Effect of Mergers on Health Maintenance Organization Premiums

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This study estimated the effect of mergers on health maintenance organization (HMO) premiums, using data on all operational non-Medicaid HMOs in the United States from 1985 to 1993. Two critical issues were examined: whether HMO mergers increase or decrease premiums; and whether the effects of mergers differ according to the degree of competition among HMOs in local markets. The only significant merger effect was found in the most competitive markets, where premiums increased, but only for 1 year after the merger. Our research does not support the argument that consolidation of HMOs in local markets will benefit consumers through lower premiums.

BACKGROUND AND SIGNIFICANCE

HMOs appear to be effective in controlling health care costs and are popular with consumers. HMOs can reduce health care costs by substantial amounts compared with fee-for-service (FFS) medical care—25 percent in one comparison with a free FFS plan (Manning, Leibowitz, and Goldberg, 1984). Other studies consistently indicate that HMOs have lower hospital days per enrollee compared with FFS plans (Miller and Luft, 1994). HMOs also have won broad acceptance in the marketplace. Nationally, HMO enrollment increased from less than 2 million in 1970 to almost 54 million in July 1995 (InterStudy, 1996).

The research for this article was supported by the Robert Wood Johnson Foundation under its Health Care Financing and Organization (HCFO) Initiative. Roger Feldman and Jon Christianson are with the Institute for Health Services Research, University of Minnesota. Douglas Wholey is with Carnegie-Mellon University. The views and opinions expressed in this article are the views of the authors and do not necessarily reflect the views of the University of Minnesota, Carnegie-Mellon University, or the Health Care Financing Administration (HCFA).

However, rapid growth in HMO enrollment has not been matched by comparable increases in the number of HMO plans. The total number of HMOs appears to have peaked in December 1986 and, despite the entry of new plans, it has since declined slightly (Christianson et al., 1991). This happened because 149 HMOs failed (i.e., went out of business) between 1986 and 1993, and another 80 HMOs disappeared through mergers. Thus, the number of competing HMOs in some geographic markets declined over this period.

A decrease in the number of competing HMOs should be of concern to health policymakers who emphasize the development of competitive markets as a means of controlling health care costs. A recent study by Wholey, Feldman, and Christianson (1995a) showed that HMOs with more competitors have lower premiums. Since a merger, by definition, reduces the number of competitors in a market, HMO mergers could tend to increase premiums. HMO failures could have the same effect as mergers on premiums of the remaining plans.

Wholey, Feldman, and Christianson's finding (1995a) is consistent with a large body of research that links seller concentration to high prices. Among the industries examined have been cement, airlines, gas stations, advertising, supermarkets, rail freight, and banking (Weiss, 1989). Although the evidence from health care industries is less complete, one study demonstrated that the events that promote hospital mergers increase the profits of

competitors (Woolley, 1989), and another showed that mergers threaten the competition that exists in hospital markets (Blackstone and Fuhr, 1989).

There has been only one published study of the effects of HMO mergers on premiums. This was a case study of a merger of two large HMOs in the Twin Cities that occurred in 1992 (Feldman, 1994). Using an economic model of health plan rivalry and simulating the model with data from several Twin Cities firms that offered these HMOs, Feldman predicted that this merger would increase HMO premiums. However, he did not attempt to compare the premium increases for the merged HMO and other HMOs in the Twin Cities using data from the post-merger period.

Since knowledge of the effects of HMO mergers is extremely limited, there is a need for further studies in this area. Building on the prior work of Wholey, Feldman, and Christianson (1995a), this study estimates an economic model of HMO premiums that includes the effects of market structure and mergers. Two critical issues are examined: whether HMO mergers increase or decrease premiums; and whether the effects of mergers differ according to the degree of competition among HMOs in local markets. The analysis controls for premium differences that existed prior to the merger and prior to the failure of some HMOs in the data.

ECONOMIC MODEL

The Basic Model

The model used in this article is an extension of the one developed by Wholey, Feldman, and Christianson (1995a) to estimate the effect of market structure on HMO premiums. That analysis was based on a profit-maximizing model of HMO behavior, with HMOs assumed to offer heterogeneous products in local, oligopolistic markets. The first-order condition for profit-maximization can be expressed as a price cost margin that depends on demand conditions in the local market and the HMO's belief about how competitors will react if it changes its premium. By making further assumptions about the specific forms of the cost and demand functions, we were able to derive the following equation for the natural logarithm of the HMO's profit-maximizing premium:

$$\log P = ß_{mc} X_{mc} + ß_i X_i + ß_{fi} X_{fi} + ß_r X_r$$

where X_{mc}, X_i, X_{fi}, and X_r are vectors of observed variables related (in order) to the HMO's marginal cost, the premium elasticity of demand for all HMOs, the premium elasticity of demand for a particular HMO, and the competitive reaction of other HMOs. A brief description of each vector of variables follows.

Variables Related to the HMO's Premium Elasticity of Demand (X_{fi})

The HMO's premium elasticity of demand may be defined as the percentage change in its enrollment, divided by a 1 percent change in its premium. Our central hypothesis was that greater structural competition in local markets increases the premium elasticity of demand facing an HMO and, through this effect, is related to lower HMO premiums. We chose the number of firms as an empirical measure of structural competition. This choice is appropriate for HMOs that produce differentiated products and compete in local, oligopolistic markets.[1] In fact, if all HMOs were equally close substitutes, the number of competitors would be an exact

[1]An oligopoly is a market structure composed of a limited number of firms. Oligopolistic markets often are characterized by some barriers to entry. In such markets, the rival firms may achieve a degree of mutual interdependence in which each firm considers the likely reaction of its rivals to price cuts.

measure of the HMO's price elasticity of demand (Waterson, 1984).[2]

An alternative measure of industry structure is the Herfindahl index, or the sum of squared market shares for all firms in the market. The Herfindahl index is an appropriate measure when the industry produces a standardized product with a single price, and when we can observe industry but not firm magnitudes. Since these conditions are not met in our data, the use of a Herfindahl index to measure competition was not pursued.[3]

Two factors suggest that competition in HMO markets may take on a special form that requires the inclusion of other structural variables in the premium equation. First, some evidence (Feldman et al., 1989) indicates that not all HMOs are equally close substitutes: Groups tend to compete with other groups for enrollees; individual practice associations (IPAs) may compete more directly with other IPAs and indemnity health insurers.[4] Thus, our empirical specification of the premium equation included interactions between the number of HMOs in the market and whether the observed HMO was a group or IPA.

Second, competition with HMOs of either type may be more likely in markets with higher "penetration," defined as the proportion of the total population enrolled in all HMOs. This special feature of HMO competition is derived from the fact that HMOs offer a product that is different from indemnity insurers. HMO policies typically are more generous than indemnity insurance, often covering more benefits and having lower coinsurance and deductibles. An HMO that competes with indemnity insurers can emphasize these non-price dimensions of its product rather than price. This type of competition is likely to be the predominant form of rivalry in markets with low HMO penetration. In such markets, an HMO has some latitude to pursue employers that offer only an indemnity plan. As HMO market penetration increases, the HMO has greater difficulty in avoiding other HMOs and must therefore restrain its prices when it presents proposals to employers. However, market penetration is not a sufficient condition for price-elastic firm demand; it should matter only when rivals are present. Because structural competition must be present in order for market penetration to affect the HMO's price elasticity, we included the interaction between competition and HMO market penetration in the premium regression.

We also hypothesized that the firm's price elasticity of demand is related to ownership (for-profit or non-profit status). Many consumers regard profit-seeking behavior as illegitimate (Hansmann, 1987), especially in the health care sector. If consumer disapproval is stronger when for-profit HMOs raise their prices, they will resist such attempts more than equal price increases by non-profit HMOs. Therefore, we hypothesized that for-profit HMOs would have more price-elastic demand and lower premiums than non-profit HMOs.[5] This effect could also be described as stronger "brand loyalty" for non-profit HMOs.

[2]The degree of substitution is defined $\partial P_j/\partial P_k$, i.e., the change in the price of one firm with respect to the price of another firm. Firms are equally close substitutes if $\partial P_j/\partial P_k$ is the same for all k HMOs in a local market.

[3]In addition to its theoretical weakness, the Herfindahl index has two empirical disadvantages compared with the number of HMOs: It has to be constructed from prorated HMO enrollment data; and, because it depends on HMO enrollment, it is more likely to be endogenous.

[4]Two basic HMO models are recognized in the literature: group HMOs and IPAs. Group HMOs are organized around multi-specialty physician group practices. Three variants of group HMOs have been described: staff HMOs, where most physicians are HMO employees; group HMOs, where the HMO contracts with a single physician group; and network HMOs, which contract with a number of physician groups (Wholey and Burns, 1993). In an IPA, the HMO contracts predominantly with independent physicians.

[5]We did not have direct evidence that individual patients know the ownership of their HMO. However, most HMO coverage is offered through employer groups, and the employer's health benefits manager is likely to know if the HMO is for-profit or non-profit. Our empirical findings (Wholey, Feldman, and Christianson, 1995a) supported the argument that for-profit HMOs charge lower premiums, controlling for many of the factors suggested as causing for-profit firms to be more efficient.

Variables Related to the Market Premium Elasticity of Demand (X_i)

The market premium elasticity of demand is defined as the percentage change in demand for all HMOs if they all raise premiums by 1 percent. We hypothesized that the market premium elasticity of demand is related to two observed variables. First, per capita income in the local market area should affect the pricing decisions of all HMOs because the demand for all health insurance products is expected to be less elastic in high-income markets.[6] The second variable related to the market premium elasticity of demand is hospital utilization per capita in the market area. Hospital utilization may be viewed as a measure of resource-intensive medical practice style in a community. This interpretation is consistent with recent work on HMO entry by Wholey, Christianson, and Sanchez (1993), who argued that consumers generally do not want HMOs to restrict their utilization of hospitals.[7] They found that high hospital utilization had a negative effect on the formation of HMOs. This effect is hypothesized to operate through reduced demand for HMO services and greater resistance by consumers to HMOs' attempts to raise premiums.

Variables Related to the Competitive Reaction (X_r)

An HMO's belief about how other HMOs will react to its pricing decisions is likely to be affected by variables that influence the ability of organizations to collude. Typically, collusion is facilitated in markets with homogeneous products because firms in those markets can more easily monitor one another and detect cheating by other firms (Carlton and Perloff, 1990). In contrast, product differentiation increases the difficulty of enforcing collusive agreements. Our measure of product differentiation was a dummy variable equal to 1 if the HMO offers an open-ended product.[8] We hypothesized that it would be more difficult for HMOs to coordinate their pricing policies if they offer open-ended products as well as traditional plans.

We also expected that collusion would be more difficult in markets where consumers are actively engaged in monitoring HMOs. The presence of coalitions initiated or sponsored by employers and having as one of their goals containing health care costs by promoting price competition is one such monitoring device (Mullner, Young, and Andersen, 1988; McLaughlin, Zellers, and Brown, 1989). Therefore, the number of such health care coalitions in the State was hypothesized to decrease the ability of firms to coordinate their premiums.

Finally, the probability of collusion may be affected by whether the State has a rate approval process for HMO premiums. Rate approval in some industries is intended to protect consumers from high prices (Harrington, 1985). However, in the HMO industry, rate approval is more likely to restrain HMOs from charging too low a price, thereby increasing the risk of failure and causing "hardships" to consumers.[9] Since the outcome of rate approval is uncertain, we included it in the premium equation without a hypothesis regarding its effect on premiums.

[6]The demand for insurance products may be quite strong in high-income markets, but the responsiveness of demand to premiums is hypothesized to be low. This will lead HMOs to charge high premiums in these markets.

[7]Dowd et al. (1996), in a study of health insurance choices by employees of large city and county governments, also found a strong preference for "non-managed care." Group HMOs can survive against this preference because they offer lower premiums and more complete coverage (e.g., lower out-of-pocket cost sharing).

[8]Consumers in open-ended HMOs may receive services from providers outside the HMO's network without prior authorization. Enrollees who go "out-of-network" must pay an additional deductible and copayment.

[9]Most States also regulate HMO solvency directly, through working capital and deposit-of-revenue requirements (Christianson, Wholey, and Sanchez, 1991). In this study, we are concerned with State approval of HMO premium rates.

Variables Related to HMO Marginal Cost (X_{mc})

Marginal cost was measured by an extensive list of variables, including costs due to selection advantages, input prices, bargaining power, and production economies. "Selection advantages" refers to an HMO's ability to attract individuals with lower-than-average health care expenditures. Hellinger (1995) finds that all health plans that restrict an enrollee's choice of providers, including group and IPA-model HMOs, enjoy favorable selection advantages among both the non-elderly and elderly populations. We hypothesized that HMOs would have the greatest selection advantages in communities where HMO market penetration is low. In those communities they would attract low-risk enrollees who are willing to accept the HMO's restricted provider networks and controls on medical care utilization in exchange for lower premiums. As market penetration increases, HMO enrollees would more closely resemble the average level of risk in the community. Therefore, HMO premiums should increase as a function of market penetration.

HMO costs should be higher in markets with higher health care costs. Our measure of health care costs in the community is the average Medicare Part A expense per beneficiary.[10] Another possible measure of health care costs is the medical care component of the Consumer Price Index (CPI), but this is available only for selected metropolitan areas, so we did not pursue this measure.

We expected that HMO marginal costs would be lower in communities where HMOs have a strong bargaining position relative to providers (Melnick et al., 1992). This should occur: (1) when HMO market penetration is high, because providers depend on the HMOs for access to patients; (2) when there is a large number of physicians per capita, because physicians compete among themselves for access to HMO enrollees (Wholey, Christianson, and Sanchez, 1993); and (3) when hospital occupancy is low, because hospitals will be more willing to discount their services to gain HMO patients. The price-decreasing effect of market penetration on bargaining power works against the price-increasing effect of vanishing selection advantages. HMO production economies were measured by a variety of HMO characteristics and market population density. Potentially the most important HMO characteristic affecting production economies is HMO type. Research suggests that groups and IPAs utilize fundamentally different methods to organize their provider networks. Physicians in groups often receive most of their income from the HMO, for example, whereas IPA physicians tend to receive about one-third of their income from the HMO (Welch, 1987). It is also suggested that IPAs are easier to establish because they do not require the creation of a medical group or a large investment in physical capital (Christianson et al., 1991). Finally, there is some evidence that groups benefit more from scale economies than do IPAs (Wholey, Feldman, and Christianson, 1995b). To account for different production technologies between groups and IPAs, we included a dummy variable in the premium equation for IPAs, as well as interactions between IPAs and certain independent variables. Because some research suggests that networks are more efficient than groups and staff-model HMOs are less efficient

[10]This measure incorporates the effect of both utilization rates and input prices on HMO costs. However, the direct measure of hospital utilization, discussed earlier, holds constant the effect of utilization rates. Thus, Medicare expenses per beneficiary isolates the cost-increasing effect of high input prices on HMO premiums.

(Group Health Association of America, 1993), we also included indicator variables for networks and staff-model HMOs, relative to groups.

Three other HMO organizational characteristics were measured by dummy variables. First, HMOs affiliated with national firms may have access to national capital markets enabling them to obtain capital at lower cost than local HMOs. National affiliation may also be a source of management expertise. We included dummy variables for HMOs affiliated with a national HMO firm (e.g., Kaiser) and for HMOs affiliated with other types of firms (e.g., commercial insurers such as Aetna or HMO management firms). The omitted category was locally owned HMOs. Second, HMOs affiliated with Blue Cross and Blue Shield (BC/BS) plans were predicted to have higher costs than other HMOs.[11] Third, Federal qualification may raise an HMO's costs because federally qualified plans are subject to stringent reporting and financial requirements, and there are restrictions on how they can set premiums.

HMO enrollment characteristics and hospital utilization may affect marginal costs. We expected that HMOs with high proportions of Medicaid enrollees or high inpatient utilization, measured by hospital days per 1,000 members, would have higher costs. HMOs that used cost-sharing for covered services were hypothesized to have lower costs, and hence, lower premiums. Cost-sharing was measured by the dollar value of copayment revenue per member-month. Finally, we expected that higher population density would reduce marginal costs because it reduces the geographic coverage needed to attract enrollees.

[11]Blue Cross's main product line, FFS insurance, is characterized by large, geographically-dispersed provider networks. To the extent that this feature carries over into its prepaid product lines, HMOs organized by Blue Cross may be more expensive than other HMOs.

Extension to HMO Mergers and Failures

In this study we extend the basic model to include horizontal HMO mergers and HMO failures. The rationale for including the effects of mergers on HMO premiums will be discussed first, followed by a discussion of the hypothesized effects of HMO failures.

Horizontal mergers involve the combination of two or more firms that produce similar goods or services. Discussions of horizontal mergers typically focus on possible economies of scale that can be achieved through expanded firm operations (Dranove and Shanley, 1995). "Economies of scale" refers to the reduction in average costs as output expands. The consolidation of administrative services (payroll, personnel, and purchasing), physical location, and technology (machinery or computing facilities, for example) are all possible bases of expansion economies. If HMO mergers are a source of economies of scale, lower average costs could be reflected in lower premiums for consumers.

"Economies of promotion" provide another strategic rationale for horizontal mergers (Scherer and Ross, 1990). Economies of promotion derive from the effects of firm actions on consumption rather than production. By combining under a single owner, sellers can reduce informational problems for consumers by offering standardized prices and quality. Dranove and Shanley (1995) found that system hospitals enjoy reputation benefits over similar non-system hospitals. In the HMO industry, Given (1995) suggests that purchasers of HMO services perceive expanded provider networks and geographic breadth of HMO operations as indicators of superior quality. Large HMOs are better able to serve large corporations and regional purchasing alliances with geographically dispersed operations.

The potential anti-competitive effects of horizontal mergers are associated with concentrated markets. Anti-competitive effects can evolve when the merged firm is able to obtain monopoly power in the relevant market. Economic theory predicts that the merged firm will then reduce output, raise prices, and procure monopoly profits.

When prices both prior to and following a merger are observable, the effects of the merger on competition in the affected markets can be determined. Airline merger studies (Borenstein, 1990; Kim and Singal, 1993) analyze fare increases on routes affected by the merger for evidence of anti-competitive market power. Airfares on non-affected routes were used as a control group. Kim and Singal (1993) find that relative fares increased by about 10 per cent for affected routes, and reject the hypothesis that the fare hike reflects increased quality of service. Our study uses a similar methodology, with premiums observed before and after a merger, compared with premiums for a control group of HMOs that did not merge over the same time period. In implementing this methodology, we control for selectivity bias among the HMOs that were involved in mergers. "Selectivity bias" refers to the possibility that firms involved in mergers may have unmeasured characteristics that are related both to mergers and to premiums. For example, suppose that exceptionally efficient HMOs always are on the lookout for merger partners to whom they can transfer their efficiency in the form of lower costs and premiums. To the extent that "exceptional efficiency" is not measured by variables included in the estimated premium equation, we would incorrectly attribute low post-merger premiums for such HMOs to the fact that they merged, whereas low premiums and mergers were both caused by the omitted factors that affect efficiency. In contrast, selectivity bias could be associated with higher premiums if merger-minded HMOs were primarily in search of markets to extend their monopoly power.

To control for selectivity bias in the estimated premium equation, we included an indicator variable that equals 1 if the HMO merged and survived in the following year. The coefficient of this variable will be negative if unmeasured factors associated with mergers also are associated with efficiency, as in the first example. The coefficient will be positive if the second example (HMOs extending their monopolies) is more widespread. Another indicator was set equal to 1 if the HMO merged and disappeared in the following year. This variable controls for unmeasured factors related to premiums and mergers in which the HMO lost its separate identity. Specific definitions for "merge and survive" and "merge and disappear" are given in the following section.

To control for merger effects that may take some time to appear, we included three indicator variables in the equation: These variables each equal 1 if the HMO merged and survived last year (i.e., 1 year prior to this observation), 2 years ago, or 3 or more years ago. The rationale for these variables is derived from the dynamics of mergers. Feldman and Murata (1991), for example, note that making a merger work requires integrating corporate structures, management styles, employee expectations, and policies. These internal issues, which divert energy and attention from productivity, usually take longer to resolve than expected and may threaten the success of the merger. If this example is generally true, it would mean that merger effects are likely to be cost-increasing for at least a year or two before any long-run savings are generated. Assuming that increased costs are reflected in higher prices (as implied by the profit-maximizing model), the result would be higher short-run premiums for consumers.

A counter-example would rely on the following argument. Mergers may occur because HMOs hope to increase market share. This may lead them to be over-confident in submitting proposals to employers immediately following the merger.[12] If this is the case, the merger's immediate effect on premiums will be negative, followed by a return to normal premiums in the long run.

We also control for the possibility that merger effects may differ according to the degree of competition in the market at the time of the merger. Because mergers remove one or more competitors from the market, they tend to decrease the price elasticity of demand for the merged firm, which should increase its premium. This effect should be less noticeable in markets where there are many competitors and more noticeable where there are few competitors. In the extreme case, a merger may create a monopolistic market structure. To control for these interactions, we multiplied the merger indicator variables by another indicator which equals 1 if the merger occurred in the top quartile of markets ranked by the number of competitors. In our previous study (Wholey, Feldman, and Christianson, 1995a), we found the lowest HMO premiums from 1988 to 1991 in this market structure quartile. We extend this model with the hypothesis that the interaction between mergers and competitive market structure has a negative effect on premiums.

Finally, we controlled for selectivity bias related to HMO failures. HMOs that are going to fail may have low premiums for a variety of reasons: they are engaged in a desperate attempt to gain or retain market share; they are located in markets which, for unobserved reasons, are exceptionally competitive; and they simply may have bad management. It is also likely that failing HMOs have poor-quality service which is directly observable by patients, but poor quality may not be associated with lower premiums.

To control for selectivity bias related to failure, we included an indicator variable in the premium equation which equals 1 if the HMO failed in the following year. We considered but rejected the idea of including indicators for HMOs that would fail more than 1 year in the future. We hypothesized that failing HMOs are caught in a downward spiral of performance, with premiums falling as the time of failure approaches. According to this hypothesis, the greatest effect of selection bias on premiums should be seen in the year immediately before failure.

DATA AND MEASURES

HMOs are the unit of analysis in this study, with the data base consisting of HMOs operating in the United States from 1985 to 1993. The study pertains to all HMOs, except those specializing in serving Medicaid enrollees. The remaining HMOs all have private, under-65 enrollment and they may offer Medicaid and Medicare contracts (Federal regulations require the HMO to have private enrollees before it can have a Medicare contract).

Four types of data were required to create the analysis file used by this study: HMO financial data; HMO characteristics, including mergers; market characteristics; and regulatory characteristics.

HMO financial data come from annual statements filed by HMOs with State regulators. These statements are used by both Federal and State regulators to monitor and assess the performance of HMOs (Wholey, Christianson, and Sanchez, 1992). Health Care Investment Analysts of Baltimore, MD, obtains these filings, codes

[12] In the trade jargon, HMO mergers may be followed by "lowball" premium proposals that are not sustainable in the long run.

the data, and sells it in machine readable format. The dependent variable in our model, private premium revenue per member month, is calculated by dividing annual premium revenue for private enrollees (total premiums minus Medicare and Medicaid premiums) by private member months of coverage. Public premiums and enrollments were removed from the data because HMOs face different market conditions and most likely follow different pricing strategies in public markets. However, we include a variable for the proportion of Medicare enrollment to control for possible errors in comingling Medicare and under-65 premium data. We also include the proportion of Medicaid enrollment to determine if participation in the Medicaid program has the potential to affect private premiums.[13]

Data from the annual HMO Census conducted by InterStudy and published in *InterStudy Competitive Edge* are used to define the merger indicator variables in our model.[14] The HMO Census provides the location of each HMO in the United States and its founding year, model type, enrollment, and various other information including Federal qualification. We used this information to define a "market area" for each HMO as the metropolitan statistical areas (MSAs) or counties in which the HMO operated in each year.[15]

When two HMOs merge, InterStudy reports that "HMO X has merged into HMO Y." We used this information to create the dependent variable for our analysis. If the market areas for HMOs X and Y overlapped, we coded HMO X as "merged and disappeared" and HMO Y was coded as "merged and survived." Multiple HMOs may be involved in a merger, yet only one was coded as surviving. The HMOs that merged and disappeared were removed from the data set in subsequent years.

The mergers reported by InterStudy were screened to exclude several related events that occurred in the data. First, HMOs operated by the same firm in different market areas (usually in the same State) may combine their data in reporting to the InterStudy Census. Second, HMOs owned by the same firm in the same market area may formally consolidate their operations. Third, consolidations may occur among national firms that operate HMOs in different markets.[16] We did not consider these events to be mergers and instead coded those HMOs as experiencing "no event." In other words, our definition of an HMO merger is limited to cases where two or more HMOs, operated by different owners in the same market, merge into a single HMO under the same owner.

These related events are not counted as mergers because they do not change the environment facing HMOs in local markets. The first event is a change in reporting status only. In fact, in several instances of joint reporting to the InterStudy survey, HMOs "unmerged" their data and resumed separate reporting in subsequent years. Consolidation of HMOs operated by the same firm within a local market will reduce the reported number of HMOs. However, the owner can maximize profits by coordinating the pricing strategies of its

[13]Medicaid was a new line of business for most HMOs during the period of our study. It is possible that HMOs may have subsidized entry into Medicaid by temporarily increasing private premiums.

[14]See Feldman, Wholey, and Christianson (1995) for details of this definition.

[15]Through 1991, the InterStudy Census reported only the MSA where the HMO was headquartered. We supplemented this information with special reports prepared by InterStudy in the mid-1980s on all MSAs where the HMO operated (see Christianson et al., 1991, for a description of these sources) and with the Group Health Association of America (GHAA) *Directory of Health Maintenance Organizations* for 1989 through 1993. GHAA, and InterStudy since 1991, lists all counties where an HMO claims to operate. We used these lists of counties to code an HMO's operating locations since 1989.

[16]Six of these events occurred in 1992, which is the largest number recorded since 1988, when there were seven consolidations among HMOs owned by different national firms. The 1992 data suggest that the HMO industry is moving toward consolidation at the regional level.

HMOs in the same market, whether or not they are separate legal entities (Feldman, 1994). Thus, this type of consolidation does not reduce the level of competition. Finally, events of the third type, which occur as a byproduct of a national consolidation, do not change the level of competition in local markets. Therefore, they are not treated as mergers in this study. Our view is that mergers can occur only in those markets where HMOs compete for enrollment.

The HMO Census also records plans that terminated their operations. We presumed that an HMO failed if it was terminated, or if it was not listed in the Census after a given year and could not be identified as changing its name, merged, or acquired. A failed HMO is removed from the data set in subsequent years. Finally, all plans that did not merge or fail, as defined above, were coded as experiencing no event. Each operational HMO, therefore, is placed into one of four mutually exclusive categories: (1) it merged and survived; (2) it merged and disappeared; (3) it failed; or (4) it experienced no event.

Data on HMO affiliation come from the GHAA *Directory of Health Maintenance Organizations*. Affiliations are coded with national HMO firms (e.g., Kaiser), with other types of national firms (e.g., commercial insurers such as Aetna or HMO management companies), and with Blue Cross/Blue Shield.

Market characteristics (e.g., income per capita) are calculated for each HMO through a process consisting of several steps.[17] In the first step, the InterStudy Census and the GHAA Directories are used to define the population of HMOs. In the second step, enrollment is prorated over all counties served by the HMO. Third, a weighted average is calculated, using the proportions of the HMO's total enrollment in each county as weights. The Area Resource File (ARF) is the source for the following market characteristics: physicians per capita, hospital occupancy, Medicare Part A expenditures per beneficiary, community hospital admissions per capita, income per capita, and population density. The HMO Census is the source of HMO "penetration" (the proportion of the total market population enrolled in all HMOs), and the number of competing HMOs.[18]

The measure of HMO rate approval was constructed from Aspen Systems Corporation's listings of State HMO regulations (1985-1993). We used an indicator variable for whether HMO rate approval is required (0 = no; 1 = yes). When there was no explicit State requirement for HMO rate approval, the rate approval variable was set to zero and a binary variable was entered (0 = rate approval not missing; 1 = rate approval missing).[19]

METHODOLOGICAL ISSUES

A variety of methodological issues arise in estimating the premium model. First, the presence of unobserved HMO, employer, or market effects may cause auto-correlated errors, which could lead to inefficient estimates. We control for temporal auto-correlation by including indicator variables for each year, with 1985 being the omitted year. The Durbin-Watson statistic indicated that spatial auto-correlation was present, probably because of unobserved regional differences in health care costs.

[17]See Wholey, Feldman, and Christianson (1995a) for details of these calculations.

[18]HMO market penetration required an additional step to calculate because a county-level measure of market penetration does not exist independently in the data. We created county HMO penetration by dividing total HMO enrollment in the county by its population. This variable was then treated like other county-level measures in calculating penetration for each HMO over all the counties it serves.

[19]There are States where no regulations are present. This sometimes occurs when HMOs first enter a State and also occurs in Hawaii, Oregon, and Wisconsin, which have not enacted specific HMO statutes. We avoid losing these cases by setting RATE APPROVAL MISSING equal to 1 for them and setting the regulatory variable equal to zero.

We corrected for auto-correlation by sorting the cases so that HMOs operating in similar States were adjacent in the data and then obtaining Prais-Winsten (1954) estimates for a first-order auto-regressive process (within States, we also sorted on HMO and year so that multiple observations on the same HMO were adjacent).[20]

To make most efficient use of the data across HMOs, we also estimated a fixed-effects model. This model assumes that individual HMOs have time-invariant and unobservable characteristics that affect premiums. As pointed out by Hsiao (1986), the fixed-effects model is appropriate if we want to assess differences among specific observations (HMOs).

Second, heteroskedasticity is likely to be present. (The variance of the error term in the econometric study is not constant.) Premiums per member month are total premiums divided by total member months. Because average costs, and therefore premiums, in small HMOs are likely to be more influenced by outlier cases (e.g., an extremely costly employee group), the variance in premiums is likely to be greater for smaller HMOs. As HMO size increases, variance should decrease because the HMO can average out costly groups and is less likely to have an unusually healthy set of customers. Since the Breusch-Pagan test (1979) indicated that this problem was present, we used White's (1980) correction for heteroskedasticity.

Third, multi-collinearity may lead to unstable estimates and/or inefficient estimators. We added the potentially collinear variables to the model singly and together to check the stability of the estimates. There was no instability in the fully specified model with pooled cross-sections and time-series.

Fourth, data on the dependent variable are missing because some HMOs did not provide data or provided extreme information. We removed all observations with negative or questionable (less than $25) premiums per member-month. Next, we removed all cases with premiums more than three standard deviations from the mean of the remaining data.[21]

Fifth, the premium data may be unreliable in the year that a merger or failure occurs. For example, an HMO that failed may list zero revenue on its last statement. Because there is no clear-cut solution to this problem, we used the previous year's annual statement for all HMOs. This is the last "clean" filing for HMOs that experienced an event, and it represents a comparable time period for HMOs that experienced no event. The financial data were coded as missing in the year an event occurred.[22]

Sixth, endogeneity may be a problem, especially for HMO market penetration. That is, penetration may be high because premiums are low. This would bias the estimated coefficient of market penetration in the premium regression. Therefore, we used an instrumental variable approach to construct predicted county penetration. A county-level file was constructed, and average HMO characteristics by county (e.g., average federally qualified) were used to estimate a model of county HMO penetration. The model also included indicator variables for State. Predicted county penetration rates were then used in all subsequent calculations and in the estimated premium regression.

[20]The Prais-Winsten estimator retains all the observations on each HMO. In our data set, where the time series is fairly short, this imparts an efficiency advantage over other methods of estimating the auto-correlation coefficient (Greene, 1993).

[21]In our previous work (Wholey, Feldman, and Christianson, 1995a), we tested for possible response bias by estimating a probit response equation for whether the premium was reported and including the Inverse Mills Ratio, $\lambda = \phi(z)/\Phi(z)$, where z is the predicted value from the probit response equation, in the premium equation. This test failed to show significant response bias, so it was not pursued in the current study.

[22]For example, an HMO that merged and survived in 1988 will have "clean" financial data for 1987. In 1989, the HMO is still operating but the lagged 1988 data are coded as missing.

Last, while our hypotheses predict effects due to competition, market penetration, and the interaction of competition and penetration, we are uncertain about the exact functional specification for these effects. Since other research suggests that competitive effects may be non-linear (Jackson, 1992; Berger and Hannan, 1992), we created 15 dummy variables for group HMOs. Each dummy variable represents a particular quartile of competition and a quartile of predicted market penetration, with the lowest quartile of both measures serving as the omitted category. Fifteen similar variables were constructed for IPAs. The overall IPA dummy variable identifies IPAs in the lowest quartiles of competition and penetration.

RESULTS

Table 1 defines the variables used in the premium model, and Tables 2-4 provide descriptive statistics on the merger indicator variables and HMO and market characteristics. Fifty HMOs were observed to merge and survive, of which 10 were located in the least-competitive markets as measured by the lowest quartile of competition. The total number of events shown in the last column of Table 2 is significantly less than the actual number of mergers and failures that occurred from 1985 to 1993.[23] Loss of observations is due primarily to deletion of observations in the year that an event occurred. As mentioned earlier, the financial data are not reliable in that year. Because many HMOs that failed were in operation for only 1 year, the number of failures in the premium regressions is especially reduced, from 151 to 78.

Table 3 shows the average number of competing HMOs (of both types) and average enrollment for group HMOs, by quartile of competition. Groups in more competitive markets were substantially larger than those in less competitive markets. As expected, markets with more competitors had higher HMO market penetration. Per capita income also is correlated with HMO market competition. Table 4 presents the same information for IPAs. Average IPA enrollment is smaller than group enrollment, and it appears to be less sensitive to the degree of competition. We find the same relations between competition, higher market penetration, and higher income for IPAs.

Table 5 presents the regression of the natural logarithm of premiums per member month on the linear independent variables.[24] The fit of this equation is relatively good, with an adjusted *R*-square of .589. We do not find evidence that HMO mergers affect premiums, except in the most competitive markets. One year after a merger, HMOs in the most competitive markets (denoted by COMPETITIVE*MERGED 1) raise premiums by 14 percent, on average.[25] The reference group for this comparison is HMOs that experienced no event. After the first year, however, premiums return to their prior level, other things equal. There is no evidence of long-run savings resulting from the merger (i.e., the coefficients of COMPETITIVE*MERGED 2 and COMPETITIVE*MERGED 3+ are not statistically significant).

In regard to selectivity bias, we find two significant results that both apply to the most competitive markets. First, HMOs that failed in the most competitive markets had low premiums 1 year before failure, as shown by the negative coefficient of COMPETITIVE*WILL FAIL in Table 5. The size of this effect is about -9 percent. This find-

[23]The actual numbers are: 75 HMOs merged and survived; 83 HMOs merged and disappeared; and 151 HMOs failed.

[24]Missing values of the following variables were set equal to 0: open-ended product, rate approval, HMO hospital days, copayments, and proportion Medicaid enrollment. Indicator variables were set equal to 1 for each missing value and 0 otherwise. The coefficients of the missing-value indicators are not reported.

[25]Percentage effects of dummy variables on premiums are obtained by using Kennedy's (1981) correction.

Table 1

Variables in the Premium Model

Variable Name	Description
Firm Elasticity Variables	
Group Market C/P	Market Competition and HMO Penetration Quartiles for Groups
IPA Market C/P	Market Competition and HMO Penetration Quartiles for IPAs
For-Profit	For-Profit HMO
Market Elasticity Variables	
Per Capita Income	Per Capita Income (Thousands of Dollars)
Hospital Utilization	Hospital Admissions per 1,000 Population
Competitive Reactions	
Open-Ended	HMO Offers Open-Ended Product
Rate Approval	State Has HMO Rate Approval
Rate Approval Missing	Rate Approval Information Missing
Coalitions	Number of Health Care Coalitions in State
Marginal Cost Variables	
Medicare Part A	Medicare Part A Expenses per Beneficiary (Thousands of Dollars)
HMO Market Penetration	Predicted HMO Market Penetration
Docs per Capita	Physicians per 1,000 Population
Hospital Occupancy	Hospital Occupancy Rate
Population Density	Population Density (10,000 per Square Mile)
IPA	IPA-Model HMO
Network	Network or Mixed-Model HMO
Group	Group-Model HMO
National HMO	National Affiliation-HMO
Other National*Year	National Affiliation-Other Interacted With Year
Blue Cross	Blue Cross Affiliation
Federally Qualified	Federally Qualified HMO
Federally Qualified IPA	Federally Qualified IPA
HMO Hospital Days	HMO Hospital Days per 1,000 Enrollees
Copayment	HMO Copayment (Dollars per Member Month)
Medicare Enrollment	Proportion of Enrollment in Medicare
Medicaid Enrollment	Proportion of Enrollment in Medicaid
Time Trend	
1986-1993	Indicators for 1986-93 Relative to 1985
Merger and Failure Variables, Main Effects	
Will Merge	HMO Will Merge and Survive Next Year
Will Exit	HMO Will Merge and Disappear Next Year
Will Fail	HMO Will Fail Next Year
Merged Last Year	HMO Merged-Survived Last Year
Merged 2 Years Ago	HMO Merged-Survived 2 Years Ago
Merged 3+ Years Ago	HMO Merged-Survived 3 or More Years Ago
Merger and Failure Variables, Interactions	
Competitive*Will Merge	HMO Will Merge and Survive Next Year in Competitive Market
Competitive*Will Exit	HMO Will Merge and Disappear Next Year in Competitive Market
Competitive*Will Fail	HMO Will Fail Next Year in Competitive Market
Competitive*Merged 1	HMO Merged-Survived Last Year in Competitive Market
Competitive*Merged 2	HMO Merged-Survived 2 Years Ago in Competitive Market
Competitive*Merged 3+	HMO Merged-Survived 3 or More Years Ago in Competitive Market

NOTES: HMO is health maintenance organization. IPA is individual practice association.

SOURCE: Research by Feldman, R., Wholey, D., and Christianson, J. for this article, 1996.

ing supports our interpretation that some HMOs in the most competitive markets are not able to charge enough to cover their costs. Second, HMOs that exited from the most competitive markets by mergers had high premiums 1 year before the merger (the coefficient of COMPETITIVE*WILL EXIT is 0.11996 and it is statistically significant at $p = .028$). These HMOs may have been pricing too high for their markets because they did not have scale economies. But, unlike the HMOs that failed, they appear to have potential value as merger partners. Other than these

Table 2

Count of HMO Mergers and Failures, by Quartile of Competition

Merger Variables	Total	Competition Quartile			
		Bottom	Low	Moderate	High
Will Merge	50	10	10	16	14
Will Exit	50	10	10	16	14
Will Fail	78	27	20	15	16
Merged Last Year	51	15	6	14	16
Merged 2 Years Ago	43	11	6	12	14
Merged 3+ Years Ago	46	12	7	12	15

SOURCE: Research by Feldman, R., Wholey, D., and Christianson, J. for this article, 1996.

two results, we do not find selectivity bias prior to the merger.

Most of the "control" variables have effects similar to those found by Wholey, Feldman, and Christianson (1995a). In particular, HMOs located in the most competitive markets are likely to have the lowest premiums, other things equal. An example is the coefficient of -0.17257 on GROUP MARKET C4/P1, which stands for group HMOs located in the fourth (highest) quartile of competition and the first (lowest) quartile of HMO market penetration. These HMOs have premiums that are about 16 percent lower than those of the reference category (Group HMOs in the lowest quartiles of competition and market penetration). Another example is the coefficient of -0.10751 on IPA MARKET C4/P4, for IPAs located in the highest quartiles of competition and market penetration. In fact, of the seven market structure variables significant at the 10 percent level, five are in the most-competitive markets, and these effects are all negative.

An exception among the control variables is the effect of affiliation with a national firm (e.g., Aetna) on premiums. In our previous work, using data from 1988-1991, we found that national affiliation had a positive effect on premiums (Wholey, Feldman, and Christianson, 1995a). With a new data set covering 1985-93, the effect of national affiliation is positive only in 1990, as shown by the interaction variable labeled OTHER NATIONAL*90. By 1992 and 1993, national affiliation had a negative effect on premiums.

Because Table 5 indicates that most of the significant effects are found in highly competitive markets (i.e., those with many HMOs), we estimated another version of the model which utilizes a different definition of competitive market structure. The alternative definition relies on an ordinary least squares regression to predict the number of HMOs in the market. From this regression, we calculated the residual number of HMOs, defined as the actual number minus the number predicted by the regression. If the residual was negative, we set it equal to zero. Then we included the residual (zero or positive) in the premium regression. In other words, a competitive market by this definition is one with more HMOs than we would expect.

The coefficients of market structure variables in the premium regression for this alternative model are shown in Table 6. For the most part, the coefficients are similar to those in Table 5. The only detectable effect of mergers occurs in highly competitive markets, where HMOs that merged had higher premiums for 1 year (shown by the positive coefficient of RESIDUAL*MERGED 1). Selection bias is found for failing HMOs in competitive markets (RESIDUAL*WILL FAIL). However, there is no selection bias for HMOs that merged and exited from competitive markets.

The fixed-effects models were estimated for both definitions of market competition.

Table 3

HMO and Market Characteristics for Groups, by Quartile of Competition

HMO and Market Characteristics	Competition Quartile			
	Bottom	Low	Moderate	High
Number of HMOs	2.72	5.96	9.72	17.32
Average Enrollment (in Thousands)	41.5	80.9	99.5	191.5
HMO Market Penetration	0.10	0.14	0.17	0.18
Per Capita Income (in Thousands of Dollars)	15.27	16.85	19.16	20.62

NOTE: HMO is health maintenance organization.

SOURCE: Research by Feldman, R., Wholey, D., and Christianson, J. for this article, 1996.

In general, the results were similar to those reported in Tables 5 and 6. Defining competitive markets by the residual number of HMOs showed only one merger effect, as before: Premiums were higher for 1 year in the most-competitive markets. The fixed-effects version of Table 5 showed no significant merger effects, although the signs of the merger coefficients were similar.

Next, because the merger/failure indicators and the interaction variables were collinear, we estimated a "basic" version of the model that omitted all interactions between HMO mergers, failures, and market structure. We found only one significant main effect in this model—negative selection bias related to impending HMO failure (i.e., a negative coefficient on WILL FAIL). However, we caution against drawing inferences from this model, since the results do appear to depend on interactions with market structure.[26]

The last model we considered is one in which the merger effect is allowed to depend on the sizes of the HMOs involved. Most mergers that we analyzed involved two small HMOs (less than 50,000 enrollees). Such mergers are not likely to affect the degree of competition in local HMO markets. The second type of merger is the purchase of a small HMO by a large one.[27] This may represent a strategy for acquiring the smaller plan's provider network, rather than an attempt to monopolize the market. If this is the case, such mergers would have little effect on the larger firm's pricing strategy. The third type of merger, which occurred only eight times in the data, involves two large HMOs. Critics (Feldman, 1994) would expect premium increases to follow mergers of the third type.

Therefore, we estimated a model in which premiums charged by HMOs that survived large mergers (those where both HMOs had more than 50,000 enrollees) were contrasted to all other observations. This was done by setting dummy variables equal to 1.0 for HMOs that survived 1 year, 2 years, and 3 or more years after a large merger. None of these variables was statistically significant. This means that large mergers cannot be distinguished from other observations in our data.

CONCLUSIONS

In this study, we estimated a model of the effects of mergers on HMO premiums, using data on all operational non-Medicaid HMOs from 1985 to 1993. We did not find that mergers affect HMO premiums, except in the most competitive markets, and then only for 1 year. This finding should ease fears that HMO mergers lead to adverse effects on consumers in the form of higher premiums. However, we found no positive benefits of HMO mergers. This result suggests that economies of scale, which supposedly result from HMO mergers, are not

[26]The estimated coefficients from the "basic" model are not reported.

[27]The purchase of a large plan by a small one is quite rare. We did not try to predict the effects of this type of merger on premiums.

Table 4

HMO and Market Characteristics for IPAs, by Quartile of Competition

HMO and Market Characteristics	Competition Quartile			
	Bottom	Low	Moderate	High
Number of HMOs	2.89	5.81	9.69	16.32
Average Enrollment (in Thousands)	39.0	34.1	49.6	56.2
HMO Market Penetration	0.10	0.13	0.16	0.18
Per Capita Income (in Thousands of Dollars)	15.54	17.36	19.45	20.89

NOTE: HMO is health maintenance organization. IPA is individual practice association.

SOURCE: Research by Feldman, R., Wholey, D., and Christianson, J. for this article, 1996.

important or do not get passed on to consumers through lower premiums.

We discovered two forms of selectivity bias related to HMO events: HMOs that merged and exited from competitive markets had higher premiums 1 year before the merger; and HMOs that failed in competitive markets had lower premiums 1 year before the merger.

Our findings were robust with respect to a different definition of competitive markets—the residual number of HMOs in the market. They apply to large mergers as well as small mergers, although the number of large mergers in our data may be too small to draw reliable inferences. Finally, as in our earlier study (Wholey, Feldman, and Christianson, 1995a), we found that HMOs in more competitive markets had lower premiums. This may be the clearest policy implication of our research. Public officials should devote their efforts toward maintaining a competitive market structure, rather than addressing the possible impact of specific mergers, as long as the number of competitors remains high.

Our study is subject to the limitation that we analyzed historical data from 1985 to 1993. The time period studied is short, and few large HMO mergers occurred during this period. Should there be a wave of large mergers, or should the reasons for HMO mergers change after 1993, the results of a future analysis might be different. Also, although we controlled for a large number of variables and interactions, the health insurance marketplace is much more complex than other industries on which similar merger impact studies have been conducted. Other measures of market competition might be considered in future research on HMO mergers, for example. Nonetheless, we believe that our study is a useful step toward understanding the effects of market structure changes in this important industry.

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Table 5

Premium Regression[1]

Observations = 3,109
Mean of LHS = 4.4066
Adjusted R-squared = 0.589
F[85, 3023] = 533.32
Results Corrected for Heteroskedasticity
Breusch-Pagan Chi-Squared (D.F.) = 1338.76 (85)
Final Value of Rho = 0.48185
Durbin-Watson: Untransformed Residuals = 1.0363
Durbin-Watson for Transformed Residuals = 2.0353
Autocorrelation: Transformed Residuals = -0.01767

Variable	Coefficient	Standard Error	t-ratio	Probability
Constant	3.8752	0.09192	42.158	0.000
Merged Last Year	-0.015550	0.03152	-0.493	0.622
Merged 2 Years Ago	0.030314	0.03521	0.861	0.389
Merged 3+ Years Ago	-0.0050665	0.03179	-0.159	0.873
Will Merge	0.015720	0.03136	0.501	0.616
Will Exit	-0.041126	0.03013	-1.365	0.172
Will Fail	-0.020851	0.02302	-0.906	0.365
Competitive*Merged 1	0.13073	0.05538	2.361	0.018
Competitive*Merged 2	-0.065699	0.06084	-1.080	0.280
Competitive*Merged 3+	-0.035040	0.05729	-0.612	0.541
Competitive*Will Merge	0.068598	0.05312	1.291	0.197
Competitive*Will Exit	0.11996	0.05461	2.197	0.028
Competitive*Will Fail	-0.10445	0.04706	-2.219	0.026
Per Capita Income	0.0072889	0.002883	2.528	0.011
Hospital Utilization	-0.00032548	0.0002555	-1.274	0.203
Open-Ended	-0.045228	0.01111	-4.071	0.000
Coalitions	-0.00095216	0.001938	-0.491	0.623
Rate Approval	-0.0045939	0.02062	-0.223	0.824
Rate Approval Missing	0.064694	0.02607	2.482	0.013
Medicare Part A	0.15486	0.01937	7.995	0.000
HMO Market Penetration	0.48424	0.1946	2.488	0.013
Docs Per Capita	-0.0069364	0.01130	-0.614	0.539
Hospital Occupancy	-0.076836	0.07500	-1.025	0.306
Population Density	-0.035144	0.01747	-2.011	0.044
IPA	0.078186	0.03039	2.573	0.010
Network	0.038882	0.01938	2.006	0.045
Group	0.025819	0.02156	1.197	0.231
National HMO	0.021957	0.01299	1.691	0.091
Blue Cross	0.022426	0.01390	1.613	0.107
For-Profit	-0.048787	0.01132	-4.309	0.000
Federally Qualified	0.065753	0.01657	3.968	0.000
Federally Qualified IPA	-0.065493	0.02005	-3.267	0.001
Medicare Enrollment	0.035368	0.07427	0.476	0.634
Medicaid Enrollment	-0.00064140	0.0008376	-0.766	0.444
HMO Hospital Days	0.000019104	0.00001067	1.790	0.073
Copayment	0.0049958	0.003995	1.251	0.211
1986	-0.0013444	0.01785	-0.075	0.940
1987	-0.083767	0.06717	-1.247	0.212
1988	-0.030775	0.06741	-0.457	0.648
1989	0.091298	0.06792	1.344	0.179
1990	0.20323	0.06901	2.945	0.003
1991	0.31623	0.06858	4.611	0.000
1992	0.42347	0.06895	6.142	0.000
1993	0.47386	0.06899	6.868	0.000
Other National*86	-0.022346	0.02497	-0.895	0.371
Other National*87	-0.020943	0.02147	-0.975	0.329
Other National*88	-0.0030227	0.02163	-0.140	0.889
Other National*89	0.017619	0.02071	0.851	0.395
Other National*90	0.043300	0.01995	2.170	0.030
Other National*91	0.0035910	0.02160	0.166	0.868
Other National*92	-0.059149	0.02312	-2.559	0.011
Other National*93	-0.12290	0.02299	-5.346	0.000
Group Market C2/P1	0.0056593	0.02530	0.224	0.823
Group Market C3/P1	-0.037440	0.03282	-1.141	0.254
Group Market C4/P1	-0.17257	0.03594	-4.801	0.000

See notes at end of table.

Table 5—Continued

Premium Regression[1]

Variable	Coefficient	Standard Error	*t*-ratio	Probability
Group Market C1/P2	-0.0053237	0.03054	-0.174	0.862
Group Market C2/P2	-0.012477	0.02919	-0.427	0.669
Group Market C3/P2	-0.0072591	0.03005	-0.242	0.809
Group Market C4/P2	-0.13649	0.03469	-3.935	0.000
Group Market C1/P3	-0.082191	0.05662	-1.452	0.147
Group Market C2/P3	-0.062830	0.04140	-1.518	0.129
Group Market C3/P3	-0.030850	0.03461	-0.891	0.373
Group Market C4/P3	-0.079354	0.04092	-1.939	0.052
Group Market C1/P4	-0.098977	0.1718	-0.576	0.565
Group Market C2/P4	-0.077343	0.06654	-1.162	0.245
Group Market C3/P4	-0.068989	0.05080	-1.358	0.174
Group Market C4/P4	-0.027380	0.04891	-0.560	0.576
IPA Market C2/P1	0.032436	0.01894	1.713	0.087
IPA Market C3/P1	0.025410	0.02442	1.040	0.298
IPA Market C4/P1	-0.014136	0.03078	-0.459	0.646
IPA Market C1/P2	-0.060882	0.02662	-2.287	0.022
IPA Market C2/P2	-0.0044402	0.02445	-0.182	0.856
IPA Market C3/P2	0.021593	0.02508	0.861	0.389
IPA Market C4/P2	-0.055676	0.03060	-1.820	0.069
IPA Market C1/P3	-0.014687	0.04011	-0.366	0.714
IPA Market C2/P3	-0.016202	0.03290	-0.492	0.622
IPA Market C3/P3	-0.0021271	0.03186	-0.067	0.947
IPA Market C4/P3	-0.027324	0.03596	-0.760	0.447
IPA Market C1/P4	-0.22130	0.1701	-1.301	0.193
IPA Market C2/P4	-0.0092861	0.05520	-0.168	0.866
IPA Market C3/P4	-0.017429	0.04673	-0.373	0.709
IPA Market C4/P4	-0.10751	0.04687	-2.294	0.022

[1]Dependent variable is the natural logarithm of private premium per member month.

NOTES: HMO is health maintenance organization. IPA is individual practice association.

SOURCE: Research by Feldman, R., Wholey, D., and Christianson, J. for this article, 1996.

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Table 6

Premium Regression
Competitive Markets Defined by Residual Number of HMOs

Adjusted *R*-squared = 0.588

Variable	Coefficient	Standard Error	*t*-ratio	Probability
Merged Last Year	-0.0093700	0.03102	-0.302	0.763
Merged 2 years Ago	0.026914	0.03573	0.753	0.451
Merged 3+ Years Ago	0.0068361	0.03200	0.214	0.831
Will Merge	0.024520	0.03016	0.813	0.416
Will Exit	-0.018569	0.02985	-0.622	0.534
Will Fail	-0.024406	0.02287	-1.067	0.286
Residual*Merged 1	0.017803	0.008231	2.163	0.031
Residual*Merged 2	-0.0075332	0.009916	-0.760	0.447
Residual*Merged 3+	-0.0095033	0.009201	-1.033	0.302
Residual*Will Merge	0.0050908	0.007195	0.708	0.479
Residual*Will Exit	0.0058509	0.007318	0.799	0.424
Residual*Will Fail	-0.013220	0.006180	-2.139	0.032

NOTE: HMO is health maintenance organization.

SOURCE: Research by Feldman, R., Wholey, D., and Christianson, J. for this article, 1996.

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