Outpatient Provider Concentration and Commercial Colonoscopy Prices

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Abstract
The objective was to evaluate the magnitude of various contributors to outpatient commercial colonoscopy prices, including market- and provider-level factors, especially market share. We used adjudicated fee-for-service facility claims from a large commercial insurer for colonoscopies occurring in hospital outpatient department or ambulatory surgery center from October 2005 to December 2012. Claims were matched to provider- and market-level data. Linear fixed effects regressions of negotiated colonoscopy price were run on provider, system, and market characteristics. Markets were defined as counties. There were 178,433 claims from 169 providers (104 systems). The mean system market share was 76% (SD = 0.34) and the mean real (deflated) price was US$1363 (SD = 374), ranging from US$169 to US$2748. For every percentage point increase in a system or individual facility’s bed share, relative price increased by 2 to 4 percentage points; this result was stable across a number of specifications. Market population and price were also consistently positively related, though this relation was small in magnitude. No other factor explained price as strongly as market share. Price variation for colonoscopy was driven primarily by market share, of particular concern as the number of mergers increases in wake of the recession and the Affordable Care Act. Whether variation is justified by better quality care requires further research to determine whether quality is subsumed in prices.

Keywords
price variation, provider concentration, spending, utilization, geographic variation

Background
Price variation is acceptable in markets for goods such as cars and hotels, where quality is readily visible at higher prices, but it is less acceptable in the market for medical services, where consistent evidence points to the disjointedness between health care spending and outcomes. In health care, price variations across markets may reflect warranted factors such as quality or geographic variations in wages, on one hand; or unwarranted factors such as market share, on the other. But because of the nontransparent nature of negotiations between providers and insurers, often protected by nondisclosure agreements, the considerations behind the price of medical care services are generally a mystery to patients, physicians, and researchers. Nevertheless, what drives prices is of growing concern as providers, striving for a stable or improved market share, have renewed interest in mergers in wake of the recession and the 2010 Patient Protection and Affordable Care Act (ACA). Further research, however, is necessary to determine the major influences on price variation for medical services; potential culprits include input prices, as well as provider and payer market power.

We examined the relationship between market- and provider-level characteristics and negotiated commercial prices for colonoscopy, as this procedure is routine and clinically well defined, and has substantial price variation both in our data and nationally. Markets were defined as counties, and prices were negotiated between insurer and provider. A

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largely ignored issue in the industrial organization literature is the presence of other competitors in addition to hospitals for outpatient services, including ambulatory surgery centers (ASCs) and even physicians’ offices. ASCs are small facilities, usually with only a few operating rooms, that perform only outpatient procedures, most commonly in gastroenterology, general surgery, and ophthalmology. Despite their small capacities, ASCs are the site of almost half of ambulatory surgery visits and outnumber community hospitals; from 4571 centers in 2003, the number of Medicare-approved ASCs grew to 6297 by 2008. Studies failing to include service volume from ASCs in price concentration studies may be overstating the market share of any given area hospital and thus misstating the magnitude of contributors to price variation. We included prices from both hospitals and ASCs.

To decide which “policy lever” to pull, the mechanisms behind pricing decisions must be better understood. Where unwarranted utilization drives spending, policies must be implemented to address variability in patient and physician decision making. Pricing decisions, however, are not made at the level of the physician-patient interaction, but at the level of the market; where prices drive spending, restricted provider networks and checks on institutional influence may be necessary to reduce spending variability. Research on commercial spending has not dug far enough into the reasons behind variations to resolve these issues. Thus, whether commercial spending variability should be addressed, and how, remains unknown.

Methods

Data

The data for this study are proprietary adjudicated fee-for-service claims from a large commercial insurer with nearly three-quarters market share by total enrollment. Dates of service for the claims are between October 2005 and December 2012. The data set is unique compared with hospital discharge data or Medicare claims data in that it contains prices rather than just hospital charges or costs, which may not be well correlated with insurance reimbursement rates. We studied patients undergoing diagnostic or therapeutic colonoscopy, excluding surgical colonoscopy and colonoscopy through a stoma (a surgical opening in the large intestine), and included current procedural terminology (CPT) codes: 45378 to 45387, 45391 to 45392, G0105, and G0121. All procedures were outpatient (day procedures) and occurred in a hospital outpatient department (HOPD) or ASC. Information contained in the claims included service date, patient age and sex, comorbidities, CPT code, allowed amount (the insurer’s theoretical payment-in-full), transaction price, patient copayment, coinsurance, deductible, and a provider identifier. Analysis was limited to adults 18 and over, with age top-coded at 110.

The claims were supplemented with information from several sources. The 2008 American Hospital Association (AHA) Annual Survey, a national survey of US hospitals with a 70% annual response, contained information on HOPDs, whereas the 2010 full-year Medicare Provider of Services (POS) Extract, created from the Centers for Medicare and Medicaid Services (CMS) Online Survey and Certification Reporting System (OSCAR) database, contained information on ASCs. Provider-level information gathered from the AHA and POS data sets included system affiliation, critical access status, ownership type (nonprofit, for-profit, or government), and teaching status. There were also utilization measures including total beds (HOPDs) and operating rooms (ASCs).

We theorized that market-level variables such as local wages and demand for services were both important determinants of price, so we included wage data from the CMS inpatient prospective payment system (PPS) occupational-adjusted wage index, used by CMS for geographic standardization of payments for markets with different mixes of occupations, and socioeconomic data from the 2010 American Community Survey (ACS), an annual compulsory survey of US communities. The ACS included estimated population (2012); percentage of population 65 and older (2012); percentage female (2012); percentage white (of any ethnicity), black or African American, American Indian or Alaskan Native, Asian, Native Hawaiian or other Pacific Islander, or multiracial (2012); percentage of high school graduates 25 years or older (2008-2012); average travel time to work in minutes for workers 16 and older (2008-2012); and median household income (2008-2012).

Constructed Variables

All prices provided are in US dollars (USD). Prices, defined as the (higher) mode allowed amount for each CPT code, were trimmed at the 1st and 99th percentiles to eliminate outliers that may have come from hospitals with only one or two very complex patients or patients for whom colonoscopy was a secondary procedure. Prices were also deflated using the seasonally adjusted medical care consumer price index for all urban consumers. To facilitate comparability of prices across markets with varying mean price, we operationalized the outcome as relative price, the negotiated price divided by mean price within the market. To do so, markets had to be defined; we defined them as counties, the limitations of which have been debated extensively in the literature. Yet without protected patient residence information, counties provided the best approximation of the market for a nonemergent, outpatient procedure because they are small relative to, for example, core-based statistical areas (CBSAs) and hospital service areas (HSAs).

Market share was the key contributor to relative price that we wished to investigate. It was defined as the proportion of beds (for HOPDs) or operating rooms (for ASCs, which do not have beds) that a system of providers occupied within a county. Individual market shares were used where providers were unaffiliated with systems.
Empirical Model

To evaluate the relative contribution of system- and market-level factors to price, the following fixed effects regression was performed:

\[ p_{smct} = \beta_0 + X_{sm} \beta_1 + X_m \beta_2 + \gamma_c + \mu_t + \epsilon_{smct}, \]

where \( s \) indexes system, \( m \) indexes market (county), \( c \) indexes CPT code, and \( t \) indexes time (in months from October 2005 to December 2012).

\( X_{sm} \) is a set of system characteristics for system \( s \) in market \( m \), including market share; whether the provider was an ASC versus a HOPD; system versus unaffiliated; teaching versus nonteaching; whether it was a critical access provider; and dichotomous variables for ownership type: for-profit and government-owned, with nonprofit providers as the reference group. Also included were average age, proportion of females, and number of diagnoses undergoing colonoscopy, to account for case mix.

\( X_m \) is a set of market-level variables in market \( m \) theorized to impact wages (and thus price), including occupational-adjusted wage index, county population (positied to affect price through demand), the percentage of population aged 65 and older, the percentage of high school graduates 25 years or older, median household income, average travel time to work in minutes, the percentage of residents who are female, and the percentage of residents who are black, American Indian or Native Alaskan, Asian, Native Hawaiian or Pacific Islander, or multiracial, with percentage white only (any ethnicity) as the excluded category. The justification for including county-level controls in addition to the provider controls (rather than just county fixed effects) was to evaluate the relationships between these variables and relative price. For example, wages may be a substantial proportion of marginal costs and thus have a large and positive coefficient. In addition, a high county population is necessary to support demand (for all services) and thus should be positively correlated with price as well. Variables such as the percentage of high school graduates, median household income, travel time to work, and county demographics address socioeconomic factors of both workers and patients in the market and thus were also theorized to influence price.

We include CPT fixed effects, \( \gamma_c \), to adjust for procedure intensity, with diagnostic colonoscopy (CPT 45378) as the excluded category. Unobserved market-invariant time shocks may also introduce bias in the model, so we included time fixed effects, \( \mu_t \), as well. \( \epsilon_{smct} \) is an error term.

Results

Descriptive Statistics

Table 1 summarizes the number of observations at both the claim and provider levels. There were 178 433 claims, of which 132 541 (74%) were from HOPDs and 45 892 (26%) were from ASCs. There were 113 477 claims (64%) from system providers and 64 956 (36%) from unaffiliated providers. Among 169 total providers, 149 (88%) were HOPDs and 20 (12%) were ASCs. Systems accounted for 104 providers (62%) and 65 (38%) were unaffiliated.

Included in the analysis were CPT codes 45378 to 45387, 45391 to 45392, and G0105 and G0121. The codes were distributed asymmetrically across the claims (not shown). There were 106 557 claims (41.87%) for CPT 45378, diagnostic colonoscopy; 32 claims for CPT 45379 (0.01%), colonoscopy with foreign body removal; 66 345 claims (26.07%) for CPT 45380, colonoscopy with biopsy; 1626 claims (0.64%) for CPT 45381, colonoscopy with submucosal injection; 328 claims (0.13%) for CPT 45382, colonoscopy with control of bleeding; 5192 claims (2.04%) for CPT 45383, lesion removal colonoscopy by ablation; 20 173 claims (7.93%) for CPT 45384, lesion removal colonoscopy by hot biopsy forceps or bipolar cautery; 43 389 claims (17.05%) for CPT 45385, lesion removal colonoscopy by snare; 19 claims (0.01%) for CPT 45386, colonoscopy with balloon dilation; 6 claims (less than 0.01%) for CPT 45387, colonoscopy with transendoscopic stent placement; 20 claims (0.01%) for CPT 45391, colonoscopy with endoscopic ultrasound examination; 6 claims (less than 0.01%) for CPT 45392, colonoscopy with transendoscopic ultrasound-guided needle aspiration or biopsy; 3022 claims (1.19%) for CPT G0105, colonoscopy for individuals at high risk; and 7584 claims (2.98%) for CPT G0121, colonoscopy for individuals not at high risk. The distribution was similar between HOPDs and ASCs and between systems and unaffiliated providers.

Provider-level data are shown in Table 2; data are reported at the system level except where noted. The average market share of systems of providers across all CPT codes and months was 76% (SD = 0.34). In some markets, systems occupied no share of the market (0%) and in other markets, a system (or individual provider) was the only one in the market (100%).

The mean real (deflated) price across systems for all CPT codes was 76% (SD = 0.34). In some markets, systems occupied no share of the market (0%) and in other markets, a system (or individual provider) was the only one in the market (100%).
Table 2. Characteristics of Commercial Colonoscopy Claims From a Single Insurer for Service Occurring Between October 2005 and December 2012.

| Patient characteristics | Mean | SD | Minimum | Maximum | P (provider differences) |
|-------------------------|------|----|---------|---------|-------------------------|
| Age                     | 53   | 9  | 18      | 109     | <.01                    |
| HOPDs                   | 53   | 9  | 18      | 109     | <.01                    |
| ASCs                    | 53   | 9  | 18      | 87      |                         |
| System                  | 53   | 9  | 18      | 100     | <.01                    |
| Unaffiliated            | 53   | 9  | 18      | 109     |                         |
| Gender (proportion of females) |      |    |         |         |                         |
| HOPDs                   | 0.51 |    |         |         |                         |
| ASCs                    | 0.55 |    |         |         |                         |
| System                  | 0.52 |    |         |         |                         |
| Unaffiliated            | 0.52 |    |         |         |                         |
| No. of diagnoses        | 3    | 2  | 1       | 12      | <.01                    |
| HOPDs                   | 4    | 2  | 1       | 12      | <.01                    |
| ASCs                    | 3    | 1  | 1       | 10      |                         |
| System                  | 3    | 2  | 1       | 12      | <.01                    |
| Unaffiliated            | 4    | 2  | 1       | 12      |                         |

Note. ASCs = ambulatory surgery centers, HOPDs = hospital outpatient departments.

codes and months was $1363 (SD = 374), ranging from $169 to $2748. Although the unadjusted price spread was large, the minimum and maximum prices were not extreme outliers; prices were normally distributed among systems (not shown). The mean relative price was $1.00 by construction (SD = $0.18). The range of relative prices was $0.14 to $2.39.

The mean age of patients across systems was 54 (SD = 7) and ranged from 18 to 83 (representing systems or individual facilities where only one patient was treated). Systems had on average 49% female patients. Of a maximum possible number of 12, the mean number of diagnoses was 3 (SD = 2), ranging from 1 to 12.

For some provider-level data, it did not make sense to aggregate to the system level, so descriptive statistics are reported at the individual facility level, also in Table 2. The mean number of beds was 94 (SD = 150), ranging from 2 to 680 (recall that operating rooms were substituted for beds in the case of ASCs). Just 6% of providers were teaching (SD = 0.2). Over half of providers (51%, SD = 0.5) were critical access and thus receive cost-based reimbursement from Medicare. In all, 58% of providers were nonprofit, 15% were for-profit, and 28% were government-owned.

Regression Results

Ordinary least squares regressions of relative price on bed share are reported in Table 3. The unit of analysis is the system-CPT-month (or individual provider-CPT-month for unaffiliated providers), but not all systems had observations for all 14 CPT codes over each of the 87 months of the study period, so there were a total of 35,781 observations.

Table 3. Results of Ordinary Least Squares Regressions of Relative Price on Bed Share.

| Outcome variable | (1) | (2) | (3) | (4) | (5) |
|------------------|-----|-----|-----|-----|-----|
|                   | Relative price | Relative price | Relative price | Relative price | Relative price |
| Relative price    | .000303***    | .000243       | .000273*      | .000271*      | .000446**      |
|                   | (.000104)     | (.000161)     | (.000163)     | (.000161)     | (.000172)      |
| ASC               | -.0114        | -.0105        | -.0143        | -.0329***     |                 |
|                   | (.0135)       | (.0118)       | (.0116)       | (.0117)       |                 |
| System            | -.00324       | -.00301       | -.00375       | -.00843       |                 |
|                   | (.00778)      | (.00787)      | (.00794)      | (.00886)      |                 |
| Teach             | -.0134        | -.0152        | -.0167        | -.0352        |                 |
|                   | (.0277)       | (.0265)       | (.0262)       | (.0278)       |                 |
| Critical_access   | -.0126        | -.0118        | -.0144*       | -.00335       |                 |
|                   | (.00841)      | (.00845)      | (.00854)      | (.0109)       |                 |
| For_profit        | .000303       | .000243       | .000273*      | .000271*      | .000446**      |
|                   | (.000104)     | (.000161)     | (.000163)     | (.000161)     | (.000172)      |
| Govt.             | -.00159       | -.00107       | -.00238       | .00130        |                 |
|                   | (.00859)      | (.00869)      | (.00891)      | (.00970)      |                 |
| Wageindex         | .0843         | .0875         | .0875         | .0875         | .0875          |
|                   | (.0547)       | (.0558)       | (.0558)       | (.0558)       | (.0558)        |
| Pop2012_county    | 1.49e-07***   | 3.02e-08      | 0.00400       | 0.00824       |                 |
| Pop65plus_county  | No            | No            | No            | Yes           | Yes            |
| Case mix          | No            | No            | No            | Yes           | Yes            |
| County demographics | No            | No            | No            | Yes           | Yes            |
| Observations      | 35 781        | 35 473        | 35 396        | 35 396        | 35 396         |
| R²                | .055          | .057          | .057          | .058          | .062           |

Note. Heteroskedasticity-robust standard errors clustered at the county level are reported in parentheses below coefficients. Each regression contains CPT and month fixed effects and a constant. CPT = current procedural terminology.

The outcome variable for each regression is relativeprice, the ratio of the system or individual provider’s real negotiated colonoscopy price divided by the mean market price. The independent variable of interest is bedshare, a system’s proportion of the market.

Each regression contains CPT fixed effects with CPT 45378 (diagnostic colonoscopy) as the excluded category, as well as month fixed effects with October 2005 (the first month of data) as the excluded category. Column 1 regresses relativeprice on bedshare; each percentage point increase in the share of beds in a county was associated with a 3 percentage point increase in price over the mean (P < .01); so for a system increasing its market share by 25 percentage points, for example, from 50% of the market to 75% of the market, the predicted relative price increase over the mean is 75 percentage points. Column 2 added provider-level controls, which dropped the predicted increase to 2 percentage points over the mean (P = .13). Column 3 added occupational-adjusted wage index, restoring the prediction to 3 percentage points over the mean (P = .10). Column 4 added case mix variables, including average patient age, percent female patients, and average number of diagnoses of colonoscopy patients. The coefficient on bedshare remained stable across all four regressions, and indicates that for each percentage
point increase in the share of beds in the market, relative price increases by 3 percentage points.

Finally, column 5, our preferred specification, included additional market-level controls including county population, percentage of the population aged 65 and older, the percentage of high school graduates 25 years and older, median household income, mean travel time to work, and gender and racial makeup. The addition of these controls did not substantially change the coefficient on bedshare, which remained statistically significant and stable. County population had the expected sign and was statistically significant but was small in magnitude; an additional 1000 population in an entire county increased relative price by only 0.0149 percentage points over the mean. ASCs, as expected, had a statistically significant negative sign and were associated with a relative price decrease of 3 percentage points. This result is expected even when controlling for case mix and CPT type as ASCs have lower overhead.

Robustness Checks

Providers and insurers do not bargain over prices every year, but rather every 3 to 5 years. Thus, current negotiated prices may be the result of past market conditions. Ordinary least squares regressions were run using lags of market share in increments of 1 year (not shown). If these results are consistent with previous results, they should also have a positive sign, but all 3 lags (1-, 2-, and 3-year lags of market share) had negative signs. Yet only the 2-year lag was statistically significant from zero and can be interpreted as follows: A 1 percentage point increase in bed share 2 years prior was associated with a 1 percentage point decrease in relative price over the mean in the current year. To determine whether this result genuinely reflects market realities, or is a fluke or indicative of conditions surrounding the recession—recall that the data are from 2005 to 2012—would require more years of data or a greater effect size to estimate the proper lag structure. Coefficients on other variables besides market share were similar in magnitude and sign to those in Table 3.

Defining markets and market share is a controversial issue. Within the limitations discussed above regarding the lack of patient-level data, we ran an alternative specification of Table 3 using CBSAs as the market rather than county, but there was not enough statistical power to precisely estimate the effect of market share on price, likely because there were not as many CBSAs in our data as there were counties. Theoretically, counties may be a better approximation of markets for an elective procedure, as patients are more likely to receive care locally, especially for nonemergent care.19,20

As for market share, we considered using admissions rather than beds, but ASCs do not admit patients. Although we only had access to colonoscopy claims, not all types of claims, a robustness check using claims as the definition of market share rather than beds or operating rooms yielded similar results (not shown).

Finally, we tested the sensitivity of the coefficients to the inclusion of county fixed effects (rather than county-level variables), to capture any unobserved time-invariant characteristics of markets. Although the magnitude of the coefficient on bedshare remained stable (each percentage point increase in the share of beds in a county was associated with a 2 percentage point increase in price over the mean), the standard error around the coefficient was too high ($P = .13$) to rule out no association (not shown).

Discussion

Consistent with both the empirical and theoretical work in the bargaining and price concentration literature, there was a substantial positive relationship between market share and colonoscopy prices relative to the mean price in the market. For every percentage point increase in a system or individual facility’s bed share, relative price increased by 2 to 4 percentage points; this result was stable across a number of specifications and included controls for provider, system, and market characteristics.

This study was among the first to incorporate ASCs into measures of market share in evaluating the effect of market concentration on prices. ASCs are associated with downward pressure on colonoscopy prices, likely somewhat mediated through unobservable patient and provider effects. Yet ASCs are not a panacea for market consolidation, as those that are freestanding may have limited bargaining power against larger hospital systems (and may be part of a different product market); others may be engaged in joint ventures with hospitals or owned by them.

A striking pattern in the data was the positive and statistically significant relationship between price and county population. This finding is consistent with theory that the number of hospitals grows with area population because hospitals require a certain level of demand to cover variable profits.18,21 Although population may be capturing some unobserved variables related to higher prices, it is also possible that population itself may have a positive effect, as demand for medical services may drive up prices, or social effects may be necessary for phenomena such as hospital reputation to exist.

Price variation for colonoscopy is driven by what would generally be considered unwarranted variation, that is, variation in market share, an indicator of bargaining power. But if market share was associated with higher quality, then price variation may be somewhat justified. Colonoscopy is an operator-dependent procedure in that whether a polyp is found and successfully removed depends on the technical skill of the physician performing the procedure. To the extent that facilities with greater market share are of higher quality, this variation is justified; yet we did not observe technical quality or any other measure of quality, and it is not clear whether insurers do either. Determining which policy lever (or market lever) to pull to address price variation in the commercial market will require data on a variety of markets (with varying degrees of insurer-provider concentration) and
could, however, be selection bias associated with setting

**Implications**

Unwarranted price variation might be mitigated in a number of ways. The Federal Trade Commission (FTC) and Department of Justice (DOJ) should more vigorously monitor provider anticompetitive behavior, both proactively and retrospectively. Payers should implement policies for their enrollees that address quality simultaneously with high prices, to make shopping for medical care an attractive feature of a plan rather than a limiting one. Delivery system reforms should address value (aligning price with quality). Policies targeted at colonoscopy such as reference pricing, in which the insurer or employer pays the first $1200 or $1300 of the patient’s facility fee for a routine colon cancer screening, address price but not quality, unless the payer restricts patients to only high-quality providers.

The positive relationship between market share and price is of particular policy significance in the current political climate. Hospital mergers were common in the 1990s; there were mergers involving over 900 facilities, but there is reason to believe that a new wave of mergers may emerge as a result of the ACA, which permits Medicare to reimburse accountable care organizations (ACOs), groups of providers responsible for coordinating patient care and subject to quality measurement. To incentivize ACO formation, the law allows ACOs to keep a portion of cost savings that might accrue. As with many policies, private insurers followed Medicare’s example, and providers prepared for the potential financial rewards from both Medicare and commercial insurers by combining forces at a rate of 3-fold compared with before the ACA and the recession. If market share is an important factor in determining prices for a relatively routine procedure such as colonoscopy, then it may be an even more important factor in determining the prices of more high-stakes surgical procedures.

**Limitations**

The findings of this study should be understood within the context of its limitations. We were not able to directly observe negotiated prices and had to infer them from transacted prices; we attempted to limit distortion from outlier providers by trimming the data. Furthermore, we obtained claims from only one insurer, whose network may not contain all providers in the market. However, the insurer had nearly three-quarters market share by total enrollment, and therefore cannot exclude most facilities from its network. Whether the insurer or the providers had the bargaining advantage in this situation is unknown, as negotiations are protected by nondisclosure agreements.

We studied colonoscopies occurring in a HOPD or ASC. Because of the capital required to perform colonoscopy, office-based procedures are becoming less common; there could, however, be selection bias associated with setting type. Furthermore, physicians or patients in an area with a preference for a less invasive procedure such as fecal occult blood test or physicians with a preference for more aggressive polyp removal during colonoscopy could bias the results as well. For example, if physicians practicing at a facility with large market share also had an aggressive practice style, then the results might be upwardly biased.

Whether the regression results may be interpreted causally is dependent on strict exogeneity of the regressors. We attempted to resolve this issue by including market-level controls and time fixed effects. But, for example, an exogeneity violation would occur if there were market-specific changes in legislation during the study period that affected provider entry and thus changed market structure. However, without patient geographic information, it is difficult to separate exogenous from endogenous information on market share.

The literature on cost shifting from public to private payers suggests that lower public prices may be linked to higher prices, though it is not clear whether lower payments from public payers such as Medicare and Medicaid incentivize providers to shift costs onto private payers or whether high-cost providers that earn negative margins on publicly insured patients also negotiate high prices from private payers to cover costs. We were not able to obtain payer information on all providers, especially ASCs. Presumably providers treating a higher number of publicly insured patients would have higher commercial prices, though it is not clear whether this association is causal and was somewhat mitigated by the inclusion of provider-level variables. Similarly, the number of capitated patients treated by a provider may also be associated with higher commercial prices. There is no readily available information on reimbursement type, especially at ASCs, and market-level health maintenance organization (HMO) penetration would not explain differences across facilities in the same market. However, we examined only facility prices, which are generally not capitated.

Finally, the external generalizability of these results is limited to markets similar to the one studied. The dynamics of a concentrated provider-concentrated insurer market may have influenced the relationship between price and market share in a way that would be different with more unbalanced power between insurers and providers, or where both markets were relatively diffuse, a less common occurrence in the United States. To evaluate the nuances of these dynamics, future research will need to address markets with varying degrees of concentration on both sides. This possibility will be explored in the next section.

**Future Research**

As researchers gain access to commercial claims data sets, more accurate inferences can be made about the drivers of price, on one hand, and volume, on the other, and the relative contribution of both to health care costs. For instance, the Health Care Cost Institute (HCCI) collects claims data from
multiple commercial insurers and partners with academic institutions. Future studies on health care prices should focus on identifying procedures whose quality is less variable, such as appendectomy, or whose quality information is available and known to the payer to determine whether quality is a source of price variation.

Furthermore, this study focused on a market with both a concentrated set of providers and a concentrated set of insurers; although this market structure is typical of many states, there are others, such as Northern California (with a more diffuse insurance market) and New York (with a more diffuse insurance market and more diffuse provider market) that may have a different relationship between market share and prices. States with different provider-insurer dynamics, as well as different employer dynamics, should be included in studies of medical care pricing to gain a complete understanding of how prices are determined.

Understanding the drivers of price and price variation will help payers and policy makers distinguish between warranted and unwarranted variations and contribute to a health care system that better reflects the quality of care delivered. Furthermore, regulators must be aware of the price implications of health care mergers in the wake of new incentives from the ACA. Unchecked, higher prices will reflect bargaining power more so than quality.

Declaration of Conflicting Interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding
The author(s) received no financial support for the research, authorship, and/or publication of this article.

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