

Competitive Bidding in Medicare: Who Benefits From Competition?

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Objectives: To conduct the first empirical study of competitive bidding in Medicare.

Study Design and Methods: We analyzed 2006-2010 Medicare Advantage data from the Centers for Medicare & Medicaid Services using longitudinal models adjusted for market and plan characteristics.

Results: A \$1 increase in Medicare's payment to health maintenance organization (HMO) plans led to a \$0.49 ($P < .001$) increase in plan bids, with \$0.34 ($P < .001$) going to beneficiaries in the form of extra benefits or lower cost sharing. With preferred provider organization and private fee-for-service plans included, higher Medicare payments increased bids less (\$0.33 per dollar), suggesting more competition among these latter plans.

Conclusions: As a market-based alternative to cost control through administrative pricing, competitive bidding relies on private insurance plans proposing prices they are willing to accept for insuring a beneficiary. However, competition is imperfect in the Medicare bidding market. As much as half of every dollar in increased plan payment went to higher bids rather than to beneficiaries. While having more insurers in a market lowered bids, the design of any bidding system for Medicare should recognize this shortcoming of competition.

(Am J Manag Care. 2012;18(9):546-552)

For author information and disclosures, see end of text.

Medicare spending is the dominant driver of our nation's projected long-term deficit.¹ Increasingly, proposals to control Medicare spending center on competitive bidding as opposed to administratively imposed payment reductions, which some consider unlikely to be politically sustainable.^{2,3} In a bidding system, private health plans compete for beneficiaries who shop among plans varying in generosity, similar to today's Medicare Advantage system. In fact, a crucial policy question surrounding cost containment in coming years is whether Medicare should use administratively set prices or market forces—including bidding—to pay health plans and perhaps even provider organizations such as accountable care organizations.

Bidding is the foundation of the Ryan-Wyden plan by Senator Ron Wyden (D-OR) and Representative Paul Ryan (R-WI),⁴ as well as the Domenici-Rivlin proposal.⁵ These proposals seek to end traditional Medicare and replace it with a bidding system based on the Medicare Advantage model. Proponents estimate that reforming Medicare into a bidding system would save \$339 billion, or 9.5% of Medicare spending, through 2020—5.6 percentage points more than projected savings under the Patient Protection and Affordable Care Act (PPACA).⁶ Yet despite increasing attention and optimistic projections, bidding remains unstudied.

In the current Medicare Advantage program, plans submit a price (bid) that they are willing to accept for insuring a beneficiary. Plans must, at minimum, cover Medicare Part A (hospital) and Part B (physician) services, but they can also offer coverage for other services such as prescription drugs or reductions in cost sharing. The amount of additional benefit plans may offer depends on how their bid compares with a benchmark payment rate set by the Centers for Medicare & Medicaid Services (CMS). The lower the bid, the more plans are allowed to “rebate” back to beneficiaries through additional benefits, which can be used to attract potential enrollees (Figure 1). When markets are competitive, plans should bid only as high as the cost of insuring beneficiaries.⁷ In other words, when Medicare raises payments to plans in a competitive market, bids (adjusting for costs) should not change, and the increased Medicare payment should largely translate into extra benefits to enrollees.

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To date, there is no evidence on how plans bid, as bidding data were not previously available. We used newly released Medicare Advantage data from CMS to conduct the first empirical study of the bidding system. Specifically, we investigated how bids respond to changes in CMS benchmark payments and whether higher benchmarks result in additional benefits to beneficiaries. Understanding how plans respond to benchmark changes is crucial for assessing how competitive markets may work in Medicare. We hypothesize that the market may not be sufficiently competitive, consequently diverting CMS payments into plan or provider profits and away from Medicare beneficiaries.

METHODS

Setting

Medicare Advantage (formerly Medicare Part C and Medicare+Choice) has grown from 2.3 million beneficiaries in 1994 to 11.7 million (1 in 4 beneficiaries) in 2011.⁸ Over these years, the predominant plan type was health maintenance organization (HMO) plans, while preferred provider organization (PPO) and private fee-for-service (PFFS) plans have grown in the last decade.⁹ Each year, CMS publishes a benchmark payment rate for every county based on its history of traditional fee-for-service Medicare spending in that county. A plan may serve (compete in) multiple counties, but may submit only 1 bid.

If the bid exceeds the average benchmark faced by the plan (calculated using its projected enrollment across counties), the plan receives only the benchmark amount and must collect the difference by charging beneficiaries a premium. If, however, the bid is below the benchmark—almost always the case—CMS pays the plan its bid plus 75% of the difference between the bid and benchmark, which the plan must give back to beneficiaries as a rebate.¹⁰ Rebates may include additional benefits or lower Medicare Part B (or Part D) premiums. The other 25% of the difference is returned to the Medicare program (Figure 1).

While the county benchmark aims to reflect Medicare Advantage plan costs, there are several reasons why the benchmark may not accurately capture true plan costs (in which case plans may bid differently from the benchmark). First, the benchmark for paying Medicare Advantage plans is calculated from fee-for-service Medicare costs rather than Medicare Advantage costs. The fee-for-service program is different from managed care plans in many ways that affect spending. Additionally, the beneficiary populations may be different. Second,

Take-Away Points

As a market-based alternative to administrative price setting, competitive bidding relies on private insurance plans proposing prices they are willing to accept. In a perfectly competitive market, plans should bid only as high as their cost of insuring beneficiaries.

- Although higher Medicare payments to plans should translate into additional benefits to beneficiaries, this assertion has never been tested.
- When we conducted the first empirical study of bidding in Medicare, we found that competition is imperfect in the Medicare Advantage market.
- About half of every dollar in additional plan payments went to higher bids rather than to beneficiaries.

the benchmark for any year (t) is estimated using fee-for-service Medicare costs from a 5-year period spanning $t-8$ to $t-3$ prior to the benchmark year. Thus, spending in the 2 years prior to any benchmark year is not included in the estimate. Moreover, various nuances of the formula for calculating benchmarks may produce differences from actual plan costs.

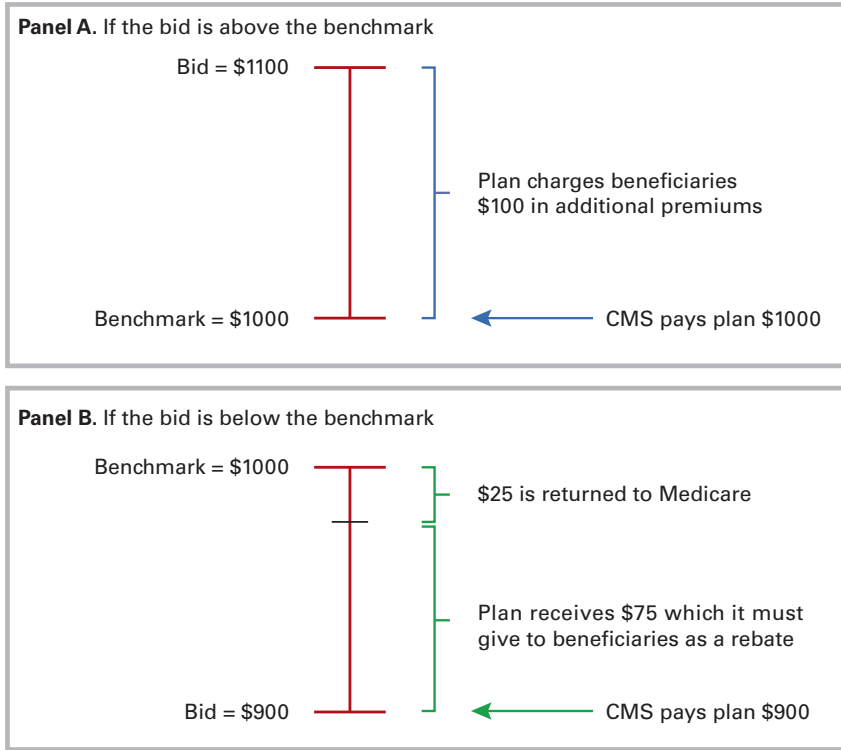
Data and Variables

We analyzed county-level and plan-level Medicare Advantage payment data from CMS for 2006 through 2010. We also used county-level published benchmark rates and actual county-level fee-for-service costs. Since actual fee-for-service costs are only available through 2009, our baseline analysis uses 2006-2009 data. CMS calculates county benchmarks by using the fee-for-service Medicare spending in a county from a 5-year period (8 years ago to 3 years ago) and trending that amount forward using the growth rate in that 5-year period. This lag, as well as various special provisions of the rules determining benchmark rates,^{8,10} results in benchmark updates that are not highly correlated with actual changes in costs at the county level. In addition, we used public CMS data on plan location and enrollment by county in each year. We merged these public data sets to create a unique Medicare Advantage market centered on each county.

The county-level data contain average plan bids and rebates weighted by plan enrollment, as well as the average county CMS Hierarchical Condition Categories (CMS-HCC) risk scores of beneficiaries. CMS-HCC risk scores are calculated using beneficiary age, sex, and clinical diagnoses.¹¹ The plan bid is standardized to a beneficiary of 1.0 risk, making all bids comparable. The plan-level data contain plan-specific bids, rebates, and average CMS-HCC risk score of plan enrollees. County benchmark rates and actual fee-for-service costs are also standardized to a beneficiary of 1.0 risk.

We restricted analysis to local plans, which bid against the same benchmark. We excluded regional plans, which use different benchmarks. We also excluded employer plans and special needs plans. Our baseline analysis included only HMO plans, the plan type with the longest history. In sensitivity analyses, we included local PPO and then PFFS plans, both

■ **Figure 1.** Overview of the Medicare Advantage Bidding System^a



CMS indicates Centers for Medicare & Medicaid Services.

^aThe Medicare Advantage bidding system is used to determine payments for health plans that enroll Medicare beneficiaries. Two scenarios are possible. If the bid is above the benchmark (panel A), CMS pays the plan the administratively set benchmark. The plan must collect the difference through enrollee premiums. If the bid is below the benchmark (panel B), CMS pays the plan its bid as well as an additional 75% of the difference between the bid and the benchmark that the plan must return to beneficiaries as a rebate. Rebates may be additional benefits (eg, dental or vision coverage) or lower premiums (for Part B or Part D if prescription drug coverage is offered). The remaining 25% of the difference is returned to Medicare.

of which are less managed. PFFS plans most closely resemble traditional fee-for-service Medicare.

Study Design

Both county-level and plan-level analyses of the relationship between benchmark rates and bids are inherently limited. Because plans are required to submit a single bid covering all counties they serve, relating the county benchmark to the average bid in any given county ignores the effect of benchmarks in other (often adjacent) counties that may affect the plan's bid. Alternatively, plan-level longitudinal models require plans to be stable over time. Yet insurers frequently consolidate or split their plans from one year to the next. For example, a "silver" plan's enrollees in one year may be subsumed under a "gold" plan in the next year, retaining the gold plan's identification number. Alternatively, the 2 plans may merge and assume a new identification number altogether. Subsequently, this consolidated plan may split again. Such plan dynamics complicate longitudinal models with plans as the unit of the observation.

To combat these limitations, we constructed, for each county, an effective "market" that takes into account the benchmarks in other counties that plans observe when making their bids. First, for each county, we identified all other counties served by plans in the target county. Next, we assigned the benchmarks in these other counties to the target county, weighted by the share of each target county plan's enrollment in these other counties. We used the plan's average share across the study period so that the weights were stable. This procedure was repeated for other variables. The resulting markets are a stable unit of analysis over time, allowing for longitudinal models.

Statistical Analysis

The primary analyses were conducted at the market level. We used a longitudinal model with indicators for each market and year (ie, fixed effects), weighted by the number of Medicare beneficiaries in a market. Our dependent variable was average plan bids in a market in a year. The independent variable of interest was the benchmark rate. Addi-

tional independent variables included actual fee-for-service costs, number of insurers offering Medicare Advantage plans, number of total beneficiaries, and average risk score of fee-for-service beneficiaries to control for market-level health status. We also included the average risk score of Medicare Advantage beneficiaries in a market to control for possible non-random enrollment into plans.

Indicators for year controlled for any underlying time trends in bids across all markets. Indicators for market gave our model a longitudinal rather than cross-sectional interpretation.¹² Specifically, they allowed us to identify the effect of benchmark rates on bids through *within*-market changes in benchmarks, rather than *across*-market differences that are more prone to bias. Restricting the variation in all variables to within-market changes helped us control for unobserved area-level characteristics that are fixed across time, especially those characteristics that might be correlated with benchmark rates. We effectively compared *changes* in bids in markets that experienced large fluctua-

Table 1. Characteristics of Markets According to Average Benchmark Changes^a

Variable	Mean ± SD	
	High Benchmark Increase Markets (N = 1576)	Low Benchmark Increase Markets (N = 1552)
Market characteristics		
Benchmark rate, \$		
Average level, 2006-2009, \$	818.64 ± 23.87	837.58 ± 30.04
Average annual change, \$	16.54 ± 4.41	3.33 ± 10.24
Fee-for-service Medicare costs, \$		
Average level, 2006-2009, \$	705.03 ± 37.80	730.39 ± 40.81
Average annual change, \$	10.60 ± 7.93	-1.06 ± 11.93
Fee-for-service CMS-HCC risk score	0.96 ± 0.04	0.97 ± 0.03
No. of insurers	10.2 ± 2.8	11.1 ± 2.8
No. of Medicare beneficiaries ^b	35,100 ± 30,000	44,600 ± 25,300
Plan characteristics^c		
Bid, \$	740.59 ± 27.40	757.84 ± 30.92
Rebate, \$	52.94 ± 16.27	54.12 ± 16.03
Enrollee CMS-HCC risk score	0.91 ± 0.04	0.93 ± 0.04

CMS-HCC indicates Centers for Medicare & Medicaid Services Hierarchical Condition Categories; SD, standard deviation.
^aAll dollar figures are per beneficiary per month in 2011 US dollars and are standardized to a beneficiary of 1.0 risk. CMS-HCC risk scores were calculated using age, sex, and clinical diagnoses.
^bApproximate, rounded to the hundred. CMS does not publish plan enrollment when the number of enrollees in a place is less than 10.
^cAll plan types (HMOs, preferred provider organization plans, and private fee-for-service plans) were included in these descriptive statistics.

tions in their benchmark versus counties that saw small benchmark changes.

Our model took advantage of relatively exogenous changes in benchmarks due to the 2007 and 2009 “rebasings” of benchmark payments, when benchmarks in all counties were updated by law using national or regional floor updates that were largely uncorrelated with changes in underlying costs in any specific county. Moreover, by controlling for market-level average fee-for-service costs, we further reduced the potential for confounding related to market-level changes in the costs of delivering care. Since markets overlap geographically, we clustered standard errors by state.¹³ This gave us more conservative (larger) standard error estimates than we would get by clustering standard errors at the market level. We conducted a number of sensitivity analyses of the longitudinal market model.

Given the effect of benchmarks on bids, it is straightforward to calculate the residual effect on rebates (Figure 1). As a confirmatory analysis of our bidding model, we estimated analogous longitudinal models using average market rebates as the dependent variable. For every \$1 increase in benchmarks, we would expect bids and rebates to move in the same direction as long as the bid increased by less than \$1. In other words, a \$1 increase in benchmarks must be accounted for by either a change in bids, a change in rebates, or a change in the amount returned to the Medicare program.

RESULTS

Characteristics of Markets and Plans

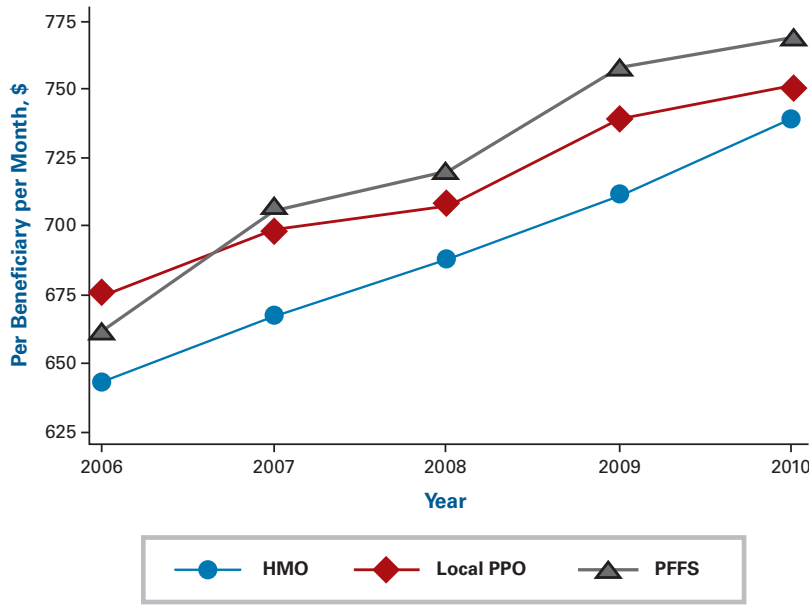
Table 1 displays the characteristics of markets and of plans competing in each market. Markets that experienced large (above median) benchmark increases saw an average annual increase of \$16.54 per beneficiary per month from 2006 to 2009, whereas markets that experienced small (below median) benchmark increase had average annual increases of \$3.33. Compared with markets with small increases, those experiencing large increases had lower average benchmark rates. Plans serving markets with large benchmark changes submitted lower average bids over the 4 years. Because of lower benchmarks in those markets, raw average rebates were also lower. Average risk scores at both the market and plan levels were comparable across the 2 groups.

Effect of Benchmarks on Bids

From 2006 to 2010, average unadjusted plan bids in the Medicare Advantage market rose for all plan types (Figure 2). As expected, HMO plans consistently bid lower than PPO and PFFS plans, given their greater use of managed care strategies to reduce costs. Private fee-for-service plans, which have the least restrictions on utilization, bid the highest.

In multivariate analysis, a \$1 change in benchmark rates was associated with a \$0.49 increase in plan bids across HMO

■ **Figure 2. Average Plan Bids, 2006 to 2010^a**



HMO indicates health maintenance organization; PFFS, private fee-for-service; PPO, preferred provider organization.

^aUnadjusted average bids for HMO, local PPO, and PFFS plans.

markets ($P < .001$, 95% confidence interval [CI] \$0.39-\$0.59) (Table 2). This result is robust to numerous sensitivity analyses, including alterations to the statistical model and omitting key predictors (eAppendix A, available at www.ajmc.com). The benchmark effect on bids is only slightly larger when we omit area-level fee-for-service costs, suggesting that changes in fee-for-service costs are largely uncorrelated with changes in the benchmark. Indeed, while the correlation between benchmarks and fee-for-service costs is 0.68, the correlation between *changes* in benchmarks and *changes* in fee-for-service costs is 0.36. This suggests that the rebasing of benchmarks in 2007 and 2009 updated benchmark rates in a way that is less correlated with changes in underlying fee-for-service costs.

We also found a consistently negative effect of competition (number of insurers) on bids across different specifications. Each additional insurer that serves a market was associated with a reduction of \$1.28 in bids ($P < .001$). That was expected, as plans have an incentive to bid low in order to offer higher rebates to attract enrollees. On average, markets had 12.1 insurers in 2009, up from 7.9 in 2006, suggesting that overall competition increased.

We repeated our analysis by adding PPO plans to the sample (eAppendix B) and additionally including PFFS plans (eAppendix C). In general, we found slightly smaller but consistently robust effects with the inclusion of less-managed plans.

With PPOs included, bids increased \$0.46 for every \$1 increase in the benchmark. With PPOs and PFFS plans included, bids increased \$0.33 for each \$1 increase in the benchmarks. This result suggests competition is greater in the PFFS market than in the HMO and PPO markets. As a further sensitivity analysis, we also conducted longitudinal models at the plan level, comprising only stable plans that existed throughout 2006-2009. While plan dynamics are still a concern in this model, its main estimate of about \$0.50 across all 3 levels of plan aggregation was consistent with our main findings.

Implications for Rebates

Figure 3 shows the average plan rebates in the study period. Given the relationship between bids and rebates, benchmark changes also affected rebates. In HMO markets, the average rebate grew by \$0.34 with a \$1 increase in the benchmark ($P < .001$, 95% CI \$0.25-\$0.43) (Table 2).

This is robust to the same sensitivity analyses, as well as to the inclusion of PPOs and PFFS plans (not shown). This estimate approximates our expected effect on rebates given the estimated effect of benchmarks on bids. As expected, we found a positive effect of competition on rebates. In our base model, each additional insurer in the market was associated with a \$0.83 ($P < .001$) increase in rebates.

DISCUSSION

To our knowledge, this is the first empirical study of the competitive bidding system in Medicare. Contrary to simple models of competition that suggest that bids should not respond to changes in benchmarks (holding costs constant), we found that bids increased by about \$0.33 to \$0.50 for every \$1 increase in benchmarks. This left only \$0.34 to \$0.38 for rebates to beneficiaries. Our results reject the notion that the private Medicare market is perfectly competitive. This has implications for current debates as well as prior literature on Medicare Advantage.¹⁴⁻¹⁸

Our results are consistent with several possible explanations. First, they are consistent with economic models of imperfect competition, in which insurers exercise their market power and use higher bids to boost profits at the expense of rebates to beneficiaries.¹⁹ Private insurance markets in the United States are often concentrated. For exam-

■ **Table 2.** Effect of Changes in Benchmarks on Changes in Bids and Rebates (HMO Plans)^a

Independent variables	(Per Beneficiary per Month, \$)			
	Estimated Change in Bids (95% CI)	P	Estimated Change in Rebates (95% CI)	P
Predictor of interest				
Benchmark (\$)	0.49 (0.39-0.59)	<.001	0.34 (0.25-0.43)	<.001
Other predictors				
Fee-for-service CMS-HCC risk score	-21.89 (-52.96 to 9.18)	.16	6.95 (-9.56 to 23.46)	.40
Plan enrollee CMS-HCC risk score	-6.53 (-50.79 to 37.73)	.77	44.94 (15.83-74.05)	.003
Fee-for-service Medicare cost (\$)	0.06 (-0.02 to 0.14)	.13	-0.01 (-0.07 to 0.06)	.87
Number of Medicare beneficiaries (1000s)	0.01 (-0.06 to 0.08)	.75	-0.02 (-0.07 to 0.03)	.44
Number of insurers	-1.28 (-1.70 to -0.86)	<.001	0.83 (0.45-1.21)	<.001

CI indicates confidence interval; CMS-HCC, Centers for Medicare & Medicaid Services Hierarchical Condition Categories; HMO, health maintenance organization.
^aEstimates were adjusted for year of measurement (year indicators) and repeated observations of markets (market indicators). Dollar figures are per beneficiary per month. Standard errors were clustered by state.

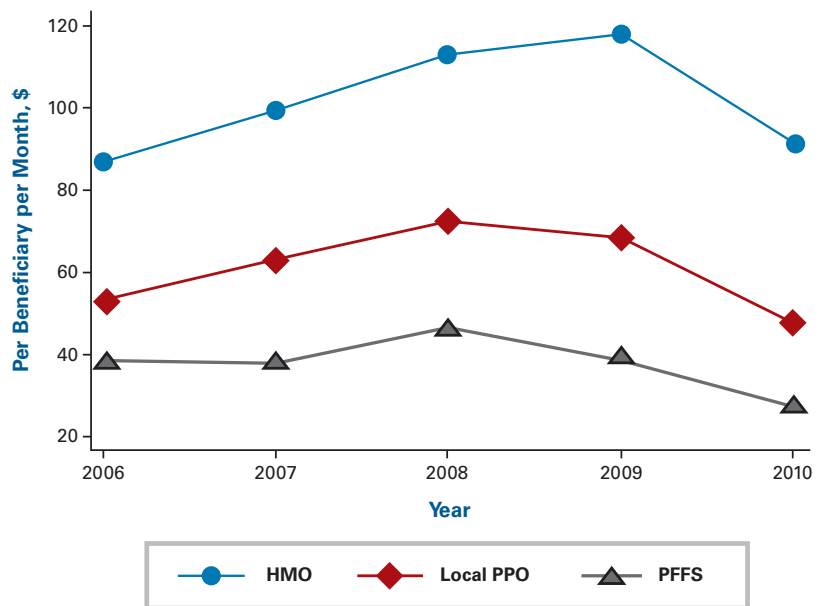
ple, many states have 1 or 2 dominant private insurers that primarily compete with each other. Even with more insurers, imperfections in the market for insurance may impede markets from behaving in a perfectly competitive manner. In fact, other work suggests that beneficiaries do not make optimal insurance choices, which is consistent with the notion that markets are not perfectly competitive.²⁰ Second, our findings are also consistent with providers exercising market power in their negotiations with insurers.²¹ Specifically, providers may observe (or anticipate) CMS increases in the benchmark rates and capture some of the increase through negotiating for higher fees from the commercial plans.²² We cannot precisely distinguish between these explanations. However, to the extent that our models control for the influence of insurer competition, the results would reflect the effect of provider market power.

Our findings do not seem to be attributable to adverse selection. We controlled for the average market-level CMS-HCC risk scores of the fee-for-service beneficiary population and the Medicare Advantage population. In our sensitivity analyses, omitting either of these risk scores did not appreciably change the resulting estimates (eAppendices A and C).

This study has several limitations. Most importantly, we did not observe actual plan costs. While we controlled for actual fee-for-service costs in the model, unobserved plan costs could be

quite different. However, our longitudinal design, reliance on bids for a standardized population, and inclusion of plan risk profiles mitigate concerns related to unobserved cost due to risk selection. Additional unobserved factors include provider concentration and plan entry decisions. Plan entry, for example, will affect the composition of markets, especially if plans differentially locate in counties where benchmarks are expected to increase more. When we repeated our baseline model using counties, not markets, as the unit of the analysis, we found that a dollar increase in the benchmark was associated with about a \$0.60 increase in bids among HMO plans.

■ **Figure 3.** Average Plan Rebates, 2006 to 2010^a



HMO indicates health maintenance organization; PFFS, private fee-for-service; PPO, preferred provider organization.
^aUnadjusted average rebates for HMO, local PPO, and PFFS plans.

Whether the naïve county-level model overestimated this relationship compared with the market-level model is unclear, given that markets are a different unit due to the aggregation. However, this robustness check does show that the estimates are fairly similar. We were also limited by the availability of data, which span 2006-2010 (actual fee-for-service costs only exist up to 2009). Thus, we could not observe the impact of more recent payment changes.

Our findings have potential implications for proposals to expand the role of competitive bidding in Medicare such as the Ryan-Wyden plan. They suggest that markets for health insurance for Medicare beneficiaries may not be perfectly competitive and thus simple bidding systems may not drive bids down to plan costs. Thus, these findings should temper the enthusiasm for replacing Medicare with a bidding system. Of course, other models of bidding, including those in which the benchmark is not known in advance, may yield better results and thus attention to the rules surrounding bidding is important. Moreover, any bidding system must be compared with alternative strategies and administratively set prices have their own faults. While administratively set prices can mitigate concerns about plan market power, they may be subject to political manipulation that sets prices too high and therefore result in excessive spending (as many felt was the case in the pre-PPACA Medicare Advantage program). Alternatively, administratively set prices could be set too low, impeding access to care. Thus careful attention to the mix of markets and regulation will be needed as the debate over Medicare reform escalates. Any reliance on, and design of, market-based bidding mechanisms should balance the concerns over imperfect competition with the imperfections of administratively set prices.²³⁻²⁶

Acknowledgments

The authors wish to acknowledge Joseph Newhouse, PhD, Thomas McGuire, PhD, and Haiden Huskamp, PhD, for thoughtful comments on a prior version of this manuscript. We also thank other members of the Harvard Medical School P01 team for helpful discussion and feedback.

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Funding Source: National Institute on Aging (P01 AG032952); National Institute on Aging Predoctoral MD/PhD National Research Service Award (F30 AG039175) and National Bureau of Economic Research Predoctoral Fellowship in Aging and Health Economics (T32 AG000186) (both to ZS). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Aging or the National Institutes of Health.

Author Disclosures: The authors (ZS, MEC, MBL) report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (ZS, MBL, MEC); acquisition of data (MEC); analysis and interpretation of data (ZS, MBL, MEC); drafting of the manuscript (ZS); critical revision of the manuscript for important intellectual content (ZS, MBL); statistical analysis (ZS, MBL); obtaining funding (ZS, MEC); administrative, technical, or logistic support (ZS, MBL); and supervision (MEC).

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Competitive Bidding in Medicare

■ eAppendix A. Effect of Changes in Benchmark on Changes in Bids: Sensitivity Analyses With HMO Plans^{a,b}

Predictors	(1) Base	(2) No Risk	(3) No Plan Risk	(4) No FFS	(5) Linear Year	(6) Unweighted	(7) Big Counties
Benchmark (\$)	0.488 ^e (0.0487)	0.524 ^e (0.0432)	0.488 ^e (0.0493)	0.486 ^e (0.0490)	0.523 ^e (0.0415)	0.437 ^e (0.0577)	0.509 ^e (0.0438)
FFS Medicare risk score	-21.89 (15.45)	-19.05 (15.06)	— —	-22.51 (16.09)	-42.69 ^e (14.16)	-2.514 (15.77)	-22.65 (15.78)
Plan enrollee Medicare risk score	-6.531 (22.01)	-5.666 (22.21)	-13.61 (23.65)	— —	-25.88 (20.38)	-13.29 (20.54)	-5.008 (22.85)
FFS Medicare cost (\$)	0.0619 (0.0406)		0.0528 (0.0393)	0.0616 (0.0405)	0.0669 ^d (0.0398)	0.127 ^e (0.0593)	0.0463 (0.0374)
No. of Medicare beneficiaries (1000s)	0.0108 (0.0336)	0.0161 (0.0360)	0.0127 (0.0340)	0.0108 (0.0336)	0.0188 (0.0342)	0.0486 (0.0338)	0.00786 (0.0337)
No. of insurers	-1.281 ^e (0.211)	-1.228 ^e (0.200)	-1.278 ^e (0.215)	-1.292 ^e (0.207)	-1.561 ^e (0.207)	-1.753 ^e (0.290)	-1.215 ^e (0.211)
Year 2006	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Year 2007	20.95 ^e (3.587)	21.72 ^e (3.611)	22.47 ^e (3.168)	21.21 ^e (3.482)	— —	17.96 ^e (3.157)	21.95 ^e (3.873)
Year 2008	8.569 ^e (2.576)	9.574 ^e (2.597)	8.493 ^e (2.621)	8.818 ^e (2.557)	— —	10.38 ^e (3.377)	8.822 ^e (2.600)
Year 2009	20.05 ^e (4.305)	19.09 ^e (4.213)	19.90 ^e (4.331)	20.42 ^e (4.473)	— —	22.37 ^e (4.476)	19.61 ^e (4.573)
Year (continuous)	— —	— —	— —	— —	4.224 ^e (1.352)	— —	— —
Constant	299.7 ^e (38.60)	310.2 ^e (37.73)	291.1 ^e (38.66)	295.8 ^e (36.62)	-8160 ^e (2706)	283.7 ^e (41.41)	291.7 ^e (37.52)
Observations	5920	5920	5920	5920	5920	5920	4189
R²	0.397	0.394	0.394	0.397	0.364	0.339	0.409
No. of markets	2000	2000	2000	2000	2000	2000	1422

CMS-HCC indicates Centers for Medicare & Medicaid Services Hierarchical Condition Categories; FFS, fee-for-service; HMO, health maintenance organization. ^aRobust standard errors are in parentheses.

^bThe dependent variable is average plan bids in a market (dollars per beneficiary per month). All models include market indicators (fixed effects) and are weighted by market size (the number of Medicare beneficiaries) except in column 6. Column 1 is our base model. In columns 2 to 4, we omit the market-level CMS-HCC risk score, plan enrollee CMS-HCC risk score, and FFS Medicare costs, respectively. In column 5, we replace year indicators with a continuous variable for year. In column 7, we restrict our sample to large markets. Robust standard errors are in parentheses. They are clustered by state.

^c $P < .01$.

^d $P < .05$.

^e $P < .1$.

■ **eAppendix B.** Effect of Changes in Benchmark on Changes in Bids: Sensitivity Analyses With HMO and Local PPO Plans^a

Predictors	(1) Base	(2) No Risk	(3) No Plan Risk	(4) No FFS	(5) Linear Year	(6) Unweighted	(7) Big Counties
Benchmark (\$)	0.457 ^b (0.0623)	0.507 ^b (0.0474)	0.457 ^b (0.0639)	0.451 ^b (0.0622)	0.522 ^b (0.0446)	0.425 ^b (0.0663)	0.476 ^b (0.0569)
FFS Medicare risk score	-18.08 (16.54)	-14.51 (16.17)	— —	-20.48 (17.47)	-39.38 ^c (16.22)	10.03 (16.60)	-20.47 (16.77)
Plan enrollee Medicare risk score	-26.27 (25.99)	-20.75 (26.62)	-31.70 (27.31)	— —	-40.88 (24.46)	-39.94 ^d (21.21)	-25.25 (27.92)
FFS Medicare cost (\$)	0.0798 ^d (0.0448)	— —	0.0731 (0.0438)	0.0752 ^d (0.0446)	0.0708 (0.0434)	0.130 ^e (0.0566)	0.0665 (0.0437)
No. of Medicare beneficiaries (1000s)	0.0136 (0.0408)	0.0180 (0.0430)	0.0156 (0.0410)	0.0141 (0.0408)	0.0201 (0.0421)	0.0638 (0.0399)	0.00905 (0.0407)
No. of insurers	-1.521 ^b (0.236)	-1.446 ^b (0.209)	-1.525 ^b (0.240)	-1.561 ^b (0.234)	-1.876 ^b (0.270)	-2.063 ^b (0.338)	-1.424 ^b (0.233)
Year 2006	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Year 2007	18.64 ^b (3.101)	19.85 ^b (3.151)	19.77 ^b (2.852)	19.58 ^b (2.849)	— —	15.23 ^b (3.072)	19.91 ^b (3.359)
Year 2008	3.476 (2.354)	4.956 ^d (2.570)	3.401 (2.381)	4.542 ^c (2.172)	— —	4.043 (3.303)	3.948 ^d (2.345)
Year 2009	19.08 ^b (4.162)	18.11 ^b (4.043)	19.02 ^b (4.199)	20.48 ^b (4.032)	— —	19.62 ^b (4.269)	19.40 ^b (4.427)
Year (continuous)	— —	— —	— —	— —	3.641 ^b (1.241)	— —	— —
Constant	343.4 ^b (38.33)	349.2 ^b (34.78)	335.7 ^b (39.21)	329.5 ^b (39.38)	-6965 ^b (2489)	319.0 ^b (39.50)	337.5 ^b (35.77)
Observations	6920	6920	6920	6920	6920	6920	4560
R²	0.395	0.390	0.393	0.394	0.354	0.342	0.410
No. of markets	2220	2220	2220	2220	2220	2220	1465

CMS-HCC indicates Centers for Medicare & Medicaid Services Hierarchical Condition Categories; FFS, fee-for-service; HMO, health maintenance organization; PPO, preferred provider organization.

^aRobust standard errors are in parentheses.

^b $P < .01$.

^c $P < .05$.

^d $P < .10$.

Competitive Bidding in Medicare

■ eAppendix C. Effect of Changes in Benchmark on Changes in Bids: Sensitivity Analyses With HMO, Local PPOs, and PFFS Plans^a

Predictors	(1) Base	(2) No Risk	(3) No Plan Risk	(4) No FFS	(5) Linear Year	(6) Unweighted	(7) Big Counties
Benchmark (\$)	0.328 ^b (0.0666)	0.523 ^b (0.0643)	0.324 ^b (0.0662)	0.337 ^b (0.0675)	0.552 ^b (0.0584)	0.269 ^b (0.0724)	0.382 ^b (0.0683)
FFS Medicare risk score	-28.11 (21.00)	-23.22 (24.23)	— —	-25.76 (20.74)	-48.97 ^c (20.75)	5.235 (23.34)	-39.67 ^c (14.97)
Plan enrollee Medicare risk score	39.30 (35.94)	56.77 (35.83)	35.13 (34.47)	— —	21.10 (35.31)	28.92 (27.98)	37.15 (47.09)
FFS Medicare cost (\$)	0.324 ^b (0.0793)	— —	0.320 ^b (0.0795)	0.332 ^b (0.0759)	0.190 ^c (0.0739)	0.394 ^b (0.0822)	0.243 ^b (0.0856)
No. of Medicare beneficiaries (1000s)	-0.0606 (0.0507)	-0.0357 (0.0563)	-0.0568 (0.0460)	-0.0605 (0.0517)	-0.0226 (0.0700)	-0.0290 (0.0425)	-0.0611 (0.0538)
No. of insurers	-1.380 ^b (0.434)	-1.291 ^c (0.507)	-1.403 ^b (0.418)	-1.312 ^b (0.451)	-2.069 ^b (0.607)	-1.882 ^b (0.550)	-1.167 ^c (0.438)
Year 2006	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Year 2007	16.36 ^b (2.326)	19.38 ^b (2.286)	17.69 ^b (2.540)	15.37 ^b (2.439)	— —	15.97 ^b (2.992)	17.52 ^b (2.310)
Year 2008	11.96 ^b (3.029)	18.07 ^b (3.379)	12.20 ^b (2.938)	11.86 ^b (3.044)	— —	12.08 ^b (3.777)	14.21 ^b (3.029)
Year 2009	43.92 ^b (4.684)	42.20 ^b (4.683)	44.34 ^b (4.495)	44.10 ^b (4.743)	— —	47.59 ^b (4.026)	42.92 ^b (5.083)
Year (continuous)	— —	— —	— —	— —	12.74 ^b (1.812)	— —	— —
Constant	235.8 ^b (51.82)	283.6 ^b (54.18)	217.7 ^b (53.82)	255.6 ^b (49.62)	-25,361 ^b (3634)	212.9 ^b (57.28)	261.8 ^b (57.75)
Observations	12,165	12,165	12,165	12,165	12,165	12,165	5455
R²	0.647	0.618	0.645	0.645	0.607	0.678	0.615
No. of markets	3106	3106	3106	3106	3106	3106	1395

CMS-HCC indicates Centers for Medicare & Medicaid Services Hierarchical Condition Categories; FFS, fee-for-service; HMO, health maintenance organization; PFFS, private fee-for-service; PPO, preferred provider organization.

^aRobust standard errors are in parentheses.

^b $P < .01$.

^c $P < .10$.