ACA Marketplace Premiums and Competition Among Hospitals and Physician Practices

Maria Polyakova, PhD; M. Kate Bundorf, PhD, MBA, MPH; Daniel P. Kessler, JD, PhD; and Laurence C. Baker, PhD

ABSTRACT

OBJECTIVES: To examine the association between annual premiums for health plans available in Federally Facilitated Marketplaces (FFMs) and the extent of competition and integration among physicians and hospitals, as well as the number of insurers.

STUDY DESIGN: We used observational data from the Center for Consumer Information and Insurance Oversight on the annual premiums and other characteristics of plans, matched to measures of physician, hospital, and insurer market competitiveness and other characteristics of 411 rating areas in the 37 FFMs.

METHODS: We estimated multivariate models of the relationship between annual premiums and Herfindahl-Hirschman indices of hospitals and physician practices, controlling for the number of insurers, the extent of physician–hospital integration, and other plan and rating area characteristics.

RESULTS: Premiums for Marketplace plans were higher in rating areas in which physician, hospital, and insurance markets were less competitive. An increase from the 10th to the 90th percentile of physician concentration and hospital concentration was associated with increases of $393 and $189, respectively, in annual premiums for the Silver plan with the second lowest cost. A similar increase in the number of insurers was associated with a $421 decrease in premiums. Physician–hospital integration was not significantly associated with premiums.

CONCLUSIONS: Premiums for FFM plans were higher in markets with greater concentrations of hospitals and physicians but fewer insurers. Higher premiums make health insurance less affordable for people purchasing unsubsidized coverage and raise the cost of Marketplace premium tax credits to the government.

Am J Manag Care. 2018;24(2):85-90

Premiums for health insurance offered through the Affordable Care Act (ACA)'s Health Insurance Marketplaces (HIMs) vary substantially across the country.[1-4] Differences in health insurance premiums throughout geographic areas affect not only the affordability of coverage for individuals, but also the cost of ACA coverage to the government because government subsidies for relatively low-income families are linked to premiums.

Researchers have documented that premiums are lower in marketplaces with greater competition among insurers.[5-8] The effect of competition among healthcare providers on premiums for Marketplace plans, however, has received less attention. Increasing consolidation among and integration between physicians and hospitals have led to higher prices for physician and hospital services.[9-12] If insurers pass on these higher prices to consumers in the form of higher premiums, greater concentration in provider markets could lead to higher premiums in the Marketplaces. Although a recent case study of Marketplaces in New York and California provided preliminary evidence that hospital competition may be related to Marketplace premiums,[13] there is no systematic evidence on whether differences in the structure of provider markets contribute to geographic variances nationwide in the premiums for Marketplace plans. This market is an important new setting in which to examine the relationship between provider concentration and plan premiums due to the relatively widespread offering of narrow network plans.[14]

In this paper, we examined whether the concentration of local hospital and physician markets, the degree of physician–hospital integration, and the number of insurers were related to the premiums for 2015 plans sold on the Federally Facilitated Marketplaces (FFMs).

METHODS

Data on Marketplace Premiums

We used publicly available data from the Center for Consumer Information and Insurance Oversight (CCIIO) on annual premiums

TAKEAWAY POINTS

Do insurers pass on higher prices to health plan customers for the services of more consolidated providers? There is little empirical evidence on this issue in the context of the Health Insurance Marketplaces established by the Affordable Care Act (ACA). We provide evidence consistent with the idea that provider market power may be an important driver of plan costs in ACA markets. Moreover, our results suggest that the role of provider market power in the price of health insurance may be more important than the degree of competition among insurance companies, which has received more attention.

- ACA health plans were more expensive in areas with concentrated providers.
- Provider concentration may be as predictive of health plan prices as insurer competition.

for each plan available in 2015 on the FFMs.[15] All plans on the Marketplaces are classified according to their metal level (Bronze, Silver, Gold, or Platinum), which corresponds to the actuarial value of the plan. We focused our analysis on the premiums of the second-lowest-cost Silver plan (SLCSP) and of the overall lowest-cost plan (LCP) of any metal level (excluding Catastrophic plans) in each rating area. Within a demographic group, insurers must charge the same premium for a given plan within a rating area. Rating areas are typically a collection of counties defined by states. We included all 411 rating areas for the FFMs in 37 states. The premiums in our sample did not include any means-tested subsidies or tax credits.

The SLCSP, the benchmark for setting federal subsidies for insurance purchases, is likely to be a focus of many consumers. The LCP is also likely to attract many consumers; research on the choice of health insurance plans shows that individuals tend to place too much emphasis on the role of premiums relative to other plan characteristics and disproportionately enroll in the lowest-premium plans.[16] Although plans may vary premiums by enrollee age, family structure, and smoking status, we limited our analysis to 1 rate category for each plan: a 50-year-old nonsmoker buying individual, rather than family, coverage.

Measures of Provider Competition and Vertical Integration

For each rating area, we developed measures of hospital and physician competition and the degree of vertical integration between physicians and hospitals. Following previous work, we computed a Herfindahl-Hirschman Index (HHI) for hospitals and physicians.[10,11] The HHI is a standard measure used by the Federal Trade Commission (FTC) and Department of Justice (DOJ) to assess competition.[17-19] HHIs range from near 0 to 1. They are low in markets served by many providers, signaling a more competitive market, and reach the maximum of 1 in a monopoly market served by a single provider.

To develop a rating area–level measure of hospital HHI, we first calculated for each hospital an admission-weighted average of the HHIs of the patient zip codes that it serves, based on Medicare claims and enrollment data for a 100% sample of traditional Medicare beneficiaries in 2011. Using the same data, we then identified the set of hospitals used by patients in each rating area and computed an admission-weighted average of the HHIs of the hospitals serving a rating area. Our hospital competition measures did not, at any point in their construction, assume that patients residing in a given rating area use only hospitals in that rating area. We accounted for hospital system structures when constructing the HHI measure by assuming that hospitals within a system bargain jointly; in addition, we controlled for the differences in the prevalence of hospital systems across rating areas in the regression specifications.

We used an analogous approach for creating measures of physician competition.[11,20] We defined physician practices as sets of physicians reporting the same specialty who billed Medicare under the same tax ID, meaning that they are part of the same financially integrated organization.[11,20-24] For each practice–specialty combination, we calculated a Medicare payment–weighted average of the HHIs of the patient zip codes it serves based on patient flows observed in Medicare data. To derive a single physician HHI at the rating area level, we computed the Medicare payment–weighted average of the specialty-specific HHIs of all practices used by patients in each rating area.

We constructed a rating area–level measure of vertical integration between physicians and hospitals using data from the American Hospital Association's 2011 survey of hospitals, in which hospitals reported information about their relationships with physicians.[10] We identified hospitals that reported participating in fully integrated physician organizations, closed physician–hospital organizations, open physician–hospital organizations, and independent practice associations. For each hospital, we constructed an admission-weighted average of the patient zip code–level market shares held by hospitals of each type using the Medicare claims and enrollment data described above. Using these same data, we then computed for each rating area an admission-weighted average of the density of each type of vertical integration facing each hospital serving the area. For analysis, we summed the shares of the 4 types of integration to construct 1 summary measure of the prevalence of vertical integration in the markets of hospitals used by patients residing in each rating area. This measure varied from 0% to 100%, increasing with the prevalence of patients using hospitals participating in vertically integrated arrangements. Greater detail on each measure is available in other studies.[10,11]

Statistical Analysis

To examine the relationship between Marketplace premiums and provider market power, we estimated cross-sectional regressions in which each observation was a plan/rating area combination. The dependent variable was the premium for either the SLCSP or the LCP

as defined above. The independent variables of interest included hospital and physician HHIs, number of insurers, and degree of vertical integration between physicians and hospitals. The models included continuous measures of these variables. We found no important differences from using less parametric specifications of market structure.

The models also included controls for other characteristics of the health plans and rating areas. The health plan controls included measures of plan type, cost sharing, provider coverage, and offering of chronic condition management.[15] (The **eAppendix** [available at **ajmc.com**] includes a complete list of these variables.) We used Medicare claims and the American Hospital Association 2011 survey of hospitals to construct other rating area measures of hospital market characteristics in the same way that we constructed rating area densities of vertical integration. We used county-level Area Resource File data to calculate rating area population characteristics and controlled for variations in practice costs using the Medicare geographic practice cost index. Finally, we used the information about FFM health insurance plans released by CCIIO to calculate the number of insurance companies and issuers (see eAppendix for details of how insurance company was defined) competing in the Marketplaces in each rating area. The models also included state indicators in order to control for other characteristics of the states, such as the regulatory climate, insurance market features, and any state-specific provider and population characteristics.

We used the estimated coefficients from the multivariate models to compute the predicted changes in premiums that would result from moving from the 10th to the 90th percentile of hospital and physician HHI, the number of insurers, and the extent of vertical integration. For statistical inference, we used standard errors clustered at the plan level to allow for unobserved differences within plans across rating areas. The eAppendix reports several robustness checks, including results from models that include the average premium of all plans offered in each rating area, metropolitan and nonmetropolitan rating areas, and Marketplaces from all states, rather than only FFMs, but with fewer controls for plan characteristics. The Stanford University Review Board reviewed the study protocol and granted a waiver of consent.

TABLE. Summary Statistics of the Analytic Sample

	Average of Each Measure Within Percentile		*T* Test for Difference Between 10th and 90th Percentiles
	Hospital HHI		
	10	90	*P*
Hospital HHI	0.38	0.70	<.001
Annual premium, SLCSP, $	4330	5014	<.001
Annual premium, LCP, $[a]	3300	3936	<.001
Number of insurers	4	3	<.001
Number of rating areas (out of 411 total)	42	41	
	Physician Practice HHI		
	10	90	*P*
Physician practice HHI	0.27	0.50	<.001
Annual premium, SLCSP, $	4461	4873	.029
Annual premium, LCP, $[a]	3467	3809	.027
Number of insurers	5	3	<.001
Number of rating areas (out of 411 total)	42	41	
	Vertical Integration of Providers Measure		
	10	90	*P*
Vertical integration measure	0.06	0.89	<.001
Annual premium, SLCSP, $	4866	4637	.186
Annual premium, LCP, $[a]	3702	3608	.535
Number of insurers	3	4	.110
Number of rating areas (out of 411 total)	42	41	

HHI indicates Herfindahl-Hirschman Index; LCP, lowest-cost plan; SLCSP, second-lowest-cost Silver plan.
[a]Calculation of the LCP premium excluded Catastrophic plans.

RESULTS

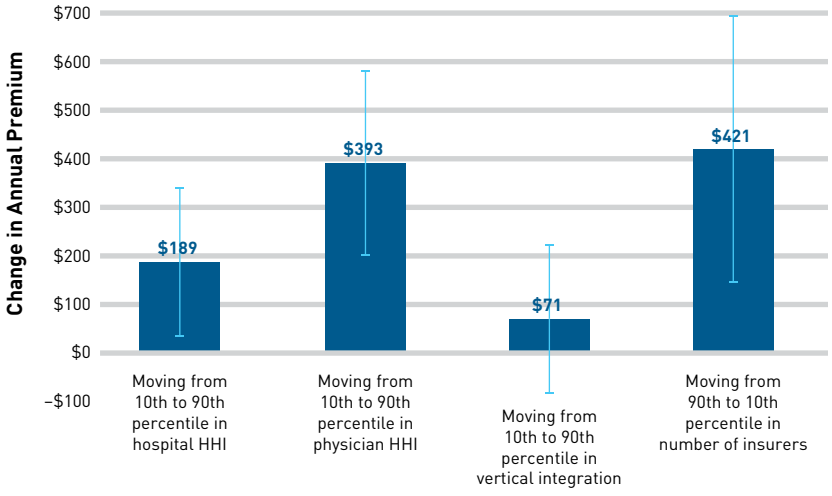
The average annual premium (for a nonsmoking individual aged 50 years) across all 4580 plans in the dataset was $5378 (SD = $1443). The average premium was $4718 (SD = $784) for the SLCSP and $3651 (SD = $656) for the LCP.

The markets for both hospital and physician services were, on average, relatively highly concentrated in the geographic areas that we studied. The average hospital HHI across the 411 rating areas was 0.56 (SD = 0.14), and the average physician practice HHI was 0.41 (SD = 0.09). The FTC and DOJ typically consider markets with HHIs above 0.25 to exhibit a high degree of concentration. The average of our vertical integration measure was 0.56 (SD = 0.28), indicating that, on average, 56% of patients used hospitals that participated in vertically integrated arrangements.

Although relatively high on average, the extent of provider market concentration varied across rating areas (**Table**). The hospital HHI averaged 0.38 at the 10th percentile and 0.70 at the 90th percentile rating area. The physician HHI measure was slightly less variable: 0.27 and 0.50, respectively. The extent of vertical integration was highly variable across markets, ranging from 0.06 at the 10th percentile to 0.89 at the 90th percentile.

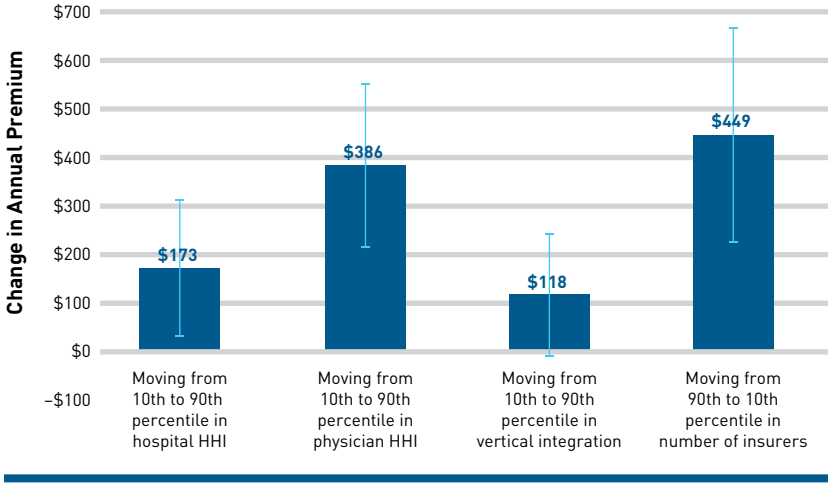
Premiums for exchange plans were higher in rating areas with more concentrated provider markets (Table). The average annual

FIGURE 1. Market Power Versus Annual Premium of Second-Lowest-Cost Silver Plan[a]



HHI indicates Herfindahl-Hirschman Index.
[a]The error bars mark 95% CIs.

FIGURE 2. Market Power Versus Annual Premium of Lowest-Cost Plan in a Rating Area[a,b]



HHI indicates Herfindahl-Hirschman Index.
[a]The error bars mark 95% CIs.
[b]Calculation of the lowest-cost plan premium excluded Catastrophic plans.

premium for the SLCSP was $4330 in the rating areas with the least concentrated hospital markets (10th percentile), $5014 in areas with the most concentrated hospital markets (90th percentile), $4461 in the rating areas with the least concentrated physician markets, and $4873 in areas with the most concentrated physician markets. The patterns were similar for the relationship between premiums for the LCP and physician and hospital concentration. These differences are highly statistically significant. In unadjusted analyses, vertical integration was not statistically significantly associated with premiums.

Premiums for exchange plans and provider market concentration were positively correlated even after adjusting for an extensive set of plan- and market-level control variables. **Figures 1** and **2** present the predicted change in premiums from moving from the 10th to the 90th percentile of the respective market power measures, based on the coefficient estimates from the regression. A change from the 10th to the 90th percentile in the physician HHI was associated with a $393 increase in the annual premium for the SLCSP and a $386 increase in the annual premium for the LCP (P <.001). These changes were also economically significant, corresponding to about an 8% increase relative to the average premium for the SLCSP and a 10% increase relative to the average premium for the LCP. Hospital market power had a similar association with premiums, although the magnitude was approximately half as large. We did not find a statistically or economically significant relationship between premiums and the extent of vertical integration.

To provide context for the estimated premium changes associated with provider concentration, Figures 1 and 2 also report the adjusted association between the number of insurers participating in the rating area and premiums. Our point estimates were quite close to the estimates of insurer effects that have been reported in the previous literature.[5-7] A change from the 10th to 90th percentile in the number of insurers participating in the rating area was associated with a $421 decrease in the annual premium for the SLCSP (P <.01) and a $449 decrease in the annual premium for the LCP (P <.001). These associations for insurers were comparable to the associations we observed for provider concentration. The association we observed for physician market concentration, in particular, is nearly as large as that for the number of insurers participating in the market.

DISCUSSION

Our study findings demonstrate that premiums for health plans in the ACA HIMs are higher in rating areas with less competition among physicians, hospitals, and insurers. These findings are consistent

with research demonstrating that prices for hospital and physician services are higher in more concentrated markets. The findings suggest that insurers pass on these higher prices for healthcare services to consumers in the form of higher premiums for coverage.

Our results provide 1 potential explanation for the prevalence of narrow network plans on the insurance Marketplaces: the use of selective contracting to limit the impact of provider concentration on premiums by avoiding providers with the most market power. Our results suggest, however, that even if narrow networks were set up to limit the impact of provider market power, they were not sufficient to eliminate the association between provider market structure and premiums. Regulatory requirements to cover certain types of providers and services may have limited insurers' ability to avoid costly providers. At the same time, beneficiaries' muted price sensitivity due to the subsidization of Marketplace premiums may have limited insurers' incentive to avoid costly providers. It is also possible that the development of narrow networks was more effective in negotiating lower prices for hospital than for physician services in concentrated markets, explaining the difference we observed in the effect of market concentration in the 2 sectors.

Although other studies have found that prices for hospital services are higher in markets with greater levels of physician–hospital integration, we did not find evidence that health plan premiums were higher in more integrated markets. We speculate that narrow networks may have been reasonably effective at avoiding or negotiating with vertically integrated providers and would provide 1 reason for why we do not find a strong association between premiums and vertical integration.

Limitations

Our study has several limitations. Our analyses are cross-sectional, and our estimates could be biased if unobserved characteristics of plans or rating areas correlated with both market competitiveness and premiums. For example, our controls did not include detailed measures of provider network breadth due to data limitations. In rating areas with higher provider concentration, insurers may be more likely to offer narrow networks, which would induce a downward pressure on premiums, biasing our estimates toward 0. Our models included an extensive set of control variables, including state fixed effects, but the possibility of bias due to omitted variables remains.

In addition, our measures of provider market structure were derived from 2011 Medicare claims data. The premiums we studied were largely set by summer 2014, leaving a lag of more than a year between the HHIs and the premiums and creating the possibility that our measures inaccurately characterized the market conditions in place when the premiums were set. Although market conditions evolve slowly, perhaps to the point that any bias from this lag would be small, we cannot rule out that measurement error from this source would cause us to underestimate the relationship between market characteristics and premiums. In particular, it is conceivable that the measurement error from the lag was more important for the vertical integration measure, which could be another reason for why our estimates of the effect of vertical integration were small and statistically insignificant.

The HHIs and vertical integration measures we used rely on patient flows observed in Medicare data. Medicare is one of the few sources of sufficiently detailed data to construct these types of measures, but these data may not represent the patient flows relevant to the non-Medicare market. We do expect that Medicare data will represent the majority of hospitals serving the under-65 market. Medicare claims also reflect care delivered by a very large share of active physicians, and the set of physicians who billed traditional Medicare should substantially overlap with the set of physicians providing services to privately insured patients. Nonetheless, this may also be a source of measurement error that could have caused us to understate the strength of the association between market characteristics and premiums.

CONCLUSIONS

Premiums for insurance offered in the FFMs were higher in markets with greater concentrations of hospitals and physicians and smaller numbers of insurers. Health insurance is less affordable for people purchasing unsubsidized coverage in these areas and is costlier to the government through subsidies in the form of Marketplace premium tax credits. To the extent that policy initiatives to promote coordinated care encourage the consolidation of providers or insurers, they may also have the unintended effects of making health insurance less affordable for consumers. ■

Acknowledgments

The authors thank Alan Jaske for outstanding research assistance.

Author Affiliations: Stanford University (MP, MKB, DPK, LCB), Stanford, CA; National Bureau of Economic Research (MP, MKB, DPK, LCB), Cambridge, MA.

Source of Funding: None.

Author Disclosures: Dr Kessler has provided expert testimony for insurers and hospitals and has received lecture fees for integrated delivery system executive education. The remaining authors 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 (MP, MKB, DPK, LCB); acquisition of data (MP, DPK, LCB); analysis and interpretation of data (MP, MKB, DPK, LCB); drafting of the manuscript (MP, MKB, DPK); critical revision of the manuscript for important intellectual content (MP, MKB, LCB); statistical analysis (MP); and supervision (MP).

Address Correspondence to: Maria Polyakova, PhD, Stanford University, Redwood Bldg, Rm T111, 150 Governor's Ln, Stanford, CA 94305. Email: maria.polyakova@stanford.edu.

REFERENCES

1. Gabel JR, Whitmore H, Call A, Green M, Oran R, Stromberg S. Modest changes in 2016 health insurance marketplace premiums and insurer participation. The Commonwealth Fund website. commonwealthfund.org/publications/blog/2016/jan/2016-health-insurance-marketplace-premiums. Published January 27, 2016. Accessed January 10, 2018.

2. Sheingold S, Nguyen N, Chappel A. Competition and choice in the health insurance marketplaces, 2014-2015: impact on premiums. Office of the Assistant Secretary for Planning and Evaluation website. aspe.hhs.

gov/basic-report/competition-and-choice-health-insurance-marketplaces-2014-2015-impact-premiums. Published July 30, 2015. Accessed January 10, 2018.
3. Burke A, Misra A, Sheingold S. Premium affordability, competition, and choice in the health insurance marketplace, 2014. Office of the Assistant Secretary for Planning and Evaluation website. aspe.hhs.gov/report/premium-affordability-competition-and-choice-health-insurance-marketplace-2014. Published June 18, 2014. Accessed January 10, 2018.
4. Graetz I, Kaplan CM, Kaplan EK, Bailey JE, Waters TM. The U.S. health insurance marketplace: are premiums truly affordable? *Ann Intern Med*. 2014;161(8):599-604. doi: 10.7326/M14-0757.
5. Dafny L, Gruber J, Ody C. More insurers lower premiums: evidence from initial pricing in the health insurance marketplaces. *Am J Health Econ*. 2015;1(1):53-81. doi: 10.1162/AJHE_a_00003.
6. Jacobs PD, Banthin JS, Trachtman S. Insurer competition in federally run marketplaces is associated with lower premiums. *Health Aff (Millwood)*. 2015;34(12):2027-2035. doi: 10.1377/hlthaff.2015.0548.
7. Gabel JR, Whitmore H, Green M, Stromberg ST, Weinstein DS, Oran R. In second year of Marketplaces, new entrants, ACA "co-ops," and Medicaid plans restrain average premium growth rates. *Health Aff (Millwood)*. 2015;34(12):2020-2026. doi: 10.1377/hlthaff.2015.0738.
8. Trish EE, Herring BJ. How do health insurer market concentration and bargaining power with hospitals affect health insurance premiums? *J Health Econ*. 2015;42:104-114. doi: 10.1016/j.jhealeco.2015.03.009.
9. Gaynor M, Town RJ. Competition in health care markets. In: Pauly MV, Mcguire TG, Barros PP, eds. *Handbook of Health Economics*. Vol 2. Amsterdam, The Netherlands: Elsevier North-Holland; 2012:499-637.
10. Baker LC, Bundorf MK, Kessler DP. Vertical integration: hospital ownership of physician practices is associated with higher prices and spending. *Health Aff (Millwood)*. 2014;33(5):756-763. doi: 10.1377/hlthaff.2013.1279.
11. Baker LC, Bundorf MK, Royalty AB, Levin Z. Physician practice competition and prices paid by private insurers for office visits. *JAMA*. 2014;312(16):1653-1662. doi: 10.1001/jama.2014.10921.
12. Dunn A, Shapiro AH. Do physicians possess market power? *J Law Econ*. 2014;57(1):159-193. doi: 10.1086/674407.
13. Scheffler RM, Arnold DR, Fulton BD, Glied SA. Differing impacts of market concentration on Affordable Care Act Marketplace premiums. *Health Aff (Millwood)*. 2016;35(5):880-888. doi: 10.1377/hlthaff.2015.1229.
14. Polsky D, Weiner J. State variation in narrow networks on the ACA Marketplaces. Robert Wood Johnson Foundation website. rwjf.org/en/library/research/2015/08/state-variation-in-narrow-networks-on-the-aca-marketplaces.html. Published August 2015. Accessed January 10, 2018.
15. The Center for Consumer Information & Insurance Oversight. Health Insurance Exchange Public Use Files (Exchange PUFs). CMS website. cms.gov/cciio/resources/data-resources/marketplace-puf.html. Published 2015. Updated November 8, 2017. Accessed January 10, 2018.
16. Abaluck J, Gruber J. Choice inconsistencies among the elderly: evidence from plan choice in the Medicare Part D program. *Am Econ Rev*. 2011;101(4):1180-1210. doi: 10.1257/aer.101.4.1180.
17. U.S. Department of Justice and the Federal Trade Commission. *Statements of Antitrust Enforcement Policy in Health Care*. Washington, DC: U.S. Department of Justice and the Federal Trade Commission; 1996. justice.gov/sites/default/files/atr/legacy/2007/08/15/1791.pdf. Accessed January 10, 2018.
18. U.S. Department of Justice and the Federal Trade Commission. *Horizontal Merger Guidelines*. Washington, DC: U.S. Department of Justice and the Federal Trade Commission; 2010. justice.gov/sites/default/files/atr/legacy/2010/08/19/hmg-2010.pdf. Accessed January 10, 2018.
19. Viscusi WK, Vernon JM, Harrington JE. *Economics of Regulation and Antitrust*. 4th ed. Cambridge, MA: MIT Press; 2005.
20. Federal Trade Commission/Department of Justice. Statement of antitrust enforcement policy regarding accountable care organizations participating in the Medicare Shared Savings Program. Government Publishing Office website. gpo.gov/fdsys/pkg/FR-2011-10-28/pdf/2011-27944.pdf. Published October 28, 2011. Accessed January 10, 2018.
21. Welch WP, Cuellar AE, Stearns SC, Bindman AB. Proportion of physicians in large group practices continued to grow in 2009-11. *Health Aff (Millwood)*. 2013;32(9):1659-1666. doi: 10.1377/hlthaff.2012.1256.
22. Pham HH, Schrag D, O'Malley AS, Wu B, Bach PB. Care patterns in Medicare and their implications for pay for performance. *N Engl J Med*. 2007;356(11):1130-1139. doi: 10.1056/NEJMsa063979.
23. Kleiner SA, Lyons S, White W. Provider concentration in markets for physician services for patients with traditional Medicare. *Health Management, Policy, and Innovation*. 2012;1(1):3-18. papers.ssrn.com/sol3/papers.cfm?abstract_id=2187981. Published December 12, 2012.
24. CMS. Physician Group Practice Transition Demonstration design overview. CMS website. innovation.cms.gov/Files/x/PGP-Transition-Design-Summary.pdf. Published July 14, 2011. Accessed January 10, 2018.

Full text and PDF at **www.ajmc.com**

eAppendix Table 1. Control Variables in Multivariate Models

Variable	N	Mean	Standard Deviation	Source
---- Measures of Market Power ---				
Hospital HHI	411	0.563	0.144	Medicare Claims
Physician HHI	411	0.412	0.0906	Medicare Claims
Measure of vertical integration	411	0.577	0.285	AHA survey and Medicare Claims
Number of insurers[a]	411	3.596	1.589	CCIIO QHP Landscape files
---- Health Plan Characteristics (SLCSP Plan) ---				
Deductible[b]	411	3499	1300	Plan Attributes PUF
Maximum OOP[b]	411	5836	976.0	Plan Attributes PUF
HMO	411	0.504	0.501	Plan Attributes PUF
POS	411	0.0730	0.260	Plan Attributes PUF
PPO	411	0.246	0.431	Plan Attributes PUF
PCP co-pay	411	19.96	16.41	Plan Attributes PUF
PCP co-insurance	411	0.0332	0.0842	Plan Attributes PUF
Specialist co-pay	411	40.84	27.94	Plan Attributes PUF
Specialist co-insurance	411	0.0398	0.0891	Plan Attributes PUF
ED Co-pay	411	205.0	198.3	Plan Attributes PUF
ED Co-insurance	411	0.116	0.127	Plan Attributes PUF
Generic drug co-pay	411	9.791	6.621	Plan Attributes PUF
Generic drug co-insurance	411	0.0148	0.0576	Plan Attributes PUF
New plan indicator	411	0.504	0.501	Plan Attributes PUF
Offers disease management	411	0.839	0.368	Plan Attributes PUF
Specialist referral indicator	411	0.307	0.462	Plan Attributes PUF
HSA eligible	411	0.182	0.387	Plan Attributes PUF
Wellness program	411	0.421	0.494	Plan Attributes PUF
Specialty drug OOP	411	0.0925	0.290	Plan Attributes PUF
No OOP for first PCP visit	411	0.0219	0.147	Plan Attributes PUF
Out of country coverage	411	0.708	0.455	Plan Attributes PUF
Out of service area coverage	411	0.766	0.424	Plan Attributes PUF
National network	411	0.287	0.453	Plan Attributes PUF
Multiple in-network tiers	411	0.0852	0.279	Plan Attributes PUF
---- Geographic Area Characteristics ---				
Median household income 2013, $	411	45,925	8913	Area Resource File
Total population 2014	411	526,261	884,853	Area Resource File
Fraction with GED to high school	411	0.849	0.0567	Area Resource File
Fraction with college	411	0.220	0.0768	Area Resource File
Fraction poor households	411	0.173	0.0472	Area Resource File
Fraction female	411	0.502	0.0196	Area Resource File

Fraction 15-19 year olds	411	0.0657	0.00888	Area Resource File
Fraction 20-24 year olds	411	0.0730	0.0207	Area Resource File
Fraction 25-44 year olds	411	0.246	0.0255	Area Resource File
Fraction 45-64 year olds	411	0.267	0.0243	Area Resource File
Fraction over 64 year olds	411	0.161	0.0436	Area Resource File
Hospitals per 1000	411	0.0235	0.0204	Area Resource File
Beds per 1000	411	2.640	1.368	Area Resource File
Physicians per 1000	411	1.721	1.089	Area Resource File
Percent Medicare	411	0.192	0.0440	Area Resource File
Percent insured	411	0.820	0.0490	Area Resource File
Physician work in Medicare Geographic Practice Cost Index	411	1.005	0.0428	Centers for Medicare & Medicaid Services
Practice expense in Medicare Geographic Practice Cost Index	411	0.936	0.0520	Centers for Medicare & Medicaid Services
Malpractice expense in Medicare Geographic Practice Cost Index	411	0.949	0.381	Centers for Medicare & Medicaid Services
Number of Medicare physicians per population unit	411	0.0218	0.0148	Medicare Claims
Share PCPs among physicians	411	0.228	0.0222	Medicare Claims
Share specialists among physicians	411	0.242	0.0190	Medicare Claims
Share surgeons among physicians	411	0.155	0.0152	Medicare Claims
Measure of bed capacity[c]	411	6.669	3.016	AHA survey
Measure of for-profit hospitals density[c]	411	0.193	0.214	AHA survey
Measure of not-for-profit hospitals density[c]	411	0.646	0.298	AHA survey
Measure of small-bed hospitals density[c]	411	0.133	0.144	AHA survey
Measure of large-bed hospitals density[c]	411	0.472	0.244	AHA survey
Measure of teaching hospitals density[c]	411	0.260	0.220	AHA survey
Measure of density of hospitals in hospital systems[c]	411	0.686	0.248	AHA survey

AHA indicates American Hospital Association; CCIIO, Center for Consumer Information & Insurance Oversight; GED, General Equivalency Diploma; HHI, Herfindahl-Hirschman Index; HMO, health maintenance organization; HSA, health savings account; OOP, out-of-pocket cost; PCP, primary care physician; POS, point of service; PPO, preferred provider organization; PUF, Public Use Files; QHP, qualified health plan.

[a]We used "issuer names" to construct measures of the number of insurance companies. The following companies entered the count individually: Aetna, Ambetter, Blue Cross Blue Shield and affiliated companies, Humana, United, Avera, Arise, CIGNA, Coventry, Health Alliance, Kaiser Permanente, MedMutal, Pacific Source, Priority, SelectHealth, DAKOTACARE, Unity, IlliniCare, Health First, AultCare. All other issuers were aggregated under "other" insurer.
[b]In-network, for all services if plans have differential deductibles or maximum out of pocket.
[c]These patient weighted density measures are used to characterize geographic markets and are constructed following the method outlined in: Kessler D, McClellan M. Is hospital competition socially wasteful? *Q J Econ*. 2000;115(2):577-615.

eAppendix Table 2. Correlation Across Measures of Market Power

	Hospital HHI	Physician HHI	Vertical Integration
Hospital HHI	1		
Physician HHI	0.573	1	
Vertical integration	0.029	0.119	1

HHI indicates Herfindahl-Hirschman index.

eAppendix Table 3. Differences in Measures of Market Power in Urban Versus Rural Rating Areas

	(1) Mean in Rating Areas With No MSA	(2) Mean in Rating Areas With MSA	(3) *P* for a 1-sided t-test of H0: (1)>(2)	(4) *P* for a 2-sided t-test of H0: (1)≠(2)
Hospital HHI	0.63	0.55	0.000	0.000
Physician HHI	0.44	0.41	0.001	0.001
Vertical integration	0.51	0.59	0.987	0.025
Number of rating areas	74	337		

HHI indicates Herfindahl-Hirschman index; MSA, Metropolitan Statistical Area.

eAppendix Table 4. Baseline Regression Specifications for Second-Lowest-Cost Silver Plan (SLCSP) and Lowest-Cost Plan (LCP)

Outcome Variable: Annual Premium	**(1)**	**(2)**
	SLCSP Premium	**LCP Premium**
Hospital HHI	531.5*	487.9*
	(218.0)	(202.4)
Physician HHI	1715.6***	1685.1***
	(421.7)	(374.7)
Vertical integration	87.83	145.5
	(96.45)	(78.50)
Number of insurers	-105.3**	-112.3***
	(34.93)	(28.14)
Deductible	-0.0805*	-0.140
	(0.0310)	(0.0952)
Maximum out-of-pocket amount	0.101	0.889***
	(0.0565)	(0.260)
Plan type: EPO	reference category	
Plan type: HMO	53.59	-248.2
	(156.8)	(195.2)
Plan type: POS	326.7	-23.47
	(225.0)	(205.7)
Plan type: PPO	354.6*	43.34
	(177.1)	(175.4)
Co-pay for a primary care visit	3.866	4.003
	(3.079)	(3.449)
Coinsurance rate for a primary care visit	-744.8	-1046.9
	(806.4)	(802.7)
Co-pay for a specialist visit	-1.223	-1.041
	(3.162)	(2.697)
Coinsurance rate for a specialist visit	1247.2	1112.7
	(907.5)	(626.9)
Co-pay for an ED visit	0.246	0.494
	(0.246)	(0.489)
Coinsurance rate for an ED visit	-322.3	-509.2
	(432.8)	(549.0)
Co-pay amount for a generic drug prescription	0.0524	-17.44*
	(7.179)	(8.776)

Coinsurance rate for a generic drug prescription	-549.4	-1000.4
	(720.9)	(600.7)
New plan	63.37	41.68
	(73.70)	(78.13)
Does the plan offer disease management programs?	57.71	-102.0
	(147.1)	(182.3)
Is a referral required before specialist visit?	196.4	117.8
	(109.3)	(96.33)
Does the plan offer an HSA?	212.3	112.3
	(143.6)	(109.1)
Is the plan for adults only?	-	35.09
	-	(176.7)
Is a wellness program offered?	-54.70	-150.3
	(109.1)	(89.44)
Has maximum coinsurance for specialty drugs?	-353.5*	-273.6
	(150.5)	(205.8)
Are there PCP visits with zero cost sharing?	-60.66	1114.8
	(233.1)	(407.1)
Does the plan offer coverage outside of the United States?	172.4	154.1
	(131.0)	(124.4)
Does the plan offer coverage outside of its service area?	-46.33	-35.20
	(123.3)	(113.6)
Does the plan offer a national network?	163.4	186.6
	(103.2)	(134.0)
Does the plan have multiple in-network tiers?	-241.2*	409.9**
	(114.8)	(135.0)
Median household income 2013	0.00507	0.00496
	(0.0101)	(0.00888)
Total population 2014	0.0000403	0.0000549
	(0.0000486)	(0.0000446)
Percent GED to high school	-50.25	-299.5
	(1046.8)	(1133.2)
Percent college	-154.3	-209.2
	(960.1)	(687.0)
Percent poor households	1183.2	1356.2
	(1581.1)	(1169.5)
Percent female	3272.1	4429.7*
	(3491.8)	(2129.2)
Percent 15-19 year olds	8041.1	2536.7
	(5934.6)	(4772.4)

Percent 20-24 year olds	2968.1	2872.2
	(3062.0)	(2237.5)
Percent 25-44 year olds	6089.0	5375.9
	(4823.4)	(3169.9)
Percent 45-64 year olds	4739.4	2965.7
	(2802.9)	(2295.5)
Percent over 64 years old	3976.9	2224.7
	(4106.4)	(2598.5)
Hospitals per 1000	976.2	-198.4
	(1439.2)	(1028.6)
Beds per 1000	8.792	13.20
	(23.73)	(15.27)
Physicians per 1000	-17.18	-22.79
	(31.59)	(24.24)
Percent Medicare	-612.3	205.9
	(2621.2)	(1542.6)
Percent insured	-1141.6	-946.0
	(1282.9)	(1472.1)
Physician work in Medicare Geographic Practice Cost Ind.	3891.6	2787.8
	(10559.3)	(8059.0)
Practice expense in Medicare Geographic Practice Cost Index	-1927.3	-1309.7
	(1783.0)	(1449.1)
Malpractice cost in Medicare Geographic Practice Cost Index	214.0	203.1
	(229.8)	(190.2)
Number of Medicare physicians per population unit	2083.6	2298.7
	(4282.2)	(4387.5)
Share PCPs among physicians	1558.6	1512.5
	(1713.1)	(1249.2)
Share specialists among physicians	652.1	1335.8
	(2258.6)	(1614.5)
Share surgeons among physicians	1992.7	1997.6
	(1902.8)	(1739.7)
Measure of bed capacity	36.28**	28.84**
	(12.89)	(9.446)
Measure of for-profit hospitals density	150.3	110.3
	(185.0)	(204.7)
Measure of not-for-profit hospitals density	264.0	134.2
	(149.0)	(120.4)
Measure of small-bed hospitals density	257.7	216.4

	(199.7)	(137.3)
Measure of large-bed hospitals density	11.89	43.91
	(117.9)	(92.52)
Measure of teaching hospitals density	-5.613	52.92
	(130.3)	(117.7)
Measure of density of hospitals in hospital systems	126.8	-0.630
	(107.3)	(82.42)
Constant	-3413.2	-7587.4
	(16396.0)	(12153.1)
State Fixed Effects	Yes	Yes
R-squared	0.828	0.829
N	411	411
Y mean	4718.0	3650.9
Y standard deviation	784.2	655.8

ED indicates emergency department; GED, General Equivalency Diploma; HHI, Herfindahl-Hirschman Index; HMO, health maintenance organization; HSA, health savings account; OOP, out-of-pocket cost; PCP, primary care physician; POS, point of service; PPO, preferred provider organization;.

Standard errors in parentheses, clustered at plan level: *P <.05; **P <.01; ***P <.001

eAppendix Table 5. Sensitivity Analysis to Alternative Specifications (SLCSP)[a]

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Unbundled VI Measure	Rating Areas with MSA	Rating Areas with no MSA	Including State-Based Marketplaces	Average Premium	Baseline with no State FE	Baseline with Population Weights	Only States with County-Level Rating Areas
Hospital HHI	507.0*	707.9**	1782.3	446.4*	655.4**	667.3	571.1*	1133.3**
	(216.4)	(243.3)	(3121.7)	(203.3)	(229.9)	(361.9)	(243.2)	(400.6)
Physician HHI	1769.5***	1630.0***	3227.7	2117.2***	1490.0**	1158.7	1528.3**	1966.6
	(426.1)	(467.3)	(3731.9)	(408.1)	(476.2)	(670.4)	(546.1)	(1190.7)
Vertical Integration		129.7	-247.7	73.64	188.7*	-2.907	118.4	-173.9
		(110.2)	(1297.0)	(88.43)	(91.77)	(119.6)	(115.3)	(207.6)
Number of Insurers	-105.2**	-79.45*	-0.913	-116.8***	-166.7***	-68.25*	-55.21	-37.9
	(34.76)	(34.41)	(782.2)	(31.66)	(31.81)	(27.15)	(33.60)	(46.2)
Fully Integrated	88.76							
	(102.0)							

Closed physician-hospital org.	260.3							
	(261.4)							
Open physician-hospital org.	16.26							
	(174.6)							
Independent practice association	239.5							
	(319.2)							
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
R-squared	0.829	0.834	0.99	0.818	0.795	0.523	0.874	0.819
N	411	337	74	482	411	411	411	113
Y Mean	4718	4641.3	5067.2	4708.1	4718	4718	4443.2	4910.2
Y Std. Dev.	784.2	734.9	904.1	817.3	784.2	784.2	729.5	495.3

FE indicates fixed effects; HHI, Herfindahl-Hirschman Index; MSA, Metropolitan Statistical Area; org, organization; SLCSP, second-lowest-cost Silver plan; VI, vertical integration.

[a]Standard errors in parentheses, clustered at plan level: **P* <.05; ***P* <.01; ****P*<.001. The regressions include, but do not report the same (unless otherwise specified in the column title) set of control variables for characteristics of plans and geographic areas as the baseline specification in eAppendix Table 4.