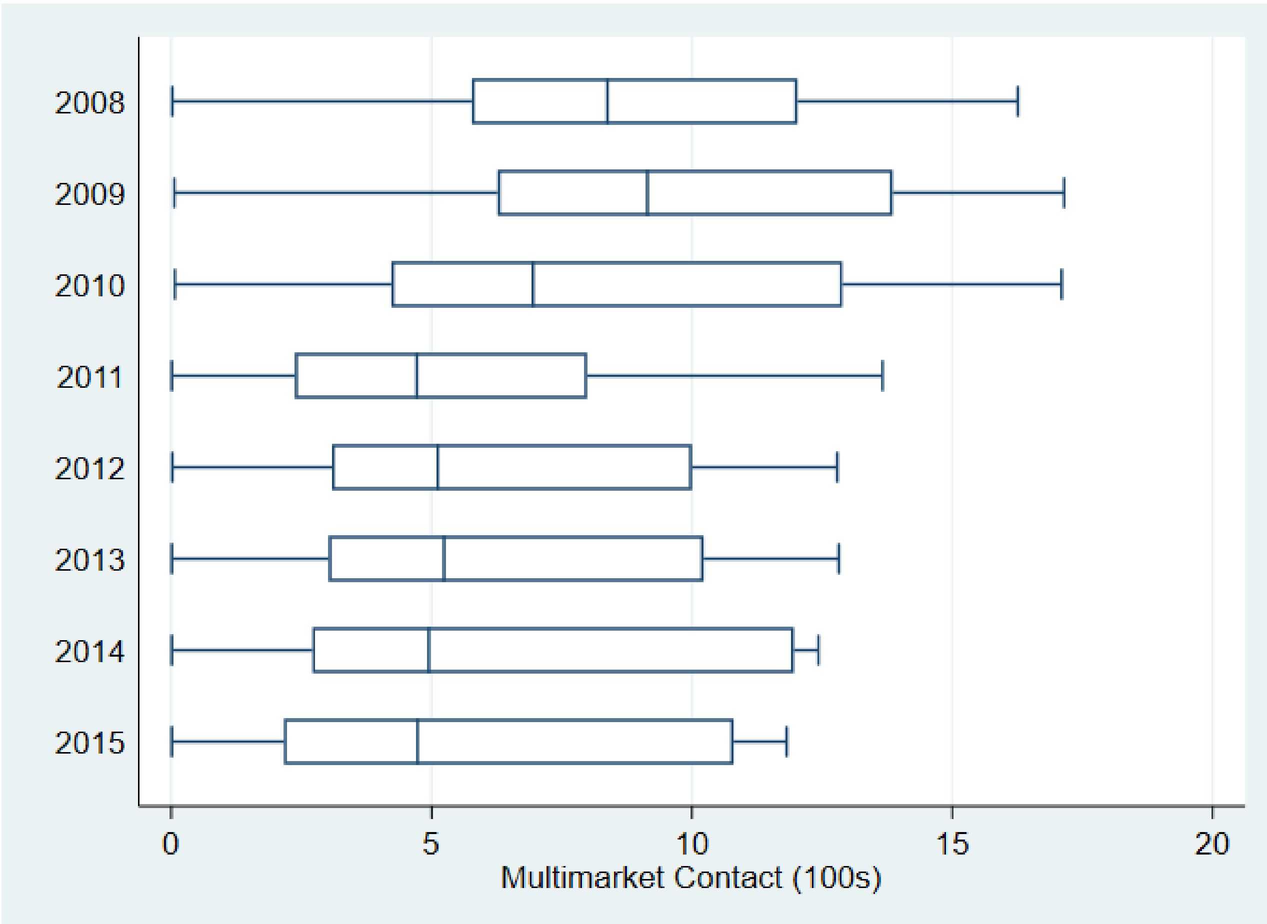

Figure 2: Kernel Density of MMC Change from 2008 to 2015

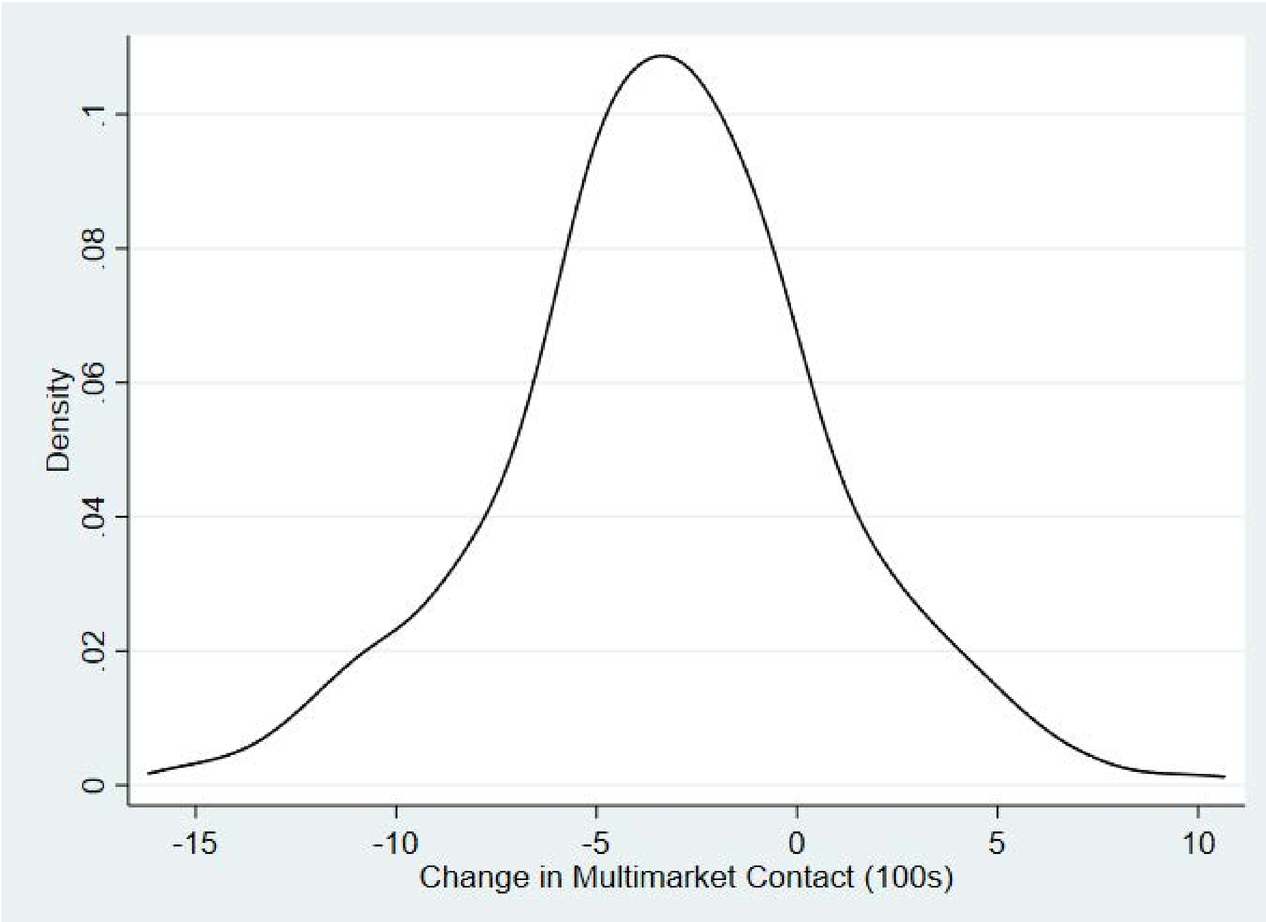

Table 1: **Plan- and Contract-level Summary Statistics**

	2008	2009	2010	2011	2012	2013	2014	2015	Overall
Plan/County Data									
Enrollment[a]	219.1	214.6	258.1	354.5	392.9	415.3	462.4	498.2	336.3
	(1151.8)	(1152.1)	(1210.7)	(1482.6)	(1562.7)	(1632.4)	(1748.1)	(1852.9)	(1462.7)
MA Share[b]	0.0618	0.0568	0.0697	0.0865	0.0866	0.0824	0.0808	0.0815	0.0741
	(0.101)	(0.0913)	(0.106)	(0.124)	(0.126)	(0.123)	(0.121)	(0.119)	(0.113)
Part C Bid	697.5	733.6	756.5	741.8	738.4	742.6	763.0	716.8	735.0
	(57.99)	(68.96)	(79.64)	(79.28)	(73.16)	(83.87)	(83.42)	(78.70)	(77.56)
Part D Bid	64.58	69.53	71.31	69.96	69.01	64.46	61.87	60.95	66.75
	(12.90)	(15.00)	(14.55)	(15.04)	(16.08)	(16.76)	(18.68)	(19.39)	(16.48)
Premium[c]	35.96	38.08	48.51	45.47	44.12	45.49	48.07	51.14	44.08
	(42.07)	(45.11)	(48.84)	(49.82)	(49.06)	(51.23)	(54.14)	(54.44)	(49.27)
Part C Premium[d]	24.14	24.16	34.44	29.49	27.99	28.12	27.45	27.16	27.79
	(33.09)	(35.36)	(38.73)	(37.30)	(35.71)	(37.00)	(36.90)	(36.67)	(36.45)
Part D Premium[e]	19.56	20.98	19.25	20.07	20.70	21.93	26.02	28.19	21.90
	(17.24)	(18.13)	(17.37)	(18.34)	(19.26)	(19.98)	(22.64)	(23.35)	(19.73)
Drug Coverage[f]	0.615	0.669	0.738	0.772	0.786	0.798	0.800	0.811	0.739
HMO[g]	0.206	0.212	0.249	0.328	0.342	0.361	0.373	0.389	0.297
PPO[h]	0.152	0.180	0.274	0.412	0.450	0.471	0.505	0.515	0.349
Observations	28,988	33,224	29,212	22,447	22,337	23,029	22,000	21,430	202,667
Contract/County Data									
Star Rating 3 to 3.5		0.161	0.206	0.462	0.621	0.652	0.612	0.325	0.354
Star Rating 4 to 5		0.028	0.057	0.100	0.115	0.182	0.312	0.557	0.154
Plans Offered[i]	1.791	1.766	1.801	1.745	1.742	1.723	1.710	1.673	1.748
	(1.064)	(1.051)	(1.063)	(1.003)	(0.991)	(1.000)	(0.994)	(0.955)	(1.021)
Observations	16,185	18,815	16,224	12,865	12,822	13,363	12,869	12,812	115,955

[a]Defined as the average monthly enrollment for a plan.

[b]Defined as a plan's share of the MA market.

[c]Denotes the consolidated Part C and Part D premium, including an $0 premium plans.

[d]Reflects the premium only for Part C benefits (basic benefits and any mandatory supplemental benefits), including $0 premium plans.

[e]Defined as the total Part D premium (sum of the basic and supplemental premiums), net of any rebates from Part C.

[f]An indicator for whether the plan offers Part D benefits.

[g]An indicator for whether the contract is a Health Maintenance Organization.

[h]An indicator for whether the contract is a Preferred Provider Organization.

[i]Defined as the number of plans offered under a given contract.

Table 2: **County-level Summary Statistics**

	2008	2009	2010	2011	2012	2013	2014	2015	Overall
MA Penetration[a]	0.146	0.159	0.160	0.170	0.183	0.201	0.221	0.233	0.184
	(0.105)	(0.109)	(0.113)	(0.119)	(0.123)	(0.126)	(0.128)	(0.131)	(0.123)
Number of Plans[b]	10.03	11.39	9.919	7.630	7.577	7.906	7.727	7.559	8.721
	(9.241)	(9.976)	(8.528)	(6.546)	(6.532)	(6.594)	(6.493)	(6.270)	(7.781)
Insurers[c]	4.382	4.638	3.952	3.112	2.944	2.965	2.942	2.890	3.480
	(2.470)	(2.497)	(2.128)	(1.726)	(1.640)	(1.672)	(1.796)	(1.795)	(2.106)
Benchmark Rate[d]	766.3	792.8	789.5	789.9	794.7	805.6	831.5	774.8	793.1
	(70.01)	(71.50)	(71.83)	(72.15)	(69.97)	(67.01)	(60.11)	(53.20)	(69.77)
Mean FFS Costs	7992.7	7950.0	8185.6	8363.6	8340.9	8272.0	8334.9	8580.0	8251.5
	(1294.8)	(1281.2)	(1354.4)	(1252.0)	(1224.1)	(1280.9)	(1148.7)	(1134.6)	(1263.6)
Population (1000s)	158.6	102.9	102.7	103.7	104.3	106.2	109.2	110.3	109.9
	(395.5)	(319.9)	(317.8)	(320.4)	(323.0)	(327.6)	(334.7)	(338.6)	(332.5)
% Age $\geq$ 65	0.139	0.152	0.154	0.157	0.160	0.163	0.166	0.170	0.158
	(0.0339)	(0.0407)	(0.0403)	(0.0405)	(0.0408)	(0.0411)	(0.0413)	(0.0419)	(0.0412)
% Employed	0.387	0.376	0.375	0.375	0.376	0.370	0.369	0.371	0.375
	(0.0537)	(0.0579)	(0.0585)	(0.0593)	(0.0607)	(0.0610)	(0.0611)	(0.0620)	(0.0598)
% White	0.828	0.840	0.841	0.839	0.839	0.838	0.834	0.833	0.837
	(0.143)	(0.160)	(0.161)	(0.161)	(0.162)	(0.161)	(0.162)	(0.162)	(0.160)
% Black	0.0930	0.0920	0.0925	0.0938	0.0947	0.0957	0.0979	0.0981	0.0948
	(0.125)	(0.145)	(0.147)	(0.147)	(0.148)	(0.148)	(0.149)	(0.149)	(0.146)
College Graduate	0.134	0.123	0.125	0.126	0.127	0.128	0.130	0.132	0.128
	(0.0561)	(0.0526)	(0.0536)	(0.0526)	(0.0527)	(0.0532)	(0.0538)	(0.0544)	(0.0536)
Observations	2,890	2,918	2,945	2,942	2,948	2,913	2,847	2,835	23,238

[a]Defined as the overall share of MA relative to the total Medicare market
[b]Denotes the total number of plans in a county
[c]Denotes the number of unique insurers in a county
[d]Reflects the average Part C benchmark payment for each county

Table 3: **Pairwise Overlaps Among Top 10 Insurers in 2015**[a]

	Aetna	BlueCross	Cigna	HealthNet	Humana	Kaiser	UCare MN	UnitedHealth	Universal	WellCare
Aetna	614									
BlueCross	283	1,222								
Cigna	80	197	298							
HealthNet	31	64	9	67						
Humana	544	1,080	287	54	2,490					
Kaiser	25	37	9	25	58	76				
UCare MN	0	0	0	0	99	0	108			
UnitedHealth	378	531	190	51	1,182	58	0	1,370		
Universal	35	57	15	5	65	5	0	85	95	
WellCare	95	187	86	15	284	23	0	207	24	304

[a] Numbers reflect the total count of market overlaps between each insurer in 2015. The values are denoted by mmc_{ijt} in Equation 1. "BlueCross" reflects all Blue Cross and Blue Shield plans and affiliates.

Table 4: **Identified Mergers/Acquisitions**

Acquired	Acquiring	Date Finalized	Year in Data[a]	Source[b]
Bravo	HealthSpring	November 2010	2011	Modern Healthcare
Sisters of Mercy	Coventry	2010	2011	St. Louis Business Journal
HealthSpring	Cigna	January 2012	2012	Cigna Press Release
XLHealth	United Healthcare	February 2012	2012	UHC Press Release
Arcadian	Humana	April 2012	2012	Humana Press Release
Munich American	Windsor	2011	2012	Munich Press Release
Coventry	Aetna	May 2013	2013	Aetna Press Release
Windsor Health	WellCare	January 2014	2014	Yahoo Finance Article

[a]Based on first observed change in "parent organization" or "organization marketing name" in the MA data, which appears to occur before some acquisitions are completely finalized.

[b]Please refer to Section 4.3 for more details regarding additional data source.

Table 5: **Effects of MMC on Pricing at Plan-level**[a]

	(1)	(2)	(3)	(4)
FE Regression Results				
Part C Bids	0.265**	0.242**	0.396***	0.440***
(n=142,780)	(0.108)	(0.108)	(0.112)	(0.116)
Part D Bids	-0.141***	-0.146***	-0.045**	-0.151***
(n=118,745)	(0.019)	(0.019)	(0.020)	(0.022)
Premium	-0.057	-0.066	0.084*	-0.145***
(n=163,008)	(0.049)	(0.049)	(0.050)	(0.049)
Part C Premium	0.051	0.043	0.120***	-0.028
(n=161,817)	(0.040)	(0.040)	(0.040)	(0.039)
Part D Premium	-0.139***	-0.143***	-0.047**	-0.155***
(n=118,759)	(0.023)	(0.023)	(0.024)	(0.026)
FE-IV Regression Results				
Part C Bids	3.568***	3.499***	3.694***	4.322***
(n=142,780)	(0.732)	(0.734)	(0.735)	(0.750)
	[170.61]	[170.13]	[174.82]	[208.53]
Part D Bids	0.086	0.075	0.158	0.233*
(n=118,745)	(0.128)	(0.128)	(0.128)	(0.128)
	[202.57]	[202.32]	[206.56]	[234.22]
Premium	0.339	0.309	0.437*	1.012***
(n=163,008)	(0.261)	(0.262)	(0.261)	(0.252)
	[214.47]	[214.18]	[218.18]	[258.93]
Part C Premium	0.466**	0.443**	0.517***	1.002***
(n=161,817)	(0.198)	(0.198)	(0.199)	(0.202)
	[209.40]	[208.97]	[213.15]	[251.07]
Part D Premium	-0.058	-0.065	0.009	0.022
(n=118,759)	(0.150)	(0.150)	(0.151)	(0.143)
	[202.61]	[202.36]	[206.60]	[234.28]
Specification				
Contract, County, Year FE	✓	✓	✓	✓
HHI		✓		
Insurer Prevalence			✓	
Star Ratings				✓

[a]Plan-level regression results, with standard errors in parenthesis clustered at the county level. Sample sizes vary due to missing values for dependent variables. See the supplemental appendix for results on a balanced panel with non-missing values over time. First-stage F-statistics for our generated instrument are presented in brackets. Additional independent variables not in the table include contract fixed effects, county and year fixed effects, county-level demographic variables, an indicator for prescription drug coverage, average FFS costs in the county, the MA benchmark rate, and measures of the local (county) hospital market including HHI, total discharges, and number of hospitals. * p<0.1, ** p<0.05, *** p<0.01

Table 6: **Effects of MMC on Pricing at Contract-level**[a]

	(1)	(2)	(3)	(4)
FE Regression Results				
Part C Bids	0.532***	0.505***	0.672***	0.512***
(n=77,114)	(0.107)	(0.107)	(0.108)	(0.110)
Part D Bids	-0.136***	-0.140***	-0.039**	-0.155***
(n=82,611)	(0.017)	(0.017)	(0.018)	(0.020)
Premium	-0.051	-0.058	0.090*	-0.184***
(n=92,217)	(0.047)	(0.047)	(0.047)	(0.048)
Part C Premium	0.050	0.044	0.120***	-0.063*
(n=91,628)	(0.039)	(0.039)	(0.039)	(0.038)
Part D Premium	-0.126***	-0.130***	-0.046**	-0.153***
(n=82,616)	(0.019)	(0.019)	(0.020)	(0.021)
FE-IV Regression Results				
Part C Bids	4.100***	4.037***	4.122***	5.011***
(n=77,114)	(0.719)	(0.721)	(0.712)	(0.717)
	[163.12]	[162.80]	[172.24]	[213.17]
Part D Bids	0.267**	0.256**	0.320***	0.322***
(n=82,611)	(0.110)	(0.110)	(0.109)	(0.107)
	[202.73]	[202.45]	[210.74]	[250.67]
Premium	0.647**	0.629**	0.708***	1.105***
(n=92,217)	(0.257)	(0.257)	(0.257)	(0.243)
	[203.11]	[202.99]	[211.83]	[258.26]
Part C Premium	0.597***	0.584***	0.629***	1.020***
(n=91,628)	(0.199)	(0.200)	(0.200)	(0.192)
	[198.87]	[198.65]	[207.59]	[251.57]
Part D Premium	0.134	0.127	0.177	0.140
(n=82,616)	(0.122)	(0.122)	(0.122)	(0.111)
	[202.73]	[202.45]	[210.74]	[250.67]
Specification				
Contract, County, Year FE	✓	✓	✓	✓
HHI		✓		
Insurer Prevalence			✓	
Star Ratings				✓

[a]Contract-level regression results, with standard errors in parenthesis clustered at the county level. Sample sizes vary due to missing values for dependent variables. See the supplemental appendix for results on a balanced panel with non-missing values over time. First-stage F-statistics for our generated instrument are presented in brackets. Additional independent variables not in the table include contract fixed effects, county and year fixed effects, county-level demographic variables, the percentage of plans offering prescription drug coverage, average FFS costs in the county, the MA benchmark rate, and measures of the local (county) hospital market including HHI, total discharges, and number of hospitals. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 7: **Effects of MMC on Contract Quality**[a]

	(1)	(2)	(3)
FE Regression Results			
Overall Rating	-0.002***	-0.002***	-0.003***
(n=64,717)	(0.001)	(0.001)	(0.001)
Keeping Patients Healthy	-0.002**	-0.002**	-0.000
(n=53,289)	(0.001)	(0.001)	(0.001)
Managing Chronic Disease	0.004***	0.004***	0.004***
(n=40,604)	(0.001)	(0.001)	(0.001)
Appeals	-0.002***	-0.002***	-0.003***
(n=54,528)	(0.001)	(0.001)	(0.001)
FE-IV Regression Results			
Overall Rating	-0.028***	-0.028***	-0.028***
(n=64,717)	(0.003)	(0.003)	(0.003)
	[259.59]	[259.96]	[271.04]
Keeping Patients Healthy	-0.016***	-0.016***	-0.016***
(n=53,289)	(0.004)	(0.004)	(0.004)
	[262.01]	[262.98]	[272.22]
Managing Chronic Disease	0.012***	0.012***	0.012***
(n=40,604)	(0.004)	(0.004)	(0.004)
	[272.25]	[272.72]	[280.75]
Appeals	-0.007**	-0.007**	-0.007**
(n=54,528)	(0.003)	(0.003)	(0.003)
	[277.72]	[277.62]	[279.80]
Specification			
County, Year FE	✓	✓	✓
HHI		✓	
Insurer Prevalence			✓

[a]Contract-level regression results with standard errors in parenthesis clustered at the county level. Sample sizes vary due to missing values for dependent variables. Additional independent variables not in the table include county-level demographic variables, the percentage of plans offering prescription drug coverage, average FFS costs in the county, the MA benchmark rate, and measures of the local (county) hospital market including HHI, total discharges, and number of hospitals. * p<0.1, ** p<0.05, *** p<0.01

Table 8: **Effects of MMC on Market Quality**[a]

	(1)	(2)	(3)
FE Regression Results			
Overall Rating	-0.025***	-0.025***	-0.026***
	(0.003)	(0.003)	(0.003)
Keeping Patients Healthy	0.009**	0.009**	0.008**
	(0.004)	(0.004)	(0.004)
Managing Chronic Disease	0.006*	0.006*	0.006*
	(0.003)	(0.003)	(0.003)
Appeals	0.002	0.001	0.008**
	(0.003)	(0.003)	(0.003)
FE-IV Regression Results			
Overall Rating	-0.242***	-0.244***	-0.236***
	(0.030)	(0.030)	(0.029)
Keeping Patients Healthy	-0.313***	-0.315***	-0.303***
	(0.038)	(0.038)	(0.037)
Managing Chronic Disease	-0.131***	-0.133***	-0.126***
	(0.028)	(0.028)	(0.028)
Appeals	-0.007	-0.009	-0.052**
	(0.023)	(0.023)	(0.022)
First-stage F-stat	170.37	169.88	178.18
Specification			
County, Year FE	✓	✓	✓
HHI		✓	
Count of Contracts			✓

[a]County-level regression results ($N = 14,345$) with standard errors in parenthesis clustered at the county level. Additional independent variables not in the table include county-level demographic variables, the percentage of plans offering prescription drug coverage, average FFS costs in the county, the MA benchmark rate, and measures of the local (county) hospital market including HHI, total discharges, and number of hospitals. * p<0.1, ** p<0.05, *** p<0.01

Table 9: **Effects of Out-of-market Mergers**[a]

	Plan Level		Contract Level	
	(1)	(2)	(3)	(4)
Part C Bids	8.485***	9.804***	7.749***	9.521***
	(1.589)	(1.633)	(1.658)	(1.793)
	[41,440]	[37,212]	[16,237]	[14,337]
Part D Bids	3.507***	3.684***	3.698***	3.858***
	(0.372)	(0.386)	(0.430)	(0.458)
	[34,442]	[30,664]	[17,834]	[15,696]
Consolidated Premiums	2.763**	3.710***	3.699***	4.120***
	(1.090)	(1.166)	(1.179)	(1.275)
	[42,871]	[38,324]	[18,394]	[16,160]
Part C Premiums	-0.240	-0.340	1.385	0.919
	(0.904)	(0.967)	(0.964)	(1.042)
	[42,429]	[37,949]	[18,228]	[16,024]
Part D Premiums	2.885***	3.495***	2.527***	3.189***
	(0.495)	(0.516)	(0.530)	(0.564)
	[34,445]	[30,667]	[17,835]	[15,697]
Overall Rating			-0.077***	-0.066***
			(0.013)	(0.014)
			[14,330]	[12,724]
Keeping Patients Healthy			-0.022	-0.036**
			(0.015)	(0.016)
			[13,101]	[11,624]
Managing Chronic Disease			-0.172***	-0.159***
			(0.016)	(0.018)
			[10,578]	[9,344]
Appeals			-0.034***	-0.036***
			(0.012)	(0.014)
			[11,854]	[10,477]
Contract FE	✓	✓	✓	✓
County, Year FE	✓	✓	✓	✓
Additional controls[b]		✓		✓

[a]Estimates presented for coefficient on $\mathbb{1}(t > \tau_{im})$ in Equation 4, with standard errors in parenthesis clustered at the county level. Columns 1-2 present plan-level results and columns 3-4 present contract-level results. Markets in which both merging insurers operated prior to a merger, as well as all observations associated with a merging firm, are excluded from the analysis. Sample sizes presented in brackets. * p<0.1, ** p<0.05, *** p<0.01

[b]Additional controls consist of county-level demographic variables, prescription drug coverage, average FFS costs in the county, the MA benchmark rate, and measures of the local (county) hospital market including HHI, total discharges, and number of hospitals.