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The effect of physician and health plan market concentration on prices in commercial health insurance markets

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Abstract The objective of this paper is to describe the market structure of health plans (HPs) and physician organizations (POs) in California, a state with high levels of managed care penetration and selective contracting. First we calculate Herfindahl–Hirschman (HHI) concentration indices for HPs and POs in 42 California counties. We then estimate a multivariable regression model to examine the relationship between concentration measures and the prices paid by HPs to POs. Price data is from Medstat MarketScan databases. The findings show that any California counties exhibit what the Department of Justice would consider high HHI concentration measures, in excess of 1,800. More than three quarters of California counties exhibit HP concentration indices over 1,800, and 83% of counties have PO concentration levels in excess of 1,800. Half of the study counties exhibited PO concentration levels in excess of 3,600, compared to only 24% for plans. Multivariate price models suggest that PO concentration is associated with higher physician prices ($p \leq 0.05$), whereas HP

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concentration does not appear to be significantly associated with higher outpatient commercial payer prices.

Keywords Market structure · Market concentration · Physician organizations · Health plans · Health insurers · Health insurance · Price · Bargaining

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Introduction

The relationship between health plans (HPs) and the physician organizations (POs)[1] with which they contract is in many cases one of bilateral dependence. In order to compete for customers, plans must assure reliable access to POs within their market areas. Similarly, POs, particularly those operating in geographic areas with high managed care penetration, often have little choice but to sign contracts with those HPs with substantial market share (Robinson and Casalino 1995; Gold et al. 2001; Hurley et al. 2002; Rosenthal et al. 2002). Some POs have argued that they face a bargaining disadvantage when considering contracts with HPs, particularly given some recent consolidation in health insurance markets (Haas-Wilson and Gaynor 1998a; Robinson 2004). Likewise, HPs have argued that in some markets POs are highly concentrated, which may apply upward pressure on prices and limit plan's ability to selectively contract (Ceniceros 2000; Strunk et al. 2001). A related concern is that PO consolidation is countervailing in response to HP consolidation and increased buying power (i.e., monopsony), which in turn may apply downward pressure on provider reimbursement rates (Federal Trade Commission and U.S. Department of Justice 2004).

Two critical aspects of the bilateral relationship between HPs and POs are (1) whether POs can use their market position to charge higher prices to HPs, and (2) whether HPs can use their market position to pay lower prices to POs. These empirical questions have been largely unexplored in the existing literature on the economic effects of the consolidation of health care organizations, mainly because of the paucity of data available to researchers to address these kinds of questions. For example, it has been difficult for researchers to obtain accurate and complete market-level enrollment data from POs and HPs conducting business in the same market (Haas-Wilson 2003).

In this paper we empirically examine the effects of PO and HP market concentration on physician prices in California. POs in California are similar in size to the rest of the nation (Gillies et al. 2003), but they conduct business in an unusually competitive environment, characterized by high levels of managed care penetration, selective contracting, and provider risk bearing (Robinson 2001; Robinson and Casalino 1995; Rosenthal et al. 2001, 2002). As POs increasingly compete for managed care contracts nationwide, the experience of California offers an opportunity to observe the effects of market structure on physician pricing.

One unique contribution of this paper is that we are able to calculate concentration measures at the county level using enrollment data for HPs and POs. Again, it has been difficult for researchers to obtain detailed market share information for POs. Another unique feature of this study is that we obtain physician price data from the commercial claims files

[1] POs come in many different forms. The data used in this study pertain mainly to medical groups and independent practice associations (IPAs); thus, hereafter, we use the term "POs" (POs) to refer to medical groups, IPAs, physician networks, physician joint ventures, and related forms of PO. The predominant model of PO in California is the IPA (61%) (Gillies et al. 2003).

maintained by Medstat MarketScan®—a nationally representative database consisting of claims data from several million commercial HP enrollees nationwide. The methodological approach used in this study consists of two components. First, we calculate market shares and concentration ratios for HPs and POs in 42 California counties. Second, we estimate a multivariable regression model to examine the relationship between concentration measures and the prices paid by HPs to POs.

Background

As stated above, two critical aspects of the bilateral relationship between HPs and POs are whether POs can use their market position to charge higher prices to HPs, and whether HPs can use their market position to pay lower prices to POs. In terms of PO concentration, monopoly power generally implies entry barriers. In the case of physician services, entry barriers are likely to stem from three factors (Haas-Wilson and Gaynor 1998b). First, payer-driven competition (e.g., selective contracting by HPs) provides strong incentives for physicians to consolidate into larger groups and networks, driven by the perceived strategic need to compete for manage care contracts from increasingly large HPs (Hough 2002; Peyser and Guzzetta 1996) and the need to coordinate care once contracts have been obtained (Pauly 1996). Second, new PO entrants face the sunk costs[2] of group and network formation—costs that incumbent POs are likely to face on a significantly smaller scale. Third, in some cases entrants lack staff privileges at market area hospitals. For example, staff restrictions were the basis for the government's case against Marshfield Clinic, which was restricting staff privileges as a means of controlling market entry (Haas-Wilson and Gaynor 1998a; Greenberg 1998).

In terms of HP concentration, Pauly (1998) argued that the most appropriate way to test for the existence of HP monopsony buying power was to observe whether HP concentration is associated with lower input prices and lower input quantities supplied to the market. In the absence of the latter condition, it is possible that lower prices represent the mitigation of provider monopoly power, rather than HP monopsony. Feldman and Wholey (2001) tested Pauly's monopsony theory using national data with a two-stage design to examine the determinants of hospital and ambulatory care prices and utilization. They found that increased HP concentration was associated with lower prices and higher utilization of hospital services, but no effect was found on ambulatory visit prices or utilization. Thus, the authors reject the monopsony hypothesis and conclude that HPs have contributed to a reduction of provider monopoly power in hospital input markets.

In this paper, we offer some additional empirical support for the ambulatory care findings of Feldman and Wholey. Whereas they assigned the HP as the unit of analysis, we use the market as the unit of analysis, combining data on plan and PO market shares in each geographic market. This technique allows us to calculate concentration measures for HPs and POs, and use each of these measures simultaneously in the regression models.

Methods

A critical component of measuring market concentration is defining product and geographic markets. The main research question addressed in this paper is whether HP or PO market

[2] Sunk costs are those costs that are non-recoverable and non-redeployable to alternative uses.

structure is associated with physician prices. In commercial health insurance markets in California, the predominant delivery model is referred to generally as the "delegated model," where multi-specialty POs sign contracts with commercial HPs (Penner 1997; Casalino 2001; Rosenthal et al. 2002). The typical HP will contract with several POs in each geographic area. Once contracts are finalized, enrollees typically must select a PO (and primary care physician) wherein they will receive the vast majority of their care. Thus, competition among POs occurs in two stages (see generally Vistnes 2000). In the first stage, POs compete with each other for contracts with HPs, and in the second stage POs compete for patients (or "covered lives" in case of groups bearing financial risk through capitation). We posit that, in commercial markets, prices are sensitive to market structure mainly in the first stage. Prices for other payers, such as Medicare and Medicaid, are established a priori by those agencies and are generally not sensitive to market structure. We therefore define the product market as enrollees in commercial HPs, including traditional managed care products and self-insured products, the latter referring to insurance policies where employers bear financial risk but delegate provider contracting and payment to HPs.

In terms of geographic markets, we chose to limit our analysis to markets within the state of California, for three reasons. First, the California economy is very large—in fact, larger than the economies of many countries. The large size and socioeconomic and demographic diversity of the California market makes it a useful "laboratory" for other states and countries (e.g., Casalino 2001). Second, the relatively large size of many of California's medical groups and other physician organizations make the state a natural place to examine the bargaining relationship between physicians and health plans. As physician organizations become larger nationwide (e.g., Casalino et al. 2003; Kane 2004; Liebhaber and Grossman 2007), the dynamics of the California market may provide generalizable approximations of price effects. Finally, our study design does not lend itself well to national data, even if such data were to exist. As we describe below, we examined market level enrollment data for all health plans and all large physician organizations in California. These data had to be checked and verified (e.g., examination of outliers), and to conduct such data reconciliations at the national level, where the number of physician organizations would number in the thousands, would have exceeded the resources available for this research. However, as we suggest in the discussion section, gathering such data from a handful of other states would be very valuable to researchers.

Within California, geographic markets for physician services can be defined empirically (e.g., using the Elzinga–Hogarty test) or approximated using existing boundaries (e.g., geopolitical boundaries such as counties or metropolitan statistical areas, or MSAs). Both of these methods are associated with tradeoffs; neither results in an exact delineation of markets (FTC 2004). Consequently, the geographic market for physician services has been difficult to generalize, evidenced by substantial variation in definition across several antitrust cases (Gaynor and Haas-Wilson 1999; Haas-Wilson 2003, pp. 121–124). The Federal Trade Commission and U.S. Department of Justice have argued that primary care physician services tend to be "local," confined to cities or counties (FTC 1996, 2003, 2004; Haas-Wilson and Gaynor 1998a; Haas-Wilson 2003). We posit that markets for the predominant physician contracting entity in California—multi-specialty practices—will be local. We further define local as the county.[3] Urban counties in California tend to be smaller than rural counties. This adds further support to defining geographic markets as counties because enrollees in urban counties

[3] The decision to define geographic markets according to geopolitical boundaries was driven in part by the complexities and practicalities of obtaining patient origin data linked to specific POs and HPs. The only means of obtaining such data is directly from the HPs. However, we would have had to obtain such data from all HPs and medical groups, a task which for the purposes of this study was not considered practical or feasible.

will typically have a larger array of choices of in-network POs. Thus, markets for urban enrollees are likely to be smaller, corresponding to smaller county sizes. Conversely, enrollees in rural areas will face fewer physician choices, and will likely be willing to travel further to obtain services. However, given that market concentration ratios are highly dependent on the geographic definition of markets, we provide additional sensitivity testing by repeating our analyses with the MSA as the geographic unit of analysis.

Market concentration indices are calculated for POs and HPs by county and MSA. We rely on the Herfindahl–Hirschman Index (HHI), which is a standard method of measuring market concentration (Viscusi et al. 1996). The HHI is calculated by summing the squares of each firm's market share in the county (and MSA); that is, $\mathrm{HHI} = \sum^{\mathrm{i}} s_{\mathrm{i}}^2$, where s denotes the market share of firm i. This method allows for firms with relatively large market share to be more heavily weighted in the index. The HHI index equals 10,000 when an industry or market consists of a single seller.

County-level physician and HP market share and concentration measures are based on annual surveys of HPs and POs conducted by Cattaneo and Stroud, Inc. (CSI).[4] The CSI HP survey is a mail survey with telephone follow-up. The surveys have been conducted annually in California since 1998. Due to extensive follow-up, the CSI survey retrieved data from 40 commercial HPs, achieving a response rate of 95%. The final HP dataset contained information on 41 HPs as of December 31, 2001. The data pertain to health plan's commercial products, including counts on enrollees in traditional managed care products and self-insured products. The CSI physician survey is conducted in a similar fashion, collecting enrollment data (total and by county) for all California medical groups and IPAs that (1) have at least six primary care physicians affiliated with the group, and (2) have at least one risk or non-risk contract with at least one HP.[5] The CSI dataset is unique in that PO enrollment (and HP enrollment) is reported by county. The final medical group dataset contained information on 482 POs as of December 31, 2001. This represents approximately 95% of the POs meeting the CSI selection criteria.

Price data were obtained from the 2002 Medstat MarketScan® Commercial Claims and Encounters (CCAE) databases.[6] The CCAE databases contain person-level claims data that reflect the health care experience of employees and dependents of 45 large self-insured employers. The data are provided by 100 different insurance companies and third party administrators, and include inpatient, outpatient, and prescription claims. An individual's claims are linked across time and providers to create episodes of healthcare utilization. While the claims do not contain individual provider identifiers, they do contain the county in which the provider is based and the type of provider for each procedure. For the purpose of this study, county and MSA-level average prices for common outpatient procedures were estimated using all fee-for-service (FFS) claims in the county/MSA. The Medstat price refers to "amounts eligible for payment under the medical plan terms after applying rules such as discounts, but before applying COB, co-payments, and deductibles" (Thomson Medstat 2004).

Because we are looking at commercial insurance markets in general, including both traditional plans and self-insured plans, it is necessary to make the assumption that the prices that providers charge to patients who enter the system via a self-insured employer are sim-

[4] The CSI data is collected at the county level, but can easily be aggregated to the MSA level using county (FIPS code) crosswalks available on the Area Resource File.

[5] For more information on the medical group inventory, including summary reports, refer to www.cattaneostroud.com.

[6] For more information, refer to www.medstat.com/products/productdetail.aspx?id=71.

ilar to the prices charged by providers to patients entering the system through traditional insurance plans, where the plan bears the majority of the financial risk. We believe this to be a reasonable assumption. Self-insured employers rely heavily on health plans to manage provider contracting and claims processing. In most cases, plans do not negotiate multiple price schedules for the same kinds of patients. Plans are likely to maintain separate price schedules for distinct groups of patients (e.g., Medicare Advantage patients), but typically negotiate fee schedules separately for each provider group regardless of whether an enrollee originates from a self-insured product (Ueeck 1996; Kinder 1998). In other words, we are more likely to observe variation in prices between physician organizations than we are to observe variation in prices within physician organization for a contract with a single health plan.

In order to calculate aggregate county and MSA-level physician prices, we started by calculating average prices for all CPT codes in all California counties. However, this approach was insufficient due to the fact that in a given year, not all CPT codes are billed in all counties. Thus, any aggregation scheme would be biased by whether, in a given year, certain procedures were performed in the county or not.[7] To address this problem, we limited the price calculations to procedures (CPT codes) billed by physicians in all 42 California counties in 2001 and 2002, which resulted in a total of 104 procedures.[8] These 104 procedure codes were then classified into five common clinical groupings used by the CPT classification system: evaluation and management (E & M), surgery, radiology, pathology/laboratory, and medicine (see Appendix A). Given that most HP/PO contracts are one year in duration, we assume a one-year lagged relationship between market structure and price. Based on the five market baskets of procedures, we aggregated average prices in 2002 for the 104 procedure codes in each county into five composite price indicators, weighting the averages by 2001 county-wide procedure volume. All patient identifiers are encrypted to prevent linkage to other data sources. Definitions and sources of all of the remaining variables serving as regressors are described in Table 1.

The physician price model has the county as the unit of observation ($n = 42$).[9] The price model that we estimate is expressed as Eq. 1:

$$\mathbf{P}_{\mathrm{it}} = \beta_0 + \sum \beta_{\mathrm{j}} \mathbf{Q}_{\mathrm{i(t-1)}} + \sum \beta_{\mathrm{k}} \mathbf{D}_{\mathrm{i(t-1)}} + \sum \beta_{\mathrm{m}} \mathbf{M}_{\mathrm{i(t-1)}} + \varepsilon_{\mathrm{it}} \tag{1}$$

Prices for a vector of common high-volume outpatient procedures ($\mathbf{P}_{\mathrm{it}}$) for the ith county in time period t (2002) is modeled as a function of lagged (2000–2001) county-level measures of the supply of physician services ($\mathbf{Q}_{\mathrm{i(t-1)}}$), the lagged demand for those services ($\mathbf{D}_{\mathrm{i(t-1)}}$), and the lagged structure of the market in which the services are transacted ($\mathbf{M}_{\mathrm{i(t-1)}}$) (Table 1). Supply measures include the number outpatient visits per 1,000 population, the number of MDs per 1,000 population, and the ratio of specialists to total MDs. Demand measures include per capita income, percent of population whose are more than 65 year old, and percent of the population living in urban areas. Market structure variables include measures of PO and HP concentration, as measured by the HHI ($\mathrm{HHI_{PO}}$ and $\mathrm{HHI_{HP}}$, respectively). We estimate the model using a simple Cobb-Douglas functional form (i.e., log–log) in order to minimize the effects of skewed price data.

[7] There were several empty CPT-county cells, mainly because California has several large counties with very low population density and relatively few medical services available.

[8] Due to the requirement that claims must be present in the 42 counties, these selection criteria result in identifying relatively high-volume procedures.

[9] We exclude counties without any PO enrollment (i.e., commercial carrier enrollment in POs with at least six physician members).

Table 1 Means, standard deviations, and sources of county-level variables, 2000–2002

Variable/Year	Mean[a]	SD
Composite price for evaluation and management (2002)[b]	$92.00	$39.32
Composite price for surgery (2002)[b]	$82.36	$29.70
Composite price for radiology (2002)[b]	$82.61	$17.59
Composite price for pathology and laboratory (2002)[b]	$31.27	$11.30
Composite price for medicine (2002)[b]	$40.06	$6.70
Outpatient visits per capita (2001)[c]	1.79	1.14
Percent urban population (2001)[c]	78.52%	20.65%
MDs per 1000 population (2001)[c]	2.03	0.94
Ratio of specialists to total MDs (2001)[c]	63.94%	15.84%
Per capita income (2000)[c]	$30,284.13	$1,1071.90
Percent over age 65 (2000)[c]	11.83%	2.56%
Managed care penetration (2001)[c,d]	41.99%	19.77%
HP HHI (2001)[d]	2,592.00	931.02
PO HHI (2001)[d]	4,430.10	2,750.76
HP enrollment (2001)[d]	454,989.10	875,953.80

Notes: [a] Based on 42 counties with non-missing price data; [b] Based on a 2002 weighted average of high-volume procedure codes by group (see appendix for list of procedure codes included in each group); Source: 2002 Medstat MarketScan® Commercial Claims and Encounters (CCAE) databases; [c] Data are from Bureau of Health Professions Area Resource File (February 2003 Release); [d] Data are from Cattaneo and Stroud, Inc. (see text)

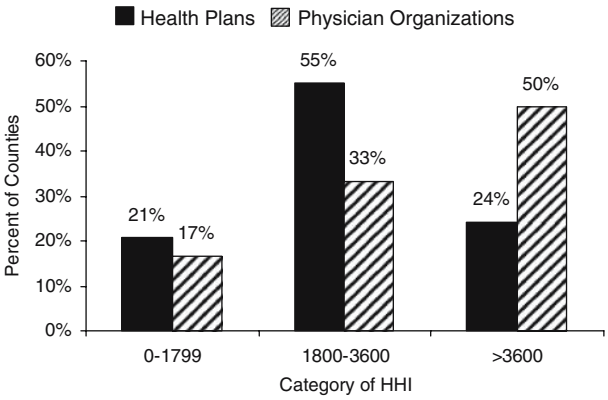
Results

The mean volume-weighted composite price measures ranged from $31 (pathology and lab) to $92 (evaluation and management) (Table 1). These measures are somewhat lower than analogous national averages because we include only high-volume procedures and services performed. More than three-quarters of the counties are considered urban, with an average of 12% of the population over age 65. Approximately two-thirds of county physicians are generalists. Commercial HP enrollment averaged 454,989 covered lives per county, with a relatively large standard deviation due to the high levels of enrollment in California's four largest metropolitan areas.[10] Mean county-level HHI_{HP} was 2,592, whereas mean county-level HHI_{PO} was 4,430, a difference of 71%.

Figure 1 shows the distribution of HHI_{HP} and HHI_{PO} by HHI category. The categories are based on the FTC/DOJ threshold of 1,800. The lowest category (0–1,799) represents the least concentrated counties. HP concentration was below 1,800 in 21% of the study counties, whereas 17% of counties had PO concentration levels below 1,800. Larger plan-provider differences were observed in the middle group (1,800–3,600), where 55% of the counties had plan concentration levels at or up to two times the FTC/DOJ threshold, compared to 33% for POs. Half of the study counties exhibited PO concentration levels in excess of 3,600, compared to only 24% for plans.

The right-hand bars of the distribution shown in Fig. 1 suggest that there may be large differences between HP and PO HHIs in some counties. Accordingly, we also examined the distribution of HHI_{HP} and HHI_{PO} differences across counties (Fig. 2). Across counties, the difference between HHI_{HP} and HHI_{PO} favored POs. In 45% of the counties, concentration

[10] Los Angeles, San Diego, San Francisco, and Sacramento.



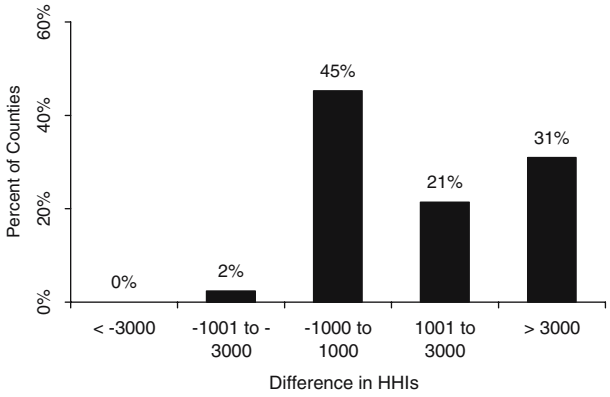


Fig. 1 Percentage of California counties by HP and PO concentration 2001. County-level HHIs for HPs and POs are based on data from Cattaneo and Stroud, Inc. (see text)

Fig. 2 Percentage of California counties by magnitude of difference between the concentration ratios of physician organizations and health plans (i.e., HHI_{PO}–HHI_{HP}). County-level HHIs for HPs and POs are based on data from Cattaneo and Stroud, Inc. (see text)

differences[11] were within ±1,000 (Fig. 2). However, for another 22 counties (52%), PO concentration exceeded HP concentration by more than 1,000; of those counties, 13 counties (31%) had differences in excess of 3,000.

Results of the multivariable regression models are summarized in Table 2.[12] With the exception of the surgery model, the models have reasonably good fit, with *R*-squared measures of 0.65 (evaluation and management), 0.26 (radiology and pathology), and 0.63 (medicine). However, even in the models with relatively high *R*-squared measures, relatively few of the covariate coefficients were significantly different from zero at $p \leq 0.05$ (Appendix B). The managed care penetration measure is significant and positive in the evaluation/management and medicine models, perhaps due to its high likely correlation with demand factors, such as population density. The coefficients for HHI_{PO} were positive and significant in all of the price models except evaluation and management. The coefficients, which can be interpreted

[11] Raw difference between county-level HHI_{HP} and HHI_{PO}.

[12] Complete regression model coefficients are provided in Appendix B (county-level) and Appendix C (MSA-level).

Table 2 Effects of market concentration in log–log models[a] of 2002 composite price measures: County-level

Composite price variables	Log (HHI_{PO})[b]		Log (HHI_{HP})[c]		Adj. R^2
	β	SE	β	SE	
E & M	−0.0427	0.1061	0.2660	0.1567	0.65
Surgery	0.3142*	0.1113	−0.1302	0.1644	0.07
Radiology	0.1907*	0.0770	−0.1765	0.1138	0.26
Pathology	0.3660*	0.1324	0.0323	0.1956	0.26
Medicine	0.0889*	0.0430	0.0487	0.0636	0.63

Notes: [a] Independent variables are based on data from 2000 to 2001 (see Table 1 and text); [b] county-level PO HHI; [c] county-level HP HHI; * Significant at $p \leq 0.05$ (*t*-test)

Table 3 Effects of market concentration in log–log models[a] of 2002 composite price measures: MSA-level

Composite price variables	Log (HHI_{PO})[b]		Log (HHI_{HP})[c]		Adj. R^2
	β	SE	β	SE	
E & M	0.0186	0.1561	0.1962	0.2213	0.5555
Surgery	0.3769*	0.0793	−0.051	0.1125	0.7614
Radiology	0.2544*	0.0772	−0.056	0.1094	0.4911
Pathology	0.4901*	0.2238	0.2024	0.3173	0.0834
Medicine	0.1395*	0.0568	0.0207	0.0805	0.6298

Notes: [a]Independent variables are based on data from 2000 to 2001 (see Table 1 and text); [b] MSA-level PO HHI; [c] MSA-level HP HHI; * Significant at $p \leq 0.05$ (*t*-test)

as elasticities in the log–log models, suggest that a 10% increase in HHI_{PO} is associated with 1–4% higher physician prices. HP concentration, conversely, appears to have no significant effect on physician prices, consistent across all five models. We repeated the regression model using the MSA as the relevant geographic market, and found the signs, magnitudes, and significance of the coefficients to be virtually identical (Table 3 and Appendix C). The most likely explanation of the concordance between county and MSA findings is that we observe a high degree of correlation between county and MSA-level measures of health plan and PO concentration.

Discussion

The goals of this study are to quantify the extent of market concentration among POs and HPs in California, and to examine the relationship between concentration and prices. The findings can be summarized as follows. First, many California counties exhibit what the FTC/DOJ would consider "high" concentration ratios, in excess of 1,800. More than three quarters of California counties exhibit HP concentration ratios over 1,800, and 83% of counties have PO concentration levels in excess of 1,800. Second, the balance of concentration appears to favor POs; half of the study counties exhibited PO concentration levels in excess of 3,600, compared to only 24% for plans. Third, multivariate models suggest that PO concentration is associated with higher outpatient prices, whereas HP concentration does not appear to be associated with lower outpatient commercial payer prices. This concentration-price relationship was evident in four of the five procedure groupings, and evident in each of the model specifications tested.

These findings are consistent with Feldman and Wholey (2001), who failed to find evidence of heath plan monopsony power. Our findings add to theirs by suggesting that, in ambulatory care settings, POs in some cases are able to charge higher prices than their less concentrated counterparts.

There are two plausible explanations for the findings on PO concentration. First, there are likely to be some economies of scale in POs, offering an efficiency rationale for larger practices. However, studies have shown that economies of scale in physician practices tend to be quite low, with economies being exhausted with group sizes of only 5–10 physicians (Andes et al. 2002; Hough 2002; Pope and Burge 1992; Rosenman and Friesner 2004; Weil 2002). Thus, a more likely explanation is that higher levels of PO concentration may be countervailing to HP concentration, driven by the perceived strategic need to compete for managed care contracts from increasingly large HPs (Hough 2002; Peyser and Guzzetta 1996) and the need to coordinate care once contracts have been obtained (Pauly 1996). Although we show that HP concentration is not exceptionally high in California counties, there is a general perception nationally that HP consolidation has led to monopsony buying power (e.g., Benko 2006).[13] It is conceivable that such perceptions encourage countervailing consolidation, even in the absence of observed plan consolidation leading to unusually high concentration.

The most plausible explanation for the positive PO price effect is simply that, on average, POs in California's more concentrated physician markets are able to charge higher prices to HPs because of their market power—market power that is enhanced by the reality that HPs have limited ability to exclude large POs from services networks. In the absence of meaningful economies of scale, the policy implications of strategic justifications for concentration must be evaluated as to their impact on competition in the market (FTC 2003, 2004). Our findings on the positive effects of PO concentration on outpatient prices raise some concerns about the extent of PO consolidation, at least in terms of its potential to increase physician prices if the trend continues nationally.

There are five notable limitations to this study. First, in the absence of patient origin data we were not able to delineate market boundaries optimally. Geopolitical boundaries such as counties may approximate actual market areas in some cases, but not in others. Second, concentration and price data pertain only to commercial payer markets. A county labeled as highly concentrated in our study may have additional physician groups of smaller size (i.e., solo practice to $\leq$5 physicians) that, if counted, would result in lower HHIs. We argued above that this is likely to not affect commercial markets because commercial plans mainly contract with larger POs, but we cannot directly test the veracity of that assertion in the absence of data on smaller groups. A third limitation is the relatively small sample size, which leaves the analysis somewhat more sensitive to outliers.

A fourth limitation is the cross-sectional study design. Ideally, studies examining the effects of market structure on price should have a lagged structure. We employ a one-year lag structure (2001 market structure and 2002 prices), but a more accurate picture would be provided by panel data models over a longer time horizon, allowing for longer lagged effects. Panel data models offer several advantages, including additional confidence in the direction of causation (e.g., concentration leading to higher prices) and the ability to simultaneously measure the effects of levels and changes (Baltagi 1995). Future research should also look for ways to make use of patient origin data as a means to delineate market areas, although that would be an exceedingly difficult task to implement beyond a small handful of market areas.

[13] In addition, a recent descriptive study by Robinson (2004) shows that in 38 states the largest health insurance firm controls one-third or more of the market, and in sixteen states the largest firm controls more than half the market.

Finally, the study is limited to the experience of one state, raising the concern that the results are likely to be highly representative of California but of potentially limited relevance to other markets. While we acknowledge this limitation, we believe that these findings are a useful starting point in characterizing similar managed care markets nationally. There are several states which have active and innovative managed care markets similar to those common to California, and many others that have witnessed substantial evolution (including consolidation) among physician organizations (Casalino and Trauner 1998; Haas-Wilson and Gaynor 1998b; Gillies et al. 2003). These parts of the US will likely exhibit similar health plan-physician organization dynamics, and further research should be conducted in those areas to assess whether our findings and those of Feldman and Wholey hold. In addition, as we suggested above, the large size of the California market offers a laboratory for states and in some cases other countries, many of which also exhibit trends toward physician consolidation through larger practices and trade associations.

Concluding remarks

As the trend toward PO consolidation continues, policy makers and industry analysts should pay as much attention to the effects of physician concentration on prices as has been devoted to hospital concentration. Our research shows that in a state with high managed care penetration and selective contracting, POs are highly concentrated in many markets. While there are perhaps more substitutes for physician care than hospital care, health insurers may be left with little or no option to selectively contract in markets where PO concentration is high. Attenuation in the ability to negotiate price and selectively contract ultimately feeds back to consumers in the form of higher prices.

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Appendix A

CPT procedure codes included in each price grouping

Composite price indicator groupings	CPT procedure code
E & M	99201, 99202, 99203, 99204, 99205, 99211, 99212, 99213, 99214, 99215, 99242, 99243, 99244, 99245, 99391, 99392, 99393, 99394, 99395, 99396
Surgery	10060, 11730, 11750, 17000, 17003, 20550, 20610, 36415, 43239, 69210
Radiology	70450, 70486, 71010, 71020, 72040, 72100, 73030, 73110, 73130, 73560, 73620, 73630, 76092, 76700, 76805, 76830, 76856
Pathology	80048, 80053, 80061, 80076, 81000, 81002, 82150, 82270, 82728, 82947, 83036, 83540, 83550, 84100, 84153, 84439, 84443, 84550, 85018, 85025, 85610, 85651, 85730, 86580, 87045, 87070, 87086, 87205, 87210, 88305
Medicine	90471, 90472, 90633, 90658, 90659, 90700, 90707, 90713, 90716, 90718, 90782, 92012, 93000, 93010, 93015, 93307, 93320, 93325, 97001, 97014, 97035, 97110, 97140, 98940, 98941, 99000, 99173

Appendix B

Full regression results for five price models:[a] county-level

Covariate	E & M	Surgery	Radiology	Pathology	Medicine
Log (outpatient visit per capita)	0.0849	−0.0256	0.0387	−0.0395	0.0574*
Log (per capita income)	−0.1023	−0.0208	0.2264	0.2212	−0.0321
Log (MDs per 1,000 population)	0.0212	−0.1318	−0.0577	0.0785	0.1233
Log (ratio of specialists/ all MDs)	−0.1813	−0.1030	−0.0337	−0.0931	−0.0755
Log (percent urban population)	0.1512	0.3540	−0.1782	−0.1302	0.0291
Log (percent over age 65)	0.0462	0.1745	−0.3604	−0.5849	−0.1293
Log (HHI_{PO})[b]	−0.0427	0.3142*	0.1907*	0.3660*	0.0889*
Log (HHI_{HP})[c]	0.2660	−0.1302	−0.1765	0.0323	0.0487
Log (managed care penetration)	0.6266*	0.1424	0.1512	0.2769	0.2318*
Constant	3.7249	2.0493	2.0275	−2.6457	2.5996*
Number of observations	42	42	42	42	42
Adj. R^2	0.65	0.07	0.26	0.26	0.63

Notes: [a] Independent variables are based on data from 2000 to 2001 (see Table 1 and text); [b] County-level PO HHI; [c] County-level HP HHI; * Significant at $p \leq 0.05$ (t-test)

Appendix C

Full regression results for five price models:[a] MSA-level

Covariate	E&M	Surgery	Radiology	Pathology	Medicine
Log (outpatient visit per capita)	0.2023	0.0037	−0.0077	−0.1110	0.0784
Log (per capita income)	−0.0229	0.0752	0.2447*	0.2271	0.1089
Log (MDs per 1,000 population)	0.0503	0.16728	0.1421	0.2338	0.0687
Log (ratio of specialists/all MDs)	−0.5097	−1.3989*	−0.4361	−0.1467	−0.2503
Log (percent urban population)	NA	NA	NA	NA	NA
Log (percent over age 65)	−0.2424	0.16737	−0.5704*	−0.6918	−0.1948
Log (HHI_{PO})[b]	0.0186	0.3769*	0.2544*	0.4901*	0.1395*
Log (HHI_{HP})[c]	0.1962	−0.0508	−0.0562	0.2024	0.0207
Log (managed care penetration)	0.6456*	0.15305	0.0600	0.2320	0.2228*
Constant	2.7720	0.82533	−1.2154	−5.9757	0.8824
Number of observations	25	25	25	25	25
Adj. R^2	0.56	0.76	0.49	0.08	0.63

Notes: [a] Independent variables are based on data from 2000 to 2001; [b] MSA-level PO HHI; [c] MSA-level HP HHI; * Significant at $p \leq 0.05$ (t-test)

References

Andes, S., Metzger, L. M., Kralewski, J., & Gans, D. (2002). Measuring efficiency of physician practices using data envelopment analysis. *Managed Care, 11*(11), 48–54.

Baltagi, B. H. (1995). *Economic analysis of panel data*. New York: Wiley.

Benko, L. B. (2006). AMA: Near-monopolies abound. *Modern Healthcare, 36*(17), 12–13.

Casalino, L. P. (2001). Canaries in a coal mine: California physician groups and competition. *Health Affairs, 20*(4), 97–108.

Casalino, L. P., Devers, K. J., Lake, T. K., Reed, M., & Stoddard, J. J. (2003). Benefits of and barriers to large medical group practice in the United States. *Archives of Internal Medicine, 163*(16), 1958–1964.

Casalino, L. P., & Trauner, J. B. (1998). *Physician organizations assuming risk: Market and policy implications*. Washington, D.C.: National Health Policy Forum.

Ceniceros, R. (2000). Docs balk at capitation. *Business Insurance, 34*(47), 1–2.

Federal Trade Commission and U.S. Department of Justice (2004). *Improving health care: A dose of competition*. Washington, D.C.

Feldman, R., & Wholey, D. (2001). Do HMOs have monopsony power? *International Journal of Health Care Finance and Economics, 1*(1), 7–22.

FTC (1996). *Statements of antitrust enforcement policy in health care*. Washington, D.C.: Federal Trade Commission & Department of Justice.

FTC (2003). *Health care competition law and policy*. Washington, D.C.: Federal Trade Commission & U.S. Department of Justice.

FTC (2004). *Improving health care: A dose of competition*. Washington, D.C.: Federal Trade Commission & U.S. Department of Justice.

Gaynor, M., & Haas-Wilson, D. (1999). Change, consolidation, and competition in health care markets. *Journal of Economic Perspectives, 13*(1), 141–164.

Gillies, R. R., Shortell, S. M., Casalino, L. P., Robinson, J. C., & Rundall, T. G. (2003). How different is California? A comparison of U.S. physician organizations. *Health Affairs* Web Exclusive (W3), 492–502.

Gold, M., Hurley, R., & Lake, T. (2001). Provider organizations at risk: A profile of major risk-bearing intermediaries. *Health Affairs, 20*(2), 175–185.

Greenberg, W. (1998). Marshfield clinic, physician networks, and the exercise of market power. *Health Services Research, 33*(5), 1461–1476.
Haas-Wilson, D. (2003). *Managed care and monopoly power: The antitrust challenge*. Cambridge: Harvard University Press.
Haas-Wilson, D., & Gaynor, M. (1998a). Increasing consolidation in healthcare markets: What are the antitrust policy implications? *Health Services Research, 33*(5 (Part II)), 1403–1419.
Haas-Wilson, D., & Gaynor, M. (1998b). Physician networks and their implications for competition in health care markets. *Health Economics, 7*, 179–182.
Hough, D. E. (2002). Is bigger always better? The optimal size of group practice. *Journal of Medical Practice Management, 17*(6), 312–318.
Hurley, R. E., Grossman, J., Lake, T., & Casalino, L. (2002). A longitudinal perspective on health plan-provider risk contracting. *Health Affairs, 21*(4), 144–153.
Kane, C. K. (2004). The practice arrnagements of patient Care physicians, 2001. In *Physician marketplace report*. Chicago: Center for Health Policy Research, American Medical Association.
Kinder, J. A. (1998). A primer of services for self-insureds. *National Underwriter, 102*(23), 18–19.
Liebhaber, A., & Grossman, J. M. (2007). Physicians moving to mid-sized, single-specialty practices. In *Community tracking study "tracking report: Quality & care delivery"*. Washington: Center for Studying Health System Change.
Pauly, M. V. (1996). Economics of multispecialty group practice. *Journal of Ambulatory Care Management, 19*(3), 26–33.
Pauly, M. V. (1998). Managed care, market power, and monopsony. *Health Services Research, 33*, 1439–1460.
Penner, M. J. (1997). *Capitation in California: A study of physician organizations managing risk*. Chicago: Health Administration Press.
Peyser, N., & Guzzetta, D. (1996). Physician group sizing: A strategic framework. *Journal of Ambulatory Care Management, 19*(3), 34–49.
Pope, G. C., & Burge, R. T. (1992). Inefficiencies in physician practices. *Advances in Health Economics and Health Services Research, 13*, 129–164.
Robinson, J. C. (2001). Physician organization in California: Crisis and opportunity. *Health Affairs, 20*(4), 81–96.
Robinson, J. C. (2004). Consolidation and the transformation of competition in health insurance. *Health Affairs, 23*(6), 11–24.
Robinson, J. C., & Casalino, L. P. (1995). The growth of medical groups paid through capitation in California. *The New England Journal of Medicine, 333*(25), 1684–1687.
Rosenman, R., & Friesner, D. (2004). Scope and scale inefficiencies in physician practices. *Health Economics, 13*(11), 1091–1116.
Rosenthal, M. B., Frank, R. G., Buchanan, J. L., & Epstein, A. M. (2001). Scale and structure of capitated physician organizations in California. *Health Affairs, 20*(4), 109–119.
Rosenthal, M. B., Frank, R. G., Buchanan, J. L., & Epstein, A. M. (2002). Transmission of financial incentives to physicians by intermediary organizations in California. *Health Affairs, 21*(4), 197–205.
Strunk, B. C., Devers, K. J., & Hurley, R. E. (2001). Health plan-provider showdowns on the rise. Washington: Center for Studying Health System Change.
Thomson Medstat (2004). MarketScan research databases user guide and database dictionary: Commercial claims and encounters medicare supplemental and COB for data year 2003 edition. Ann Arbor: Thomson Medstat.
Ueeck, E. (1996). The role of exclusive provider organizations in self-funded health plans. *Employee Benefits Journal, 21*(3), 22–25.
Viscusi, W. K., Vernon, J. M., & Harrington, J. E. (1996). *Economics of regulation and antitrust* (2nd ed.). Cambridge: The MIT Press.
Vistnes, G. (2000). Hospitals, mergers, and two-stage competition. *Antitrust Law Journal, 67*, 671–692.
Weil, T. P. (2002). Multispecialty physician practices: Fixed and variable costs and economies of scale. *Journal of Ambulatory Care Management, 25*(3), 70–77.