Managed Care and Physician Incentives:
The Effects of Competition on the Cost and Quality of Care[*]

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Abstract: We analyze the effect that competition between HMOs has on the cost and quality of medical services. Our key result is that increasing competition *enhances* consumer utility while also *moderating* the impact of managed care on quality and costs. Indeed, we find that heightened competition between HMOs can cause an overall increase in care quality and costs. This result derives from an important, but overlooked, feature of the managed care market place. Plans differentiate themselves by the size and depth of their provider network. The resulting competition to attract physicians exerts a moderating effect on the incentive contracts HMOs write with providers.

Key Words: Managed care, physician incentives, product differentiation, norms.

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Introduction:

For most of the post World War II period in the United States, health insurance took the form of indemnity plans in which insurers simply paid the bills for services ordered by physicians. These traditional plans provided few incentives for cost-conscious medical decisions and, as a result, facilitated the steady rise in health care costs. Responding to this shortcoming of the indemnity model, private insurers began to "manage care" by exerting influence on the decisions made by physicians. Sometimes this influence took the form of bureaucratic rules, e.g. requiring physicians to seek administrative approval before proceeding with certain procedures. In other cases, financial incentives were used to shape physician behavior. By the mid 1990's, "managed care" had become the dominant form of private sector health insurance.[1]

The story of managed care in the United States is a story of hope and fear. Enthusiasts hope that managed care will control the growth of health care costs by giving providers appropriate incentives to reduce inefficiencies in the delivery of care. This perspective on managed care also plays an important role in past and present debates about the reform of Medicare and Medicaid. (Gold, 2003; Aaron and Reischauer, 1995). Critics in the popular press and elsewhere fear that asymmetric information between providers and consumers will lead to cost-control measures that severely degrade care quality. As an empirical matter, the effect of

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[1]   Ma and McGuire (2002) cite evidence that roughly 75% of the privately insured in the U.S. receive health care under some form of management by their health plan. See Fox (1997) and Robinson (1999) for institutional background on managed care.

managed care on the cost and quality of care has generally been more moderate than either its supporters or its opponents had predicted (Miller and Luft, 2002).[2]

Ironically, managed care enthusiasts and critics share the (often unstated) belief that competition magnifies the effects of managed care – whether for good or for ill. If competing plans have similar cost structures and offer homogeneous products, than competition for customers will require managed care organizations to employ high-powered, cost-containment incentives. If asymmetric information prevents consumers from directly observing the quality of care they receive, the successful plans, in the interest of keeping prices down, may deploy such stringent cost controls that the quality of medical care becomes unacceptably low.

To better understand the impact of managed care, we offer a theoretical analysis of the effect that competition between plans has on the cost and quality of care. The setting we model is that of a "typical" commercial health maintenance organization (HMO). The insurers in our model contract with independent physicians to provide medical services to their policyholders or members.[3] These contracts contain provisions that reward physicians who practice in a cost-

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[2]   The initial adoption of managed care methods in the commercial health insurance market place coincided with a slowing in the growth rate of insurance premiums, but recently costs have begun rising very rapidly again (Gold, 2003). A recent review of the literature finds that HMOs offer a quality of care roughly comparable to non-HMOs but at somewhat lower cost. HMOs appear to also reduce enrollee satisfaction and some types of access to care.   There is great heterogeneity across studies, however, particularly in regards to quality of care outcomes (Miller and Luft, 2002).

[3]   Independent practice HMOs like these comprise one of the largest segments of the managed care market, roughly 40 percent of total HMO enrollment in 1998 (InterStudy, 1999).

conscious manner. The HMO networks in our model are open to any provider willing to accept the contract terms and physicians can belong to multiple HMO networks.[4]

The main innovation of our analysis is the inclusion of two important, but largely overlooked features of managed care competition. First, we allow the HMOs in our model to compete by offering heterogeneous products. This product differentiation allows for avenues of competition other than price-cutting. Specifically, we assume that health care consumers, and hence the employers who purchase plans on their behalf, prefer plans that allow them to choose among a larger set of physicians. By extension, we posit that consumers will pay higher premiums to plans that offer larger physician networks. Competition among HMOs therefore occurs both on premiums *and* on the size of physician networks.

The role played by physician network size in differentiating HMOs' products leads to the second important feature of our model: in designing incentive plans, managed care organizations must consider not just the impact on costs but also the impact on doctors' decisions whether to join their networks. These considerations are necessarily influenced by the norms that physicians bring to the practice of medicine. Physicians care about the income they can earn, but they also care about the quality of care they deliver. They get utility from spending medical resources on their patients in both an absolute and a relative sense. In an absolute sense, physicians dislike spending less on a patient than they would if cost considerations were irrelevant. In a relative sense, physicians dislike using fewer resources on their patients than are

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[4]   A Commonwealth Fund survey of physicians in November of 1995 found that 87% of physicians have some managed care patients and most of these have contracts with multiple plans. The median number of contracts is five, although a quarter (26%) hold contracts with more than 10 plans (Collins, Schoen and Sandman, 1997).

employed by other physicians treating similar patients. These absolute and relative care norms pose a strategic dilemma for managed care organizations needing to assemble networks of providers. [5] HMOs that choose to compete as low price plans do so by writing high powered cost containment incentives into their physician contracts. These high powered incentives, however, are unattractive to a substantial portion of the physicians in the marketplace. Conversely, HMOs competing on the basis of their large physician networks will only be able to attract large numbers of physicians to their network by offering low-powered cost-containment incentives. This trade-off between network size and the power of incentives to cut costs determines how far managed care competition can go in reducing the cost of medical care.

The core insight from our model is that increasing competition *enhances* consumer utility while also *moderating* the impact of managed care on quality and costs. Indeed, we find that heightened competition between HMOs can cause a uniform *increase* in care quality and costs if physician relative care norms are sufficiently strong. This last finding is more intuitive than it might appear on the surface. If physicians are averse to providing lower quality care than is available elsewhere in the market, it will be hard for a low-price plan to operate with aggressive, cost-containment incentives. This countervailing force is intensified by competition because of increased product differentiation.

Our results suggest that there are good economic reasons for promoting competition between managed care plans. Contrary to the fears of the critics, competition between plans will

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[5] We use the term "norms" to highlight the fact that physicians derive utility directly from the delivery of appropriate medical care (in addition to the utility derived from the income generated by the provision of medical services). See Kandel and Lazear (1992) for a discussion of norm based decision making in economic transactions as well as March (1994) and Akerlof and

generally not accelerate a 'race to the bottom' in care quality. The hopes of those who championed managed care as a powerful force for containing health care costs are also likely to be disappointed. Instead, the primary beneficiaries of competition are consumers who enjoy a greater variety of plans along with lower average prices.

The plan of the paper is as follows. In the next section, we briefly review the empirical evidence concerning physician incentives in managed care. Section 3 presents the model and discusses its implications. We conclude by suggesting directions for future research.

2. Physician Incentives and Managed Care: At the core of our model are three assumptions about the ways physicians respond to the incentives used by managed care organizations to control costs: (1) physicians will respond to financial incentives by changing their practice style, (2) physicians' responses to financial incentives are shaped by absolute and relative care norms, and (3) HMOs take these norms into account when writing incentive contracts. In this section we summarize available evidence relating to these ideas.

Response to Incentives: A number of recent econometric studies suggest that the practice style of physicians is influenced by the explicit and implicit financial incentives under which they operate. Kessler and McClellan (1996), for example, find that reforms in state malpractice laws have an economically and statistically significant effect on patient expenditures for the treatment of heart disease. Barro and Beaulieu (2000) study the effect of a switch from fixed salary to profit sharing at a set of physician practices owned by a hospital chain. They find that the introduction of a performance-based pay plan increased profitability significantly, primarily

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Kranton (2000).

because physicians increased the number of patients they saw.[6] Barro and Beaulieu's study looked at compensation practices in a fee for service setting. In contrast, Gaynor, Rebitzer and Taylor (2003) examine the effect of cost-containment incentives within the type of HMO network we model. After examining incentive contracts and costs, the central finding was that in this HMO costs were most reduced when the incentives to cut costs were the greatest. The common conclusion of these studies, as well as in Robinson's review of the medical literature (2001), is that physicians' choice of practice style *does* respond to financial incentives.[7]

Incentives and Physician Care Norms: In making the case for the importance of physician care norms in the analysis of incentives, we rely on both direct and indirect evidence. Direct evidence that physicians experience disutility when incentives are perceived to influence the level of care quality comes from a survey of physician attitudes published in the <u>New England Journal of Medicine</u>. This paper states: "Our findings suggest that bonuses based on limitation of referrals and on productivity heighten physicians' 'performance anxiety' and their perceptions that care may be compromised in these areas…" (Grumbach et.al. 1998; p. 1520).   The same study also reports that when physicians perceive pressure to limit referrals or improve productivity in ways that compromise care, their satisfaction with their practice declines.

Where one might interpret the preceding survey results as indicating the presence of *absolute* care norms, there is also indirect evidence suggesting the importance of *relative* practice

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[6]   Barro and Beaulieu also found that the terms of incentive contracts can influence a physician's decision to affiliate with a plan or practice. If incentive arrangements influence physicians' exit and entry patterns, then HMOs need to take preferences regarding incentives into account when constructing physician networks.

[7]   Robinson (2001) reaches a similar conclusion based on his review of the medical literature.

norms. It is well established that physicians' practice styles have a local flavor and that care for

similar patients varies in persistent and meaningful ways from one location to another.[8] The

source of these "small area variations" remains mysterious -- they are not accounted for by

variations in underlying clinical conditions, cost of treatment, or patient incomes. Some analysts

have suggested that these geographic practice patterns are the result of physicians learning by

observing the practice style and clinical decisions of other physicians in the vicinity (Phelps,

1992). In other words, physicians' norms for acceptable practices are not necessarily based on

some absolute external standard, but instead are determined endogenously by the practices of

other physicians in the area. To the extent that physicians are responsive to financial incentives,

this implies that the efficacy of one HMO's incentive plan will depend on the incentive plans

being used by other HMOs in the area.

Another piece of evidence supporting the existence of physician norms, as well as HMOs'

sensitivity to these norms, comes from studying the incentive contracts HMOs offer their

physicians. If physicians dislike incentives that force them to compromise care, one might

expect HMOs to write incentive contracts in ways that mitigate incentive pressure for patients

most in need of care. This is what Gaynor *et al* (2003) found in their case study described above.

Specifically, they found that the HMO relied on incentive contracts with built-in safeguards to

protect seriously ill patients. For the purposes of calculating cost-containment bonuses, the

primary care physicians in the HMO's network were only held responsible for the first $15,000

of costs per year generated by each patient. This 'stop-loss' provision was intended to remove

cost-containment pressures for seriously ill patients and the statistical evidence presented by

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[8]   For an excellent discussion of this large literature see Phelps (1992).

Gaynor *et al* suggests that it had the intended effect. That this provision was aimed at physicians and not consumers is evident in how the HMO viewed it within their overall strategy. The general impression at the HMO was that purchasers were much more responsive to premium levels and the number of physicians in the network than to assertions regarding quality. The physician incentive contracts were not advertised and even if the contracts had become common knowledge, they were so complex that only the most sophisticated buyers would have been able to understand the significance of the stop-loss provisions. In other words, the incentive contract was weakened not to attract patients through a more permissive style of medical practice, but rather to attract physicians.[9]

The preceding observation on HMO incentive contracts derives from a case study of a single organization. Ideally we would like to know more generally whether HMOs shape incentives to accommodate physician practice norms. No general database of HMO contracts exists, but we can infer something more about these incentive contracts by examining the effect of HMOs on care quality. If HMOs did not try to shape incentives in accordance with physician care norms, one would expect to see corresponding effects on the quality of clinical outcomes. However, the few econometric studies that have directly examined the issue have generally found no HMO effect on care outcomes (see Miller and Luft, 2002; for a review of the literature that reaches this same conclusion as well as studies by Cutler, McClellan and Newhouse, 2000; Altman, Cutler and Zeckhauser, 2000; and Duggan, forthcoming). We interpret the absence of an HMO effect on clinical outcomes for serious illnesses as reflecting the reluctance of HMOs to

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[9]   This conclusion is based on informal personal communications with executives at the HMO.

push physicians into treatment decisions that they might find objectionable for either moral or legal reasons.

3.   A Model of Physician Incentives and HMO Competition: HMOs design physician incentive contracts as part of their overall competitive strategy. While much of the existing literature on the design of these contracts is primarily concerned with minimizing costs subject to appropriate constraints, we broaden the scope of our analysis by also considering the interaction between willingness of physicians to accept an incentive contract and the competition among HMOs for enrollees.

We model competition among HMOs as an extensive form game with three stages. The players in this game are two HMOs and the population of doctors that might treat patients insured by these HMOs.[10] In the first stage of the game, the HMOs simultaneously set the number of doctors they want in their network and the quantity of HMO members they intend to service. Prices for each HMO are then set to clear the market.[11]

In the second stage of the game, the HMOs write incentive contracts for the physicians in their network. HMOs are constrained to write contracts that yield the promised number of

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[10]   The model can be extended to include any number of HMOs, but the key results are easiest to communicate in a model with only two HMOs. The subsection discussing the market equilibrium describes how the results would be affected by including more firms. To further simplify things we assume that each HMO offers only one plan. Allowing HMOs to offer multiple plans would complicate the model without altering its basic conclusions.

[11]   The model of product market competition in the first stage builds off of Gal-Or's (1985) model of differentiated product oligopoly. In the context of HMO competition, the Cournot assumption means that HMOs set target market shares and then set prices to achieve those targets. This focus on market share is roughly consistent with informal discussions about strategy the authors have had with a local HMO.

physicians for their network. In the final stage of the game, doctors make two related decisions: which HMO (or HMOs) to join and what style of medical practice to adopt. Both of these decisions are shaped by the incentive contracts HMOs offer. We use subgame perfection as a solution concept and solve the model via backward induction. Our exposition of the model therefore begins with the final stage and works backward in time to reach the first stage.

To identify how competition impacts the efficacy of managed care, we also present results about coverage, costs, and quality of care for the monopoly case. The derivation of these results is not presented here as it represents a trivial extension of the duopoly model.

The following section necessarily contains a great deal of detail. Readers who are primarily interested in the results rather than their derivation may want to skip to the discussion in subsection 3.4.

3.1.   *Stage 3: Physician Choice of Network Affiliation and Practice Style*: Consider an HMO whose network is composed entirely of primary care physicians. In this HMO, PCPs are "responsible" for the care of their panel of HMO members in both a clinical and economic sense. Clinically, primary care physicians must approve any actions that incur medical utilization costs, e.g. drug prescriptions, referrals to specialists etc. Economically, primary care physicians are also held "responsible", via incentive contracts, for the medical costs incurred by their patients. Managing care by making the primary care physician the "gatekeeper" to resources is a common strategy in the managed care industry.

The HMO writes incentive contracts with the primary care physicians in its network. For simplicity we focus on linear contracts having two parameters, a capitation rate and a cost

share.[12] The capitation rate for incentive contracts offered by HMO i, represented by k_i, is a flat

fee that the HMO pays the physician for each HMO member in the physician's patient panel.

The cost share parameter for HMO i, represented by d_i, is the fraction of incurred medical costs

that the physician must bear. Without loss of generality, we assume that it is HMO 1 that will

have the relatively low powered incentives and HMO 2 that has the high powered incentives, i.e.

that $d_2 > d_1$.

If incentives are to matter, physicians must be free to adopt different styles of medical

practice in response to different levels of cost sharing. Think of these medical styles as short-

hand descriptions of the strategies primary care physicians use to treat the patients that arrive in

their office. For example, a primary care physician may decide to send every case of acne to a

dermatologist and every ankle sprain to a sports medicine specialist. This style of medical

practice would typically generate more medical expenses than one in which the primary care

physician tried to treat the acne or the sprains themselves. We index practice styles by s and

think of s as increasing with the costliness of a practice style. More specifically we write the

cost per patient of a physician adopting practice style s as:

$$c(s) = \beta s^2 \qquad \textbf{(1)}$$

Physicians make choices about their practice style based on a combination of clinical and

financial considerations. In writing down physicians' preferences over practice styles, we posit

that physicians are not solely concerned with maximizing their monetary earnings, but also have

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[12] In principle the model can be extended to include other cost-control mechanisms such as direct and intrusive monitoring, the informal 'steering' of patients to low-cost providers, and more complex contracts, but these features would greatly complicate the analysis. See Ma and McGuire (forthcoming) for a discussion of other incentive instruments available to HMOs.

their patients' best interests in mind. Because they have a sense of what services patients would

choose *if they had the knowledge and information to make these decisions*, physicians are

assumed to prefer, ceteris paribus, more resource intensive practice styles over less intensive

styles.[13] Indeed, if physicians did not generally prefer more expensive practice styles, there

would be little need for HMOs to write contracts with incentives for controlling costs.

We incorporate absolute physician norms into the model by assuming the existence of a

minimum acceptable practice style, α, for each physician. This norm acts largely through its

effect on a doctor's willingness to join an HMO network.[14] We stipulate that a physician will

join a network if this action meets two criteria. First, being a member of the network must

generate non-negative utility when operating with the utility-maximizing practice style (as

derived below in (3) – (5)). Second, this utility maximizing practice style must be greater than α,

the minimal acceptable practice style.[15] Under our maintained assumption that patients do not

have the information or expertise to adequately assess physician practice styles, it is a

physician's judgment about what is minimally acceptable rather than the marginal patient's

preferences, which limits the physician's choice of styles. We capture heterogeneity in physician

judgments by allowing α to be uniformly distributed on the interval 0 to A, where A > 0.

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[13] Less pure motives may also play a role: physicians may have intellectual or scientific motives to use the latest and best technology on their patients or may also practice "defensive medicine", i.e. using tests and procedures to preempt future malpractice suits. We abstract from these issues in this paper.

[14] We also incorporate α directly into the physicians' objective function, but this is a matter of analytical convenience rather than an economically significant aspect of the model.

[15] More specifically, we treat physicians as making a two-stage decision, first choosing whether to join HMO i and then choosing a style, s_i, for patients from HMO i. At the second stage, doctors choose the unconstrained maximum, ignoring the absolute practice norm. In the first stage they

In addition to absolute care norms, we also assume that physician preferences are affected by the practice styles adopted by other doctors in the market. Relative care norms emerge from the same altruistic considerations that drive absolute care norms. Physicians prefer more resource intensive practice styles because they believe this better serves their patient's interests. Thus, if cost-cutting incentives compel physicians in one HMO to adopt a less resource intensive practice style than prevails in others, some patients will be getting "short-changed" in terms of medical care solely on the basis of which HMO they joined. As we shall see, these "relative" practice norms play a critical role in the interaction between competition and quality of care. To incorporate relative practice norms, we assume that physicians observe the practice style adopted by other physicians in the market and experience a reduction in utility when they adopt a practice style that is lower than the most expensive style prevailing in the market.

Formally, let $\hat{s}$ denote the maximum style present in the local market and $\lambda s_i (\hat{s} - s_i)$ the disutility derived from offering a style below the maximum.[16] The variable λ is positive, implying that as long as $s_i > \hat{s}/2$, marginal reductions in practice style reduce physician utility. When $s_i = \hat{s}/2$ the disutility of choosing an inexpensive practice style is maximized, so beyond this point ($s_i < \hat{s}/2$) we assume the marginal effect of further reductions in s_i is 0.[17]

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anticipate their second stage decision and only join if it yields an acceptable style ($s_i \geq \alpha$).

[16]   In assessing $\hat{s}$, the physician is assumed to *not* include his own style. In other words, $\hat{s}$ is the highest practice style used by *another* physician.

[17]   This functional form implies that utility drops as style moves further from the maximum, but the saliency of the comparison with the maximum decreases as the difference between practice styles grows. The assumption of decreasing marginal disutility was chosen for mathematical reasons: it allows us to obtain a simple closed form solution for the equilibrium. In an unpublished appendix, we present an alternative specification where that the marginal disutility of

Letting q_i be the number of patients the physician treats from HMO i, we combine physician preferences for income, their preferences for more expensive styles of practice, the disutility generated by relative practice norms, and the constraints imposed by the incentive contracts into a doctor's objective function:

$$u_D^i = q_i \left((k_i - d\beta s_i^2) + \gamma(s_i - \alpha) - \lambda s_i(\hat{s} - s_i) \right) \text{ if } s_i > \frac{\hat{s}}{2} \quad \textbf{(2a)}$$

or

$$u_D^i = q_i \left((k_i - d\beta s_i^2) + \gamma(s_i - \alpha) - \lambda \frac{\hat{s}^2}{4} \right) \text{ if } s_i \leq \frac{\hat{s}}{2} \quad \textbf{(2b)}$$

where $0 \leq d_i \leq 0$ and $\gamma > 0$. The first term of (2a) is the income earned for each member served from HMO i, the second term is the per-member utility derived from the direct returns to adopting a costly practice style, and the final term is the disutility from choosing a practice style below the maximum.

Having fully specified the doctor's utility function, we can now determine the style physicians adopt after choosing to join an HMO. Conditional on having joined, we get the following first order condition for doctors in HMO i's network.[18]

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comparisons increases with distance from the maximum, i.e. where the disutility from practicing relatively low cost medicine is $\lambda(\hat{s} - s_i)^2$ for $\hat{s} < s_i$ and zero otherwise. This functional form assumption yields very complicated closed form solutions, but we show using simulations that it has the same basic properties as the model presented here.

[18]   Note that α does not appear in the first order condition. This implies that all physicians, subject to joining an HMO's network, select the same practice style, a property that greatly simplifies the modeling to follow. It does not imply that all physicians appear identical to consumers, since physicians can differ along many dimensions (e.g. location, bedside manners, and availability of extended office hours) other than practice style.

The second order condition for the physician's maximization problem holds so long as $d_i\beta > \lambda$.

$$-2d_i\beta s_i + \gamma - \lambda\hat{s} + 2\lambda s_i = 0 \quad i \in \{1,2\} \qquad \textbf{(3)}$$

To close the model, (4) adds the equilibrium condition that $\hat{s}$ equals the higher of the two practice styles chosen by physicians.

$$\hat{s} = \max[s_1, s_2] \qquad \textbf{(4)}$$

Noting that $s_2 < s_1$ because incentives are, by construction, more potent in HMO 2 than HMO 1, we can write the style chosen by physicians in each HMO as:

$$s_2 = \frac{\gamma - \lambda s_1}{2(d_2\beta - \lambda)} \text{ and } s_1 = \frac{\gamma}{2d_1\beta - \lambda} \qquad \textbf{(5)}$$

The important point to take away from (5) is that increases in incentives to control costs (represented by increases in d_1 or d_2) have the effect of reducing the costliness of the practice styles physicians adopt.

3.2.   *Stage 2: Incentive Contracts and HMO Cost Functions:*   In this stage of the game HMOs have committed to attracting a certain number of doctors, δ_i, to their network. A doctor "joins" a network by agreeing to receive HMO members as patients under the terms of the HMO's incentive contract, i.e. with a capitation rate k, and a cost share parameter, d.

HMO 1 chooses values of k and d to minimize per patient costs subject to the participation constraints that must be met to build a network with δ_1 doctors.[19] Recall that by assumption $d_1 < d_2$, implying that physicians in HMO 1's network will employ a more costly

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Since the optimal style s_i goes to infinity as d_i goes to λ/β from above, this condition always holds for any incentive contract the HMO would wish to write.

[19]   Because costs are linear in the number of patients, minimizing the HMO's cost per patient is equivalent to minimizing costs. Cost minimization is implied by profit maximization.

practice style than those in HMO 2's network. Let D be the total number of available doctors. HMO 1's cost minimization problem is as follows, where s_1 is a function of d_1.

$$\min_{k_1,d_1} (k_1 + (1 - d_1)\beta s_1^2) \qquad \textbf{(6)}$$

$$\text{subject to } k_1 - d_1\beta s_1^2 + \gamma\left(s_1 - \frac{A\delta_1}{D}\right) \geq 0 \text{ and } s_1 \geq \frac{A\delta_1}{D} \qquad \textbf{(7)}$$

In (7) we give the two physician participation constraints. The first constraint, that physicians must always have non-negative utility under HMO 1's incentive contract, holds with equality. Otherwise, the HMO could always reduce costs by cutting k_i. The second participation constraint states that the optimal style chosen by physicians working under HMO 1's contract equals or exceeds the physician's minimum acceptable practice style.[20] Cost minimization requires that this participation constraint must also hold with equality. If it did not, the HMO could always reduce costs further by increasing the share parameter, d_1. Substituting (7) into (6) we derive HMO 1's cost function.[21]

$$c_1(q_1,\delta_1) = q_1\beta K\delta_1^2 \text{ , where } K \equiv \left(\frac{A}{D}\right)^2 \qquad \textbf{(8)}$$

We derive HMO 2's cost function analogously. HMO 2 chooses d_2 and k_2 to minimize per patient costs while attracting δ_2 physicians into its network.

$$\min_{k_2,d_2} (k_2 + (1 - d_2)\beta s_2^2) \qquad \textbf{(9)}$$

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[20]   Since α is distributed uniformly between 0 and A, the marginal physician in HMO 1's network of size δ_1 will have $\alpha = (\delta_1/D)A$. Rearranging this equation gives the second constraint in (7).

[21]   Note that this will also give the cost function for a monopolist because relative care norms do not matter for HMO 1.

subject to $k_2 - d_2 \beta s_2^2 + \gamma \left(s_2 - \dfrac{A\delta_2}{D} \right) - \lambda s_2 (s_1 - s_2) \geq 0$ and $s_2 \geq \dfrac{A\delta_2}{D}$ **(10)**

The constraints in (10) are the same as those for HMO 1 except for the final term of the first constraint, $\lambda s_2 (s_1 - s_2)$. This term reflects payments that HMO 2 must give physicians to compensate them for adopting a less resource intensive style than in HMO 1. Comparing the participation constraints in (7) and (10), it is clear that the physicians who join HMO 2's network will be a strict subset of those who join HMO 1's physician network.

Once again cost minimization ensures that both participation constraints in (10) hold with equality. Substituting (10) into (9) we derive the cost function given by (11).

$$c_2(q_2, \delta_1, \delta_2) = q_2 \left(\beta \delta_2^2 + \lambda (\delta_1 - \delta_2)\delta_2 \right) K, \text{ where } K \equiv \left(\dfrac{A}{D} \right)^2 \text{ (11)}$$

Note that HMO 2's costs depend on the size of HMO 1's network. The magnitude of these cost spillovers increases with the strength of physicians' relative practice norms.[22]

3.3.   *Stage 1: Market Equilibrium:* We begin by considering the preferences of the consumers in the market. Each consumer can decide to purchase membership in one of the two HMOs or to purchase no health insurance at all.   To highlight the information asymmetries present in health markets, we adopt the strong assumption that *consumers cannot perceive the style of care provided by physicians in the network nor can they infer this style from the size of HMO's networks*. We therefore do not incorporate practice style into consumers' preferences. Even though consumers would presumable prefer (ceteris paribus) to be treated with a more generous

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[22]   The possibility of strategic interdependencies between HMO networks was also noted and

practice style, their inability to distinguish differing practice styles implies that their choice of insurance cannot reflect differences in practice style. In spite of this blind spot, consumers in our model still have preferences over physicians, based on characteristics such as physician age, gender, communication style, office hours, or location. Because these non-clinical factors matter to consumers and because the odds of finding a good physician match increases with the number of doctors in the HMO's network, consumers in our model value larger networks.

We model consumers' preferences for a large network by assigning each consumer a parameter, x, that determines the strength of preferences for network size. This parameter is uniformly distributed over the interval [0, X] with X indicating the greatest possible preference for access to a larger network of doctors. We write a consumer's utility in terms of premium costs, p, and network size, δ. Since all consumers prefer a larger network ceteris paribus, b is strictly positive.

$$u(\delta, x : p) = bx\delta - p \qquad \textbf{(12)}$$

By identifying the value of x for the marginal members of HMOs 1 and 2, we use the consumer's utility function to derive inverse demand functions. For convenience, assume that the total population size is also X. Maintaining our notational convention that HMO 1 has relatively low-powered incentives, it follows that HMO 1 chooses to provide a larger network of physicians than HMO 2 ($\delta_1 \geq \delta_2$). The price of HMO 2's product is determined where the marginal member is indifferent between joining HMO 2 and going without insurance.[23]

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analyzed by Beaulieu (2000), although in a different theoretical context.

[23]   If HMO 1 has the larger network ($\delta_1 \geq \delta_2$), then it must also be the more expensive network ($p_1 > p_2$) or no consumers would join HMO 2. It follows from this that HMO 2 has the

$$p_2 = \delta_2 b(X - q_1 - q_2) \quad \textbf{(13)}$$

Likewise, HMO 1's price is set where the marginal enrollee in HMO 1 is indifferent between joining either HMO 1 or HMO 2.

$$p_1 = \delta_1 b(X - q_1) - b\delta_2 q_2 \qquad \textbf{(14)}$$

Using these inverse demand functions and the cost functions from (8) and (11), the HMOs' profit functions are as follows:

$$\pi_1 = q_1 \left(\delta_1 b(X - q_1) - b\delta_2 q_2 - \beta K \delta_1^2 \right) \quad \textbf{(15)}$$

$$\pi_2 = q_2 \left(\delta_2 b(X - q_1 - q_2) - \beta K \delta_2^2 - \lambda K (\delta_1 - \delta_2)\delta_2 \right) \qquad \textbf{(16)}$$

The HMOs simultaneously choose the number of enrollees (q) and physicians in the network (δ). In (Nash) equilibrium, each HMO maximizes its profits taking q and δ for the other HMO as fixed. The equilibrium must satisfy the four following first-order conditions:[24]

$$\frac{\partial \pi_1}{\partial q_1} = b(X\delta_1 - 2\delta_1 q_1 - \delta_2 q_2) - K\beta \delta_1^2 = 0 \qquad \textbf{(17)}$$

$$\frac{\partial \pi_1}{\partial \delta_1} = bq_1(X - q_1) - 2\beta K \delta_1 q_1 = 0 \qquad \textbf{(18)}$$

$$\frac{\partial \pi_2}{\partial q_2} = b\delta_2(X - q_1 - 2q_2) - K\beta \delta_2^2 - K\lambda(\delta_1 - \delta_2)\delta_2 = 0 \quad \textbf{(19)}$$

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most price sensitive consumers and it's marginal enrollee is choosing between HMO 2's policy or no policy at all. More generally, it can easily be proved that in equilibrium consumers are segmented into three sets. Consumers with low values for a large network ($x < p_2/b\delta_2$) take no insurance at all, those with intermediate values adopt HMO 2 ($p_2/b\delta_2 \leq x < (p_1 - p_2)/b(\delta_1 - \delta_2)$) and consumers with the highest values for a large network ($x \geq (p_1 - p_2)/b(\delta_1 - \delta_2)$) enroll in HMO 1.

[24]   For simplicity, we assume parameter values are such that both HMOs employ interior solutions for δ and that each physician can serve an unlimited number of patients.

$$\frac{\partial \pi_2}{\partial \delta_2} = bq_2(X - q_1 - q_2) - 2\beta K\delta_2 q_2 - \lambda K\delta_1 q_2 + 2\lambda K\delta_2 q_2 = 0 \qquad \textbf{(20)}$$

It is straight-forward, if tedious, to solve this system of first-order conditions for closed form expressions of each HMO's equilibrium values of q and δ:

$$q_1 = \left(\frac{5\beta^2 - 5\beta\lambda - \lambda^2}{23\beta^2 - 23\beta\lambda - \lambda^2} \right) X \qquad \textbf{(21)}$$

$$\delta_1 = \left(\frac{9b(\beta - \lambda)}{23\beta^2 - 23\beta\lambda - \lambda^2} \right) \frac{X}{K} \qquad \textbf{(22)}$$

$$q_2 = \left(\frac{6\beta^2 - 9\beta\lambda + 3\lambda^2}{23\beta^2 - 23\beta\lambda - \lambda^2} \right) X \qquad \textbf{(23)}$$

$$\delta_2 = \left(\frac{3b(2\beta - \lambda)}{23\beta^2 - 23\beta\lambda - \lambda^2} \right) \frac{X}{K} \qquad \textbf{(24)}$$

Fulfilling the first-order conditions given by (17) through (20), along with the second-order conditions, guarantees that each HMO's equilibrium strategy is a local maximum of the payoff function given the other's choice. Because the payoff functions are not quasi-concave, this is a necessary but not sufficient condition for Nash equilibrium. In technical notes available from the authors we prove that equations (21) through (24) represent a global profit maximum for each firm as well.[25] These notes also show that the second-order conditions hold.

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[25] To prove that equations (21) - (24) are a global maximum we must prove that neither HMO can improve its payoff by switching roles, i.e. that, given HMO 1's network, HMO 2 can't do better by building a larger network than HMO 1. Analogously we must also demonstrate that given HMO 2's network, HMO 1 can't do better by building a smaller network than HMO 2. To establish this we derive each HMO's optimal strategy if it switched roles with the other and then compare each HMO's maximum payoff after switching roles with the payoff from remaining in the current role. We find that so long as $\lambda \leq 0.5\beta$, the equilibrium in (21) - (24) represents a global profit maximum. Since this is also the condition for the HMOs providing differentiated

Combining (22) and (24), we get the following relationship between the equilibrium network sizes of the two HMOs.

$$\delta_2 = \left(\frac{2\beta - \lambda}{3(\beta - \lambda)} \right) \delta_1 \quad \textbf{(25)}$$

It follows that our assumption of product differentiation ($\delta_2 < \delta_1$), requires that that $\lambda \le 0.5\beta$. Thus HMOs will engage in product differentiation provided that relative practice norms are not 'too strong' relative to the costs incurred by more generous practice styles.

Having solved for equilibrium values of q and δ for each HMO, it is trivial to solve for equilibrium prices, profits and costs for each HMO. Given that the marginal physician's participation constraints hold with equality for both HMOs, it is similarly easy to derive the equilibrium incentive pay parameters, k and d, and physician practice style, s, for each HMO.

To discuss the effect of competition on the impact of managed care, we need the monopoly solution for quantity of patients covered and network size. These are given by the following equations:

$$q_M = \frac{X}{3} \quad \textbf{(26)}$$

$$\delta_M = \left(\frac{b}{3\beta} \right) \frac{X}{K} \quad \textbf{(27)}$$

We use these as benchmarks to compare against the outcomes under duopoly.

3.4. *Discussion of the Market Equilibrium:* In the introduction to this paper we discussed the hopes and fears raised by the emergence of managed care: proponents hope that active management of health care will short circuit the rapid increase in health care costs, while

products in equilibrium, it holds for all cases of interest.

opponents fear that an excessive concern with costs will lead to the provision of substandard care. Whatever the expected impact, conventional wisdom holds that competition intensifies the effect of managed care. HMOs, responding to competitive pressures, slash costs by employing powerful incentive contracts with physicians. Consumers, unable to judge the quality of care, end up receiving increasingly poor medical care. Competitive forces therefore reduce both costs and quality of care.

The equilibrium described by equations (21) – (24) contradicts this conventional wisdom. Indeed these results suggest that increased competition dampens the impact of managed care rather than intensifying it. To illustrate the moderating impact of competition, we compare the equilibrium outcomes for quality of care, costs, and overall consumer welfare under monopoly and duopoly.[26]

It eases exposition to examine quality prior to analyzing costs and welfare. It may seem problematic to discuss quality in a setting with such severe asymmetric information that quality doesn't even enter consumers' utility functions. In our framework, however, physicians are altruistic in the sense that, ceteris paribus, they want to deliver the quality of care a patient would choose for themselves if they were equipped to form these judgments. For this reason we use physician practice style, s, as our index of quality. If altruistic physicians prefer more expensive care styles, then patients would also prefer these styles, ceteris paribus, in the absence of asymmetric information.[27]

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[26]   The basic results would also hold if we compared outcomes under duopoly to the case of three or more competing firms, but the math becomes much more cumbersome.

[27]   The physician altruism assumption in our model is very strong. An alternative approach to the quality issue would be to drop altruism altogether and assume that consumers

Result 1, Competition and Quality of Care: *Increasing competition by moving from monopoly to duopoly always increases the quality of care provided by the high-cost HMO above the level provided by a monopolist. If relative practice norms are sufficiently strong, <u>both</u> HMOs will provide greater quality of care than a monopolist.*

First, consider the case with no relative practice norms ($\lambda = 0$). Given that practice style is proportional to network size in equilibrium, we use the equilibrium network sizes to make the relevant comparisons. Compare the network size under monopoly, given by (27), with the network sizes under duopoly, shown in (22) and (24). While the low cost HMO, HMO 2, chooses a smaller network size than a monopolist, the high cost HMO, HMO 1, chooses a larger network size.[28]

Intuitively, HMO 1 is better off differentiating itself from HMO 2 and enjoying market power in its chosen niche rather than trying to compete with HMO 2 for the lowest costs of providing medical care. Unlike standard models with homogeneous products, cutting costs does not necessarily make you a stronger competitor in a model with product differentiation. Instead, effective competition often means avoiding competition. Rather than offering the same thing at a better price, a firm can gain by offering a product sufficiently different from the other firms' offering that some consumers are willing to pay a premium for it. In our model, this translates to HMO 1 differentiating itself by providing access to a larger physician network. Tough cost control measures (and the resulting low cost practice style) are counter-productive for HMO 1

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willing to pay for large networks would also be more willing to pay for quality. The logic would be that consumers very concerned about physician match are also very concerned about the quality of care they receive. In this case we would use network size as an indicator of quality. Because provider network size is monotonically related to provider style, all our results would hold if we adopted this alternative approach.

[28]   Taking the appropriate weighted average, the average quality of care when $\lambda=0$ is slightly lower under a duopoly. This result is of questionable relevance since no consumer

because they limit its ability to attract a large number of physicians to its network and this is what differentiates its product from HMO 2. Thus, the benefits of product differentiation and the need to cater to physicians' practice norms combine to mitigate the negative impacts of managed care on the quality of healthcare.

The preceding result becomes even stronger we introduce relative practice norms ($\lambda > 0$). To examine the effects of competition on quality of care, it is a useful first step to describe how changes in λ, the strength of relative practice norms, impact equilibrium strategies. For a monopolist there is no effect from increasing λ – intuitively, relative practice norms have no bite since all doctors must choose the same practice style. For the duopoly case, λ affects the equilibrium strategies. Differentiating (21) through (24) with respect to λ and maintaining the necessary and sufficient condition for product differentiation ($\lambda \leq 0.5\beta$) we get the following:

$$\frac{dq_1}{d\lambda} = \frac{-18\lambda\beta(2\beta - \lambda)X}{\left(23\beta^2 - 23\beta\lambda - \lambda^2\right)^2 K} < 0 \quad \textbf{(28)}$$

$$\frac{d\delta_1}{d\lambda} = \frac{9b\lambda(2\beta - \lambda)X}{\left(23\beta^2 - 23\beta\lambda - \lambda^2\right)^2 K^2} > 0 \quad \textbf{(29)}$$

$$\frac{dq_2}{d\lambda} = \frac{-3\beta\left(23\beta^2 - 50\beta\lambda + 26\lambda^2\right)X}{\left(23\beta^2 - 23\beta\lambda - \lambda^2\right)^2 K} < 0 \quad \textbf{(30)}$$

$$\frac{d\delta_2}{d\lambda} = \frac{3b\left(23\beta^2 + 4\beta\lambda - \lambda^2\right)X}{\left(23\beta^2 - 23\beta\lambda - \lambda^2\right)^2 K^2} > 0 \quad \textbf{(31)}$$

From (29), we find increasing the importance of relative practice norms causes HMO 2 to increase the size of its physician network. This is to be expected as heightened relative practice

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actually receives the average quality of care.

norms increase the cost of getting physicians to adopt a practice style less generous than HMO 1's. In other words, when λ increases it becomes less advantageous for HMO 2 to strongly differentiate itself from HMO 1 by using tight incentives to keep costs (and hence prices) down. As HMO 2's network size increases, cost-containment incentives are reduced and premiums rise. HMO 1 responds to HMO 2's incursion into the "up scale" insurance market by increasing the size of its own network as shown by (27).

We can now, for the general case, evaluate the effect of competition on quality of care. Because both HMOs' network sizes are increasing function of λ, competition will never cause a uniform decrease in quality of care. At the very least, HMO 1 will always choose a larger network (and better quality of care) than a monopolist would. For sufficiently high values of λ both HMOs choose larger networks than a monopolist.[29] Rather than increasing the negative impact of managed care on quality of healthcare, competition can actually generate a market-wide improvement in the quality of healthcare.

Intuitively, the more firms there are competing, the greater the strategic advantages of product differentiation at the top and bottom of the market – high end plans build larger networks with weaker cost controls and low-end plans implement tough cost controls to lower prices in exchange for a more limited provider network. However, relative practice norms inhibit product differentiation at the low-end of the product market. The stronger the relative practice norms, the more powerful is the desire of physicians in the low-cost network to offer care that closely approximates the high-end care provided elsewhere. These social comparisons can overwhelm

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[29]   Comparing (24) and (27), HMO 2 chooses a larger network than a monopolist if $\lambda \geq \left(3\sqrt{6} - 7\right)\beta$.

the ability of low-end HMOs to respond to increased competition by offering inexpensive

products to the most price-sensitive customers.

Result 2, Competition and Costs: *Increasing competition by moving from monopoly to duopoly always increases total healthcare costs. If relative practice norms are sufficiently strong, average healthcare costs per consumer will also be increased with competition.*[30]

To analyze the impact of competition on healthcare costs, it is useful to first note that

costs must be proportional to the square of network size. Once again we start by considering the

special case where there are no relative practice norms ($\lambda = 0$). Taking the appropriate weighted

average across HMOs, average healthcare costs (cost per patient treated) are lower under

duopoly. The difference is small – average costs under duopoly are 96% of average cost under

monopoly – as lower costs for consumers using HMO 2 are almost counter-balancing by higher

costs for consumers choosing HMO 1. Because the total number of insured consumers is much

higher under duopoly, total healthcare costs increase by almost 38% under duopoly.[31]

Allowing for relative practice norms ($\lambda > 0$) strengthens the preceding results. As noted

above, for sufficiently high values of λ both HMOs choose larger networks than a monopolist. It

follows directly that average healthcare costs must be larger under duopoly than under monopoly

for sufficiently large values of λ. In fact, relative practice norms need not be especially strong

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The term in parentheses equals approximately .35.

[30]   By costs we mean the economic costs of delivering health care services as described in equation (1). These costs are, of course, distinct from the premiums consumers pay. In our model premiums can fall even when costs rise as surplus is shifted from producers to consumers.

[31]   The number of insured consumers increases because premiums fall under duopoly, primarily due to a transfer of some of the monopolist's surplus to consumers.

for average costs to greater under duopoly: $\lambda > .085\beta$ is sufficient.[32] Total healthcare costs are an

increasing function of λ for a duopoly but are unaffected by λ for a monopoly. Therefore, total

healthcare costs are always much higher under duopoly than under monopoly. The intuition

behind these results is identical to that underlying our results on quality. By weakening cost

controls at high-end firms, increased competition ratchets up the pressure on low-end HMOs to

let their physicians employ a more generous practice style.   This increases HMO 2's costs and,

by extension, average costs as well.

Result 3, Competition and Consumer Welfare: *All consumers are made better of by moving
from monopoly to duopoly.*

Moving from monopoly to duopoly makes *all* consumers (weakly) better off. This occurs

because competition both lowers premiums and leads to product differentiation. The latter effect

of competition allows consumers to purchase policies that more closely match their preferences.

This point is made formally by the following proposition.

Proposition: For all values of λ such that product differentiation occurs in equilibrium for a
duopoly ($\lambda < \beta/2$), all consumers weakly prefer their outcome in the duopoly equilibrium to their
outcome with a monopoly. The inequality is strict for all consumers who strictly prefer to
purchase insurance in the duopoly equilibrium.

Proof: To prove this proposition, we start by noting that more of the market is covered under

duopoly than under monopoly ($q_1 + q_2 > q_M$) for all values of $\lambda < \beta/2$. To prove this, given that

both q_1 and q_2 are decreasing functions of λ, it is sufficient to note that $q_1 + q_2 = 11X/23$ for $\lambda = 0$

and $q_1 + q_2 = 2X/5$ for $\lambda = .5\beta$. (Recall that under monopoly $q_M = X/3$.)   This implies that the

consumer with the lowest value of x who purchases insurance under monopoly must be strictly

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[32]   This is only 17 percent of the maximum value of λ, which is 0.5β

better off under duopoly and that all consumers who buy insurance under duopoly but not under monopoly must be weakly better off. By (12), consumers' utility is an increasing function of x holding price and network size fixed. Therefore, the preceding inequality must be strict for all but the marginal consumer (the consumer with the lowest value of x who purchases insurance under a duopoly). Next, using (12) note that the derivative of the difference between the utility from two insurance policies with respect to x must have the same sign as the difference between the two HMOs' network sizes. There are now two possible cases. For $\lambda < \left(3\sqrt{6} - 7\right)\beta$, the network size for a monopoly is between the network sizes of the high and low cost HMO in a duopoly. It follows that we only need to check that the consumer on the margin between HMO1 and HMO2 is better off under duopoly. Doing some algebra, this is equivalent to requiring

$\dfrac{\delta_2}{\delta_M} > \left(\dfrac{q_M - q_1}{q_2}\right)$ A straight forward calculation confirms that this is true for all $\lambda < \beta/2$. The remaining case, $\lambda \geq \left(3\sqrt{6} - 7\right)\beta$ is simpler. The marginal consumer with a monopoly ($x = 2X/3$) must be strictly better off under a duopoly. Since $\delta_2 \geq \delta_M$, strict preference must hold for all higher values of x as well. **Q.E.D.**

The preceding result must be interpreted with some caution because of the information problems inherent in the health care setting. When the relative care norm parameter (λ) is low, consumers in HMO 2 receive less resource intensive medical care in a duopoly then under monopoly. If these patients were able to directly assess the quality of care they receive, they might actually be less happy under a duopoly than with a monopoly. Our confidence in the efficiency improving effects of competition would be greater if we knew: (1) that relative care norms were powerful; and or (2) that consumers who join HMO 2 would have a low willingness to pay for health care quality if they were capable of observe it. Obviously we cannot address

this last condition within the framework of this paper. If we enriched the model by allowing

patients to directly perceive quality, it seems reasonable to suppose that preference for larger

network sizes correlates with a preference for higher quality care.

Result 4, Consumer Welfare and Physician Norms: *Conclusions 1 and 2 indicate that competition weakens the impact of managed care. This effect is increased by stronger relative practice norms. However, the impact of stronger relative practice norms on consumer welfare is ambiguous.*

Strong relative practice norms help competition rein in the effects of managed care by

forcing low-end HMOs to loosen cost controls on doctors, leading to increased network sizes,

increased quality of care, and increased costs. One might be tempted to conclude from this that

strong relative practice norms make all consumers better off since high values of λ lead to larger

network sizes. However, the comparative static results derived above indicate otherwise. From

(26) and (28) we see that an increase in λ reduces the number of consumers choosing either

HMO 1 or HMO 2. Since an increase in λ reduces membership in *both* HMOs, there must occur

a corresponding increase in the number of uninsured consumers. These newly uninsured

individuals are, by revealed preference, worse off than before since they had the opportunity to

opt out of insurance before the increase in λ caused premiums to rise. More generally, an

increase in physician practice norms helps consumers who care most about access to large

networks and harms those who are most sensitive to prices.[33]

A related point is made via the following comparative statics result, derived by

differentiating (25):

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[33]   The welfare implications of increasing λ are worked out formally in an appendix available on Cooper's website (www.weatherhead.cwru.edu/djcooper).

$$\frac{d(\delta_2/\delta_1)}{d\lambda} = \frac{\beta}{(\beta - \lambda)^2} > 0 \qquad \textbf{(32)}$$

When relative practice norms increase in importance, product differentiation falls as the low cost HMO becomes more similar to the high cost HMO. Thus, strong relative practice norms reduce one of the advantages of a duopoly over a monopoly, providing diverse consumers with options that more closely fit their tastes.

Before concluding this section, a few comments on the robustness of our results are in order. First, our model does not allow for adverse selection, a ubiquitous feature of health markets. While it greatly complicates the analysis, we can replicate our main results for a setting with adverse selection.[34] Second, to simplify the model we have only allowed for two HMOs. Two puzzling properties of our model, the non-negligible fraction of physicians who choose to be unemployed and the lack of any insurance firms like old-fashioned indemnity plans, are side effects of this assumption. With more firms in the market, the insurance plans being offered in equilibrium become more diverse. As the number of firms increases, the highest cost HMO charges increasing prices while imposing weaker cost controls on physicians. In the limit, virtually all physicians will treat at least some patients through the highest cost plans. The only "unemployed" physicians are those with a great aversion to cost controls. The high cost plans offer almost unlimited portability, high prices, and little cost control. In other words, they closely resemble old-fashioned indemnity plans.

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[34] In numerical simulations available from the authors, we study settings where x, the parameter governing a consumer's willingness to pay for large networks, is positively correlated with the HMO member's expected medical costs. We show that the HMOs still produce differentiated products with at least one firm offering a larger physician network than a monopolist.

4. Conclusion:

We have analyzed the effect that competition between HMOs has on the cost and quality of medical services. Our key result is that increasing competition *enhances* consumer utility while also *moderating* the impact of managed care on quality and costs. Indeed, we find that heightened competition between HMOs can lead to an overall increase in care quality and costs. This result derives from an important, but overlooked, feature of the managed care market place. Plans differentiate themselves by the size and depth of their provider network. The resulting need to attract physicians exerts a moderating effect on the incentive contracts HMOs can write with providers.

Our results suggest that there are good economic reasons for promoting competition between managed care plans. Contrary to the fears of the critics, competition between plans will generally not accelerate a 'race to the bottom' in care quality. The hopes of those who championed managed care as a powerful force for containing health care costs are also likely to be disappointed. Instead, the primary beneficiaries of competition are consumers who enjoy a greater variety of plans along with lower average prices.

Our model highlights a number of empirical, theoretical and public policy issues that are worthy of further study. From an empirical perspective, the general thrust of the literature is that managed care has a more modest effect on cost and quality than either its supporters or critics had predicted (Miller and Luft, 2002). The obvious question raised by our analysis is whether this is due to the moderating effect of physicians' practice norms on incentive contracts.

Another important issue raised by our study concerns the nature of physician care norms. At present these norms are only dimly understood by economists. Further research into the formation and operation of norms is critical for understanding the impact of physician incentives

in healthcare and in the many other settings where critical outcomes hinge on the decisions and

actions of highly skilled professionals.

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