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Contributions

Demanding Customers: Consumerist Patients and Quality of Care

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Demanding Customers: Consumerist Patients and Quality of Care

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Abstract

Consumerism arises when patients acquire and use medical information from sources other than their physicians. This practice has been hailed as a means of improving quality. This need not be the result. Our theoretical model identifies a channel through which consumerism may reduce quality: consumerist patients place additional demands on their doctors' time, thus imposing a negative externality on other patients. Relative to a world in which consumerism does not exist, consumerism may harm other consumerists, non-consumerists, or both. Data from a large national survey of physicians confirm the negative effects of consumerism: high levels of consumerist patients are associated with lower perceived quality among physicians.

KEYWORDS: consumerism, health care quality, physician time, time allocation, time budget

1. INTRODUCTION

The shortcomings of the healthcare system in the United States are well documented. In an oft-mentioned study, McGlynn et al. (2003) examined 439 markers for quality of care for 30 different conditions. They found that on average, patients receive only 54.9 percent of recommended care. These omissions have significant costs. The National Committee for Quality Assurance (NCQA, 2010, p. 21), documents that in 2009, low-quality care led to $4.6 - $7.4 billion in additional medical costs, and between 50,000 and 186,000 additional deaths.

Over the past several decades, the U.S. health care system has transformed twice – from a model dominated by private insurance companies that contracted with individual physicians and/or providers to one in which managed care organizations played a very active role, and then to one in which decision making power devolved back to individual patients and physicians as preferred provider organizations gained market share at the expense of HMOs. Throughout, concerns about quality have been prominent.

As with most economic goods, traditional health insurance (i.e., fee-for-service reimbursement of an unrestricted provider network) relies on market competition among private suppliers as the principal means to promote quality and control cost. In theory, patients will flock to those who provide high-quality care, giving providers an incentive to improve quality. But this mechanism may function poorly in health care. The parts of health care quality that are easy to observe (e.g., courtesy in the doctor's office) often hold little relevance for health outcomes, while the salient indicators of quality for health outcomes (e.g., risk-adjusted morbidity and mortality) are notoriously difficult to observe. Thus, market forces are unlikely to focus providers' attention on the most critical aspects of quality. Indeed, some studies have found a negative relationship between competition and quality (Propper et al., 2004). Further, since patients cover only a small portion of their costs at the point of consumption, we should also expect inadequate cost control (Relman, 1993). Indeed, costs skyrocketed in the 1980s, when fee-for-service dominated and competition among doctors flourished.

Managed care spread in the early 1980s, largely as a response to the excesses of the fee-for-service system. Cost-control was surely a major objective, but there were also strong hopes that managed care would enhance quality. Several features of that organizational form offered promise. Many managed care plans offered "one-stop shopping"; patients could receive all of their care within the managed-care network. In theory, this should promote better quality of care by improving both the continuity of treatment and information exchange among

providers. Having all care delivered under one roof might also generate efficiencies in production and/or economies of scale in service, leading to cost savings (Sullivan, 2000; Brown and Pagan, 2006). Managed care organizations also have strong incentives to provide preventive care (Dysinger, 1996), which may both promote quality of care and yield future cost savings. Empirical evidence indicates that managed care is associated with greater use of preventive services (Balkrishnan et al., 2002; Rizzo, 2005). Moreover, with payments on a capitated basis, the underlying financial incentives could help control costs.

While costs were constrained as managed care blossomed, especially during the mid-1990s, health care costs resumed their upward trend in the late 1990s. In addition, both patients and providers became increasingly disenchanted with the restrictions manage care placed on treatment choices, believing that they had impaired quality (Blendon et al., 1998; Enthoven and Singer, 1998; Miller and Luft, 1997, 2002; Miller, 2006). Patients thought their inability to choose among physicians more broadly hurt quality, and insisted on changes. In response, restrictions on physician choice in the HMO model declined significantly in the late 1990s. Many HMOs now offer broad access (Robinson, 2001; Draper et al., 2002). At the plan level, increases in health insurance premiums and copayments (Kaiser Family Foundation, 2007) have no doubt prompted consumers to scrutinize their plan and treatment options more intensely.

In recent years, consumers have come to play a much more active role in their personal medical care decisions (Robinson, 2005), a phenomenon called "consumerism" (Teutsch, 2003; Rosenthal and Milstein, 2004; Dutta-Bergman, 2003; Havlin et al., 2003). [1] Such behavior may be a reaction to their dissatisfaction with managed care, or a reaction to the rapid increase in the availability of medical information from health-care report card programs, direct-to-consumer advertising, and particularly over the Internet.

Many have argued that as patients learn more about their medical needs and the quality of different providers, they will flock to the best ones, increasing the average quality of a physician visit, and giving providers an incentive to increase quality. Well-informed consumers may be better able to determine when to go to the doctor. Further, since the success of modern medical treatment often requires high levels of compliance by patients, consumerism holds the additional potential that more-informed patients will be better patients, more willing to follow the doctor's instructions, for example in taking prescribed medications.

Moreover, to the extent that physicians value patient input and involvement in decision making, more inquisitive and questioning patients may be seen as desirable and complementary to the physician's efforts to provide high-

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[1] The term "consumerism" is also used in a different context with a quite different meaning. It is sometimes associated with "consumer-driven health plans," which feature high deductibles, often coupled with health savings accounts. See Wilensky (2006).

quality care (Smith, 2005). For example, consumers – whose parochial concern for their health makes them more interested in it than their physicians – might do considerable research on their conditions, which could complement or stimulate the relevant knowledge of the doctor. Some previous work analyzes the relationship between more-informed patients and physicians. Xie et al. (2006) study the impact of patient-obtained medical information on the physician-patient relationship, and the conditions under which patient-obtained medical information can affect the practice strategy of physicians. They also identify circumstances under which increasing the general level of information will harm patients. Shih and Ming (2011) study the effect of more-informed patients on demand-induced supply, such that services are requested by patients and provided by their physicians. Employing instrumental variables, they find that the proportion of more informed patients correlates significantly and positively with demand-induced supply for a significant number of physicians. However, no prior study examines the effects of more-informed patients on the potential health care quality that physicians can provide, which is the subject of our paper.

Consumerism plays a critical role in consumer-driven health plans, which typically involve using high deductibles and/or coinsurance to provide patients with financial incentives to seek out high-quality, low-cost care. Some studies suggest that these plans reduce expenditure without harming quality (Herzlinger (2004a, 2004b), Wilensky (2005)). However, despite the intuitive appeal of consumerism's role in improving care and suggestive evidence supporting it, other health policy analysts have expressed doubts. For example, Sofear and Gruman (2003) argue that the   strategy of providing comparative quality information to consumers to improve health care quality may not work well, since the quality information given to consumers is often irrelevant, and/or difficult to understand and use. The Consumer Assessments of Healthcare Providers and Systems (CAHPS) Hospital Survey indicates that consumers and patients are more interested in communicating directly with doctors, nurses, and hospital staff (Sofaer et al., 2005). Sofaer and Gruman (2003) specifies the conditions under which health care consumers can significantly affect their own health and the performance of the health care system, and argues that most of these conditions are unlikely to be met.

The relationship between consumerism and quality of care also has potential negative aspects. On the negative side, consumerist patients might follow their own beliefs, rather than those of their more knowledgeable physicians, in effect undermining the physician's authority, taking more of physicians' time, and perverting the agency relationship. A recent article on physician interactions with consumerist patients is quite telling:

A few months ago, Dr. David Golden says, he had to fire a patient for being obnoxious. The patient had a cough. After examining him, Golden recommended a medication. But the patient did his own research and became worried about side effects. "He said, 'But I read about this on the Internet, and I know this and I know that, and I know I'm right,'" remembered Golden, an allergist in Baltimore, Maryland. Golden says he tried to explain why the side effects weren't as bad as the patient thought, and why the medicine would take care of his cough. "But he wasn't open to discussing anything. He countermanded everything I said. So I told him, 'You know it all, so go take care of yourself. I'm not your doctor any more.'" Golden says he's all for empowered and educated patients, but some patients have become so empowered, they're actually putting their care in jeopardy. "I've been doing this for 28 years, and unquestionably it's gotten much worse," Golden says. (Cohen, 2008)

While such definitively negative interactions are probably rare, there is no debate that greater consumer involvement in decisionmaking has altered the doctor-patient relationship. Virtually all observers agree. An editorial in *the Lancet,* (2005) focused on consumerism and the doctor-patient relationship, but left open the question of effects on quality:

Patients have a wealth of information at their fingertips through the Internet. What most do not have, however, is the skill and knowledge to sift useful and valid information and evidence from useless or harmful advice. In a mutually beneficial and effective patient-doctor partnership, medical expertise and knowledge need to be an accepted and valued part of that interaction, just as much as doctors need to have the time and skills to communicate preventive measures and treatment choices to patients appropriately. (p. 343)

Consumerist proclivities also have the potential to strongly affect the physician's time allocation, possibly in an adverse way. Time is a scarce resource in the doctor-patient relationship, and a fundamental input into quality of care. It is the focus of our theoretical model, and a central element of our empirical study. While consumerism could be beneficial if it enabled patients to effectively demand more time from their doctor – who often has an incentive to move on – when their condition merits more care and attention, perhaps consumerist patients are, in effect, "time hogs" who describe their symptoms and knowledge at length.

Such minutes benefit them, if only marginally, but take critical time from others. In the worst case, physicians may have to spend extra time and effort dissuading consumerist patients from requested treatments of dubious value. The effect of consumerism on the quality of care is an empirical issue that we seek to investigate in this study.

Our investigation employs a unique dataset that provides information on physicians' perceptions about quality-of-care indicators in their practices, as well as a measure of consumerism, to test the model empirically. The results are striking. We find that physicians perceive increased consumerism to *adversely* affect the quality of care for all three of our quality measures. Moreover, the magnitudes of these negative relationships appear to be substantial.

The rest of this paper is divided into six parts. Part 2 presents the theoretical model. Part 3 describes the data and variables. The estimation strategy is spelled out in Part 4, and the results are provided in Part 5. Part 6 distills the results and their policy implications.

2. THEORETICAL MODEL: HOW CONSUMERISM AFFECTS QUALITY

2.1. Basic Model.

The potential benefits of consumerism are well known. This section presents a theoretical model that illustrates one of the potential drawbacks of consumerism, namely that consumerist patients can place additional demands on doctors' time, thereby reducing the time available to others. This "time externality" can harm other consumerist patients, non-consumerist patients, or both. Ultimately, this effect must be weighed against the potential gains from consumerism in determining whether it is beneficial overall (and for whom).[2]

Consumerist patients know more than their less-informed peers about their own health and medical treatments. They usually have greater concerns about their health, since that can spur the effort to gather information. The critical theoretical question is how these characteristics translate into the ultimate quality of care delivered to them and to patients as a whole. Our basic model addresses the doctor's allocation of time to two classes of patients, consumerist and

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[2] Our theoretical model is in the spirit of other recent theoretical contributions that explain surprising responses in the health care sector due to its many second-best features. Thus measures that increase competition may have significant downsides. Consider hospital waiting times. If competition among hospitals is sufficient, competition will increase waiting times. Moreover, policies that reduce travel cost may do the same. See Brekke at al. (2008). In various points in the paper, we identify countervailing potential benefits from consumerism.

ordinary, assuming that she has a fixed patient load.[3] The fixed patient load implies that the doctor's revenue is effectively fixed, and so we treat the doctor as if she maximizes the average quality of the patients she treats. A more complex model, where consumers could switch among doctors, thereby varying patient load, and physicians were concerned with income not merely quality, would not change the qualitative nature of the results.

When the doctor spends t minutes with an ordinary patient, the health quality gain is produced according to $h_o=h(t)$. We normalize $h(o)=0$, so that $h(t)$ is interpretable as the health gain from t minutes of treatment. It is assumed that $h(t)$ is strictly increasing and strictly concave, with $h'(0)<\infty$. That is, there are positive but decreasing returns to time with any patient over the relevant range,[4] and quality for zero time is normalized to 0. To simplify, we assume that all patients suffer the same representative condition, though our normalization of $h(o)=0$ could allow for different initial health states..

The health-time relationship for an ordinary patient is $h_o=h(t)$. Suppose that fraction μ, $0 \leq \mu \leq 1$, of patients coming into the doctor's office is consumerist. Consumerist patients differ from ordinary patients in two ways. First, because they are both more knowledgeable and more concerned, their time with the doctor is more productive. For example, they may be more effective in describing symptoms, or better able to follow instructions. The consumerist's potential to enhance the productivity of time spent with the doctor is represented by the parameter $a \geq 1$, which multiplies the productivity of an entire doctor-patient encounter of a given length.

Second, despite their superior knowledge and attentiveness, they may take too much of the doctor's time. They may hope to convince the doctor of their expertise or to secure more information for themselves, expecting in the process to benefit from more time with the doctor, or they may simply feel a strong need for information. For example, they might inquire, "Couldn't this be condition X?" They may ask to have things explained to them, when that adds little or no value, or they may inquire about irrelevant treatments. The parameter p, where $0 \leq p \leq 1$, represents the fraction of the doctor's time with the consumerist devoted to high- as opposed to low-productivity communication. A minute of low productivity communication has productivity b, where $b<1$. Thus if a physician spends t minutes with a consumerist patient, the *effective* time spent with that consumerist is $t_e = (p+b(1-p))t$.

For notational convenience, let $r = p + b(1-p)$. Variable r can be interpreted as taking into account that consumerists convey information less efficiently than non-consumerists. Thus, if a piece of information takes 1 minute to elicit from a non-consumerist, it takes $1/r > 1$ minutes to elicit from a

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[3] For explanatory purposes, we will treat the physician as female and patients as male.
[4] This allows for an initial bit of time in a visit that yields little benefit by itself.

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consumerist. Note that even though it takes longer to extract information from the consumerist, the physician may be able to make better use of it, as captured by the fact that a may be strictly greater than 1.

Taking both factors into account, the time-health relationship for a consumerist patient is thus $h_c = a\, h(r\, t)$. Suppose that the doctor's average time spent per patient must be less than or equal to T. The quality-maximizing doctor, able to identify types, chooses how much time to spend with each consumerist and each ordinary patient. Let t_o denote the time spent with each ordinary patient, and let t_c denote the time spent with each consumerist; the doctor's problem is to choose t_o and t_c to maximize average quality subject to the constraint that average time per patient be less than or equal to T:

$$\max_{t_o,\, t_c} (1-\mu)\, \left[h\!\left(t_o\right) \right] + \mu a h\!\left(rt_c\right) \ ,$$

$$s.t.\ (1-\mu)\ t_o + \mu t_c \le T.$$

Deriving and analyzing the first-order conditions for this problem shows that if the doctor devotes any time to each type of patient, her optimal choices solve:

$$h'\!\left(t_o^*\right) = arh'\!\left(rt_c^*\right) \ ,$$

where asterisks denote optimal values of t_o and t_c. Note the factor ar, which multiplies the marginal value of health for consumerist patients on the right-hand side of this expression. This factor represents the net effect of the two aspects of consumerism (i.e., that consumerists are more productive patients, but possibly less efficient users of the doctor's time). When $ar>1$, the first effect outweighs the second, while if $ar<1$, the second effect outweighs the first. Thus, if the doctor sees both types of patients, then if $ar<1$, effective time spent with ordinary patients is greater than effective time spent with consumerists ($t_o^* > rt_c^*$), while the opposite conclusion holds ($t_o^* < rt_c^*$) if $ar>1$.

Our goal is to characterize the effect of consumerism on quality. That is, we want to determine how a positive fraction μ of consumerist patients affects average quality. To facilitate intuition and illustrate possibilities, it is useful to consider the extreme case where the marginal utility from quality is linear up to some limit, after which it falls to zero. That is, let $h(t) = kt - \frac{1}{2}\, t^2$ for $0 \le t \le k$ and $h(t) = \frac{1}{2}\, k^2$ for $t > k$.[5]

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[5] While this assumption facilitates the analysis, the graphical arguments show that the qualitative results generalize to more general functional forms. Further, the goal of the model is to illustrate that the relationship between consumerism and quality is complex, and that consumerism need not

There are two basic cases to consider: *ar>1*, and *ar<1*.[6]

Case 1: *ar>1*. In this case, the consumerists' better use of the doctor's information (*a>1*) outweighs their tendency to take up the doctor's time for low-value interactions. The marginal utility of the tth minute spent with an ordinary patient is $h'(t) = k-t$, while the marginal utility of the tth minute spent with a consumerist patient is $arh'(rt) = ark-ar^2t$. Thus, when *ar>1*, the marginal-utility of time curve for consumerists lies everywhere above the marginal-utility curve for ordinary patients. See Figure 1.

Figure 1: Marginal Benefit: *ar > 1*.
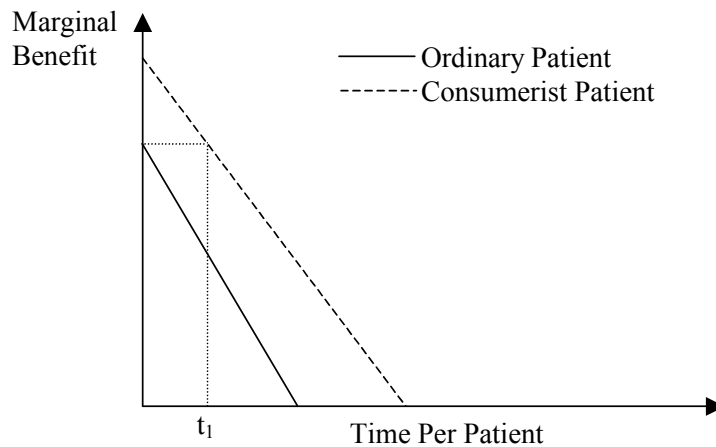
In this case, when the doctor's time budget is tight, i.e., *T* is small, the doctor will devote all her time to consumerists, because they are much more effective producers of quality than ordinary patients. As the doctor's time budget increases, the doctor spends more and more total time with the consumerists, working her way down the consumerists' marginal value curve up to the point, shown as t_1 in the figure, where the marginal health benefit of the last minute spent with a consumerist equals the marginal health benefit of the first minute spent with an ordinary patient. Since the marginal health benefit of time for ordinary patients when $t_o = 0$ is $h'(0) = k$, this occurs when $k=ar(k-rT'/\mu)$, or $\mu k(ar-1)/ar^2 = T'$. When the total time budget is T', consumerist patients receive $t_1 = k(ar-1)/ar^2$ minutes of care. At t_1 the doctor begins spending time with each kind of patient. The solution to the doctor's problem is found by solving:

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improve quality. Given that this is true for the simple functional form employed here, it is all the more likely to be so in less well-behaved environments.
[6] For brevity, we do not present the knife-edge case where ar=1. The analysis is available from the authors.

$$k - t_o^* = ark - ar^2 t_c^*, \text{ and}$$
$$\mu t_c^* + (1 - \mu) t_o^* = T, \tag{1}$$

which has solution:

$$t_c^* = \frac{T + k(ar - 1)(1 - \mu)}{ar^2(1 - \mu) + \mu}, \text{ and}$$
$$t_o^* = \frac{ar^2 T - \mu k(ar - 1)}{ar^2(1 - \mu) + \mu}. \tag{2}$$

Eventually, as T continues to increase, the marginal health benefit of spending additional time with either type of patient reaches zero. At this point, even if the doctor's time budget continues to increase, the doctor gives no more time to either type of patient. This occurs when $h'(t_o^*) = 0$, or $T'' = k(r + \mu - r\mu)/r$. Thus, the full solution is given by:

$$t_c^* = \begin{cases} T/\mu & \text{if} \quad 0 \le T \le T', \\ \frac{T + k(ar-1)(1-\mu)}{ar^2(1-\mu) + \mu} & \text{if} \quad T' < T \le T'', \quad \text{and} \\ k/r & \text{if} \quad T > T''; \end{cases}$$

and

$$t_o^* = \begin{cases} 0 & \text{if} \quad 0 \le T \le T', \\ \frac{ar^2 T - \mu k(ar-1)}{ar^2(1-\mu) + \mu} & \text{if} \quad T' < T \le T'', \quad \text{and} \\ k & \text{if} \quad T > T''. \end{cases}$$

Figure 2 shows t_o^* and t_c^* as functions of the overall time budget, T.

We are primarily interested in determining the impact on quality of the presence of consumerists. The baseline case we consider is one in which all patients are not consumerist. In the baseline case, all patients are identical, and each receives T minutes of care.

Next, we characterize, for any time budget T, how consumerism affects quality. Relative to the situation where every patient is ordinary, since $T/\mu > T$, for $0 \le T \le T'$ were there consumerists in the population, they would get more quality than in a world where no patient was consumerist. Consumerists also get more quality than they would in the baseline case when $T > T''$, since $ah(r(T/r)) = a\,h(T) > h(T)$. Since t_c^* is a continuous function of T, consumerists would only get less quality than in the baseline case if $t_c^* = T$ for some $T' < T < T''$. It is straightforward to verify that no such solution exists, and hence when $ar > 1$

Figure 2: Optimal Time Allocation: *ar > 1*.
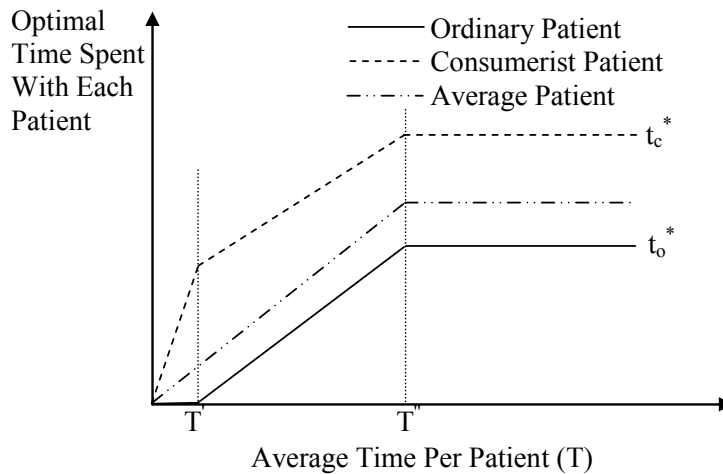
consumerists always receive more quality than do the ordinary patients who populate the baseline case.

Next, consider how consumerism affects the quality received by ordinary patients. Note that when $ar>1$, consumerists always receive more time than non-consumerists. Since for $T<T''$, $\mu t_c^* + (1-\mu)t_o^* = T$, this implies that $t_o^* < T$, and hence that ordinary patients receive less quality when consumerists are present than they would in a world without consumerism. For $T \geq T''$, ordinary patients get the same quality with or without consumerists, since the doctor's time-budget constraint does not bind.

Figure 3 shows how quality changes as a function of T. Average quality must be higher with consumerism than without. To see this, note that the marginal quality curve for consumerists lies everywhere above the marginal quality curve for ordinary patients. Thus if the doctor were to devote T minutes to every patient in a world with consumerism, the average quality would be greater with consumerists than without simply because when $ar > 1$, consumerists convert time into quality more efficiently than do ordinary patients. Given that the doctor is maximizing average quality, average quality must always be higher with consumerism than without.

Case 2: *ar<1*. Unlike in Case 1, here the marginal quality curves for consumerists and ordinary patients cross, as illustrated in Figure 4. Thus, consumerists are no longer always more efficient quality producers than ordinary patients. When her total time budget is small, the doctor's time is better used to concentrate on ordinary patients, since the lower quality per minute of the consumerists' hunger for information outweighs the fact that they are more productive consumers of the doctor's advice. On the other hand, when time is

Figure 3: Optimal Quality: *ar > 1*.

Average Time Per Patient (T)
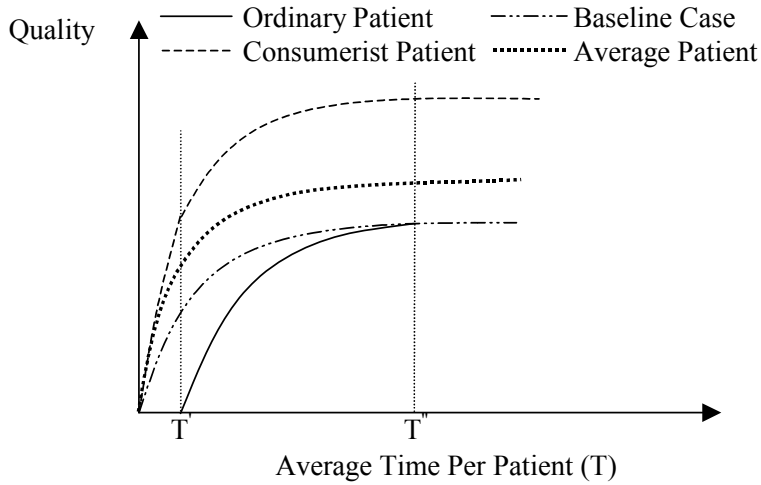
Figure 4: Marginal Benefit: *ar<1*.

Time Per Patient
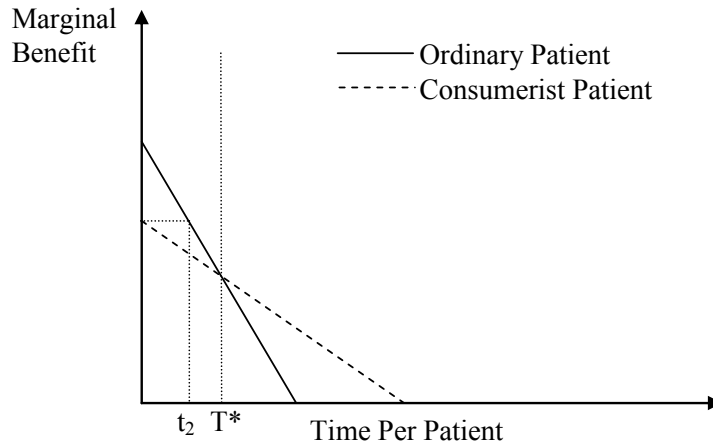
abundant the second effect dominates, and the maximizing doctor concentrates more time on consumerists.

For low levels of *T*, it is optimal for the doctor to devote all of her time to ordinary patients.[7] In this range, each ordinary patient receives $T/(1-\mu)$ minutes of time, and each consumerist receives 0. This is true up until the point where the marginal quality of time spent on ordinary patients equals *ark*, or $k - T/(1-\mu) = ark$. Letting T^0 denote the solution and solving, this yields $T^0 = (1-\mu)(1-ar)k$.

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[7] Of course, in reality this corresponds to the physician spending minimal time with consumerists and as much time as possible with ordinary patients.

As in the previous case, once the marginal quality for ordinary patients drops to the point where it is worthwhile to spend time on consumerists, the solution to the problem is found by solving the equations in (1), which yields solution (2). This remains the solution up until the point where the marginal utility of quality equals zero, which once again occurs at $T'' = k(r+\mu - r\mu)/r$. Thus the solution to the doctor's problem in Case 2 is given by:

$$t_c^* = \begin{cases} 0 & \text{if} \quad 0 \le T \le T^0, \\ \dfrac{T+k(ar-1)(1-\mu)}{ar^2(1-\mu)+\mu} & \text{if} \quad T^0 < T \le T'', \quad \text{and} \\ k/r & \text{if} \quad T > T''; \end{cases}$$

and

$$t_o^* = \begin{cases} T/(1-\mu) & \text{if} \quad 0 \le T \le T^0, \\ \dfrac{ar^2T-\mu k(ar-1)}{ar^2(1-\mu)+\mu} & \text{if} \quad T^0 < T \le T'', \quad \text{and} \\ k & \text{if} \quad T > T''. \end{cases}$$

Clearly, consumerists receive less time than ordinary patients when $0 \le T \le T^0$, and consumerists receive more time than ordinary patients when $T \ge T''$. Since t_c^* and t_o^* increase linearly for $T^0 \le T \le T''$, this implies that there is a critical time level, T^X, such that ordinary patients receive more time for $T < T^X$ and consumerists receive more time for $T > T^X$. Further, t_c^* increases more rapidly with T than t_o^* for $T^0 \le T \le T''$. Figure 5 shows the optimal time spent with each type of patient as a function of T.

Figure 5: Optimal Time Allocation: *ar < 1.*
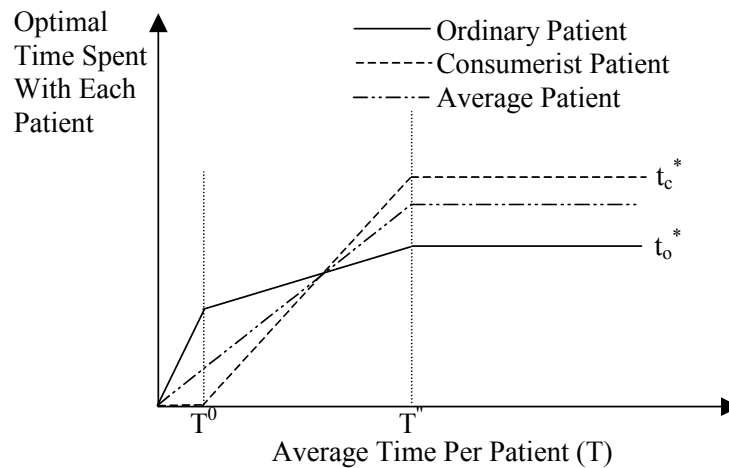
Having characterized the solution, we turn once again to the question of how, for any time budget, quality with consumerism compares to quality without. For very tight time budgets, $0 \leq T \leq T^0$, consumerists get zero time and hence zero quality, and ordinary patients get more time and quality than they do in the baseline case. Average quality with consumerism is lower than in the baseline case, since the additional time spent on consumerists could be spent more productively on ordinary patients.

As before, for very high levels of time, $T \geq T''$, both consumerists and ordinary patients receive time up until the point where the marginal benefit from additional care falls to zero. Thus consumerists receive more quality, and ordinary patients receive the same quality as do the ordinary patients who comprise the baseline case. Over this range, since the maximum quality for a consumerist is higher than the maximum quality for an ordinary patient, average quality is once again higher with consumerism than in the baseline case.

For intermediate levels of T, it is straightforward to show that health quality for consumerists rises more steeply with T than does health quality for ordinary patients (because the marginal quality curve is flatter for consumerists than ordinary patients). This implies that as T ranges from T^0 to T'', the quality curve for consumerists crosses the quality curve for ordinary patients once (Figure 6).

Figure 6 has several notable features. As explained above, when doctors have ample time consumerists receive more quality than do the ordinary patients of the baseline case, and this increases average quality. When time is scarce, consumerists get zero time, and ordinary consumers receive more time than in the baseline case. The overall result is that average quality falls relative to the baseline case. With intermediate time budgets, average quality starts lower than in the baseline case, but then rises above it, starting at point A in Figure 6, since the quality curves are continuous and cross once.

There is a range of time budgets over which *both* consumerists and ordinary patients do worse than in the baseline case. To see why this must be so, consider the point where the marginal benefit curves for consumerists and non-consumerists cross, labeled T^* in Figure 4. If the time budget is T^*, then the doctor allocates the same amount of time to consumerists and ordinary patients. For that budget, ordinary patients get the same quality that they would get in a world without consumerism, while consumerists get less quality than would every patient in a world without consumerism (since the consumerist's marginal benefit curve lies everywhere below the marginal benefit curve for ordinary patients to the left of T^* in Figure 4).

Now, suppose that the time budget increases slightly to $T^* + \Delta$. Since the consumerists' marginal benefit curve lies above the ordinary patients' marginal benefit curve to the right of T^*, consumerists receive a disproportionate share of

this additional time. Thus, ordinary patients get less than $T^* + \Delta$ minutes of time, on average. This implies that they do worse in a world with consumerism than they do without consumerism (since in the latter world they receive $T^* + \Delta$ minutes of time). On the other hand, since at time budget T^* consumerists do strictly worse in a world with consumerism than people do without consumerism, by continuity they also do strictly worse at time budget $T^* + \Delta$. Thus, at $T^* + \Delta$ both consumerists and ordinary patients suffer from the presence of consumerists, and by continuity this is also true for a range of time budgets around $T^* + \Delta$.

Figure 6: Optimal Quality: *ar<1*.
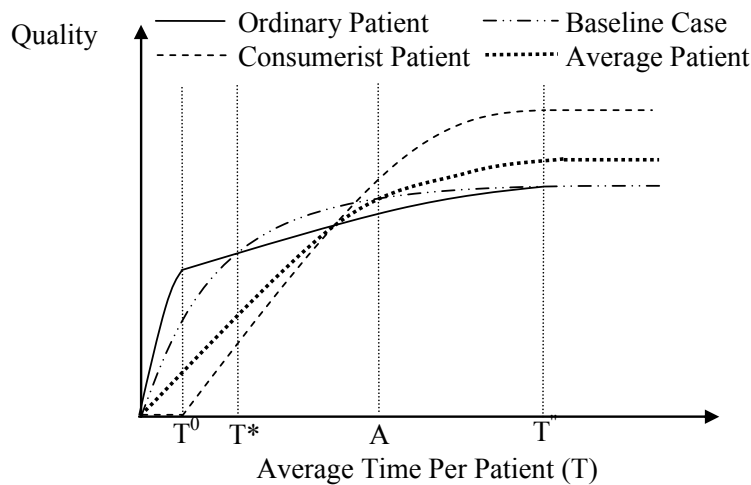
2.2. Discussion and Qualifications of the Theoretical Model

The model identifies an important channel through which consumerism can affect quality. Consumerism affects the doctor's optimal allocation of time between consumerists and non-consumerists. Consumerism is never Pareto-improving in the context of our stylized model. Thus, relative to a world in which all patients are ordinary, consumerism always harms either consumerists or ordinary patients, and sometimes both.

Even in a world where consumerists are more productive users of the doctor's information but do not "waste" the doctor's time (i.e., $a > 1$ and $r = 1$), consumerism harms ordinary patients. Here, the doctor chooses to spend more time with consumerists, since they benefit more from it. However, this necessarily leaves less time for ordinary patients. Although *average* quality increases in this case, ordinary patients suffer. Thus, at the very least, consumerism has distributional consequences.

When consumerists do not make efficient use of the doctor's time (i.e., $r < 1$), consumerism harms all patients. For example, if the marginal value of time

spent with consumerists is relatively low relative to ordinary patients early on, but higher after some point, then the doctor must spend a lot of unproductive time with consumerist patients before they get information that is (relatively) high-valued, thus leaving little time for ordinary patients. Ordinary patients suffer because they receive too little time from the doctor, while consumerists suffer because they make poor use of the time they take, especially the "early minutes" whose marginal value is low relative to time spent with ordinary patients. Xie et al. (2006) also identify sets of circumstances under which increasing the general level of patient-obtained information may harm patients.

For the sake of illustration we have assumed that the doctor has a fixed time budget and number of patients. The presence of consumerists imposes an externality, sometimes negative and sometimes positive, on ordinary patients and on each other. This would remain true even if the doctor's time were elastic, as long as it was not so elastic that she always devoted enough hours to reach a particular level of quality. If the doctor were inclined to vary T substantially, then the doctor would respond to the advent of consumerism by adjusting total working hours. If that adjustment were upwards, obviously, a Pareto improvement could result. If the doctor adjusted the number of patients, increasing their numbers could not lead to a Pareto improvement, and cutting their numbers leads to Pareto noncomparability, since some patients go from being seen to going without or being treated in a less favored setting.

The model presented here is simple, leaving aside critical factors such as financial incentives for doctors. However, the basic insights of the model, that consumerism need not benefit everyone and may in fact harm everyone, extend to more complex functional forms. Indeed, the fact that these phenomena arise in such a simple model suggests that they would be readily found in more complex models. To be sure, in practical situations consumerism will also yield benefits. Whether consumerism increases or decreases quality as well as how it alters the distribution of quality across different types of patients are empirical questions to which we now turn.

3. DATA AND VARIABLES

3.1 Data

We employ physician survey data from the 2000-01 Community Tracking Study (CTS), conducted by the Gallup Poll and maintained at the Center for Studying Health System Change. It includes 12,406 physicians who are engaged in direct patient care for at least 20 hours per week in 60 selected communities in the United States. The response rate of the CTS physician survey is above 60 percent

(Strunk and Reschovsky, 2002).[8] The survey inquires about a physician's percent of consumerist patients, adequacy of time with patients, and the quality of health care she delivers, as well as a wealth of information on the physician's specialty, practice and demographic characteristics, income, involvement with managed care arrangements, and perceptions about competitive pressures. After excluding approximately 4 percent of physicians who did not respond to questions about consumerist patients, the study sample includes 11,936 respondents.

3.2 Dependent Variables

We consider three dependent variables, each providing a slightly different insight into physicians' perceptions of the quality of care they provide. All three quality-of-care variables are measured on a 5-point Likert scale. Possible physician responses to our three quality questions are: 1) disagree strongly, 2) disagree somewhat, 3) neither agree nor disagree, 4) agree somewhat, and 5) agree strongly.

Our theoretical model recognizes that consumerist patients may take up more physician time than do ordinary patients. Thus, we first seek to examine the effect of consumerism on physicians' perceptions about the adequacy of time with their patients. Although the question does not directly inquire about quality, time adequacy can be viewed as a measure of the physician's view of her ability to provide quality care. If time is inadequate, presumably she could be doing more for patients if she had more time.

Quality Measure 1 (Q_1): S*trength of agreement: I have adequate time to spend with my patients during typical office/patient visits.*

The other two indicators more directly measure the quality of care. The first considers whether the physician believes that she can provide high-quality care to all of her patients, and the second indicates whether the physician believes that she can maintain continuing relationships with patients as a means to promote trust, communication, understanding of the patient's overall condition, and thus quality of care.

Quality Measure 2 (Q_2): *Strength of agreement: it is possible to provide high-quality care to all of my patients.*

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[8] A review of the CTS database concluded that "there was little evidence of a systematic under representation among demographic and practice characteristics available for all physicians from the American Medical Association Masterfile" (Center for Studying Health System Change, 2003a, p. C19-C20).

Quality Measure 3 (Q₃): *Strength of agreement: it is possible to maintain the kind of continuing relationships with patients over time that promote the delivery of high-quality care.*

3.3 Independent Variables

The independent variable of primary interest is a measure of consumerism in the physician's practice. We also employ a number of controls to help isolate the effect of consumerism on our outcome variables.

Consumerism measure. The CTS physician survey asked physicians the following question, which provides direct evidence on the extent of consumerism in a physician's patient caseload:

> *During the last month, what percentage of your patients talked about medical conditions, tests, treatments, or drugs they had read or heard about from various sources other than you, such as the Internet, their friends, relatives, TV, radio, books, or magazines?*

The response to this question gives our measure of the percent of consumerist patients in the physician's patient caseload. As noted earlier, consumerism takes many forms, and any attempt to define or measure it is open to criticism. The strength of this measure is that it captures the essence of consumerism: namely, gleaning medical information from sources other than one's doctor and engaging one's doctor in discussions about alternative treatment options. This measure of consumerism also accords with the one in our theoretical model.

Other explanatory variables. In our analysis, we also control for a variety of physician demographic and practice characteristics that may affect time adequacy and the quality of care. These variables include the physician's gender, race, board certification status, and whether the physician is a domestic or foreign medical graduate. We also control for physician specialty (general/family practice, internal medicine, medical specialty, surgical specialty, psychiatry, and obstetrics/gynecology with general/family practice as the reference group), practice experience (categorized into groups to account for potential non-linearities: less than or equal to 5 years, 6-14 years, 15-24 years, and greater than or equal to 25 years with 6-14 years as the reference group), type of practice (solo/2 physicians practice, group practice with 3 physicians or more, HMO practice, medical school, hospital, and other practice type, with solo/2 physicians practice works as the reference group), annual practice income and annual hours of work.

To help control for the characteristics of patients within a physician's practice, we include the percentage of the physician's revenue from managed care, Medicaid, and Medicare. Competitive pressures in the physician's practice area may also affect health care quality. Thus we use binary variables indicating whether the physician perceives his market area to be very competitive, somewhat competitive, or not competitive.

Instrumental variables. As we discuss more fully below, our consumerism measure may be endogenous. To cope with this, we employ instrumental variables estimation. The CTS household survey studies individuals' health care access, utilization, coverage, costs, and other experiences with the health care system. As the first step, we merged the CTS physician survey with the CTS household survey for the same year, utilizing data on the 60 distinct CTS survey areas. The CTS household survey had 59,725 respondents in approximately 33,000 households (Center for Studying Health System Change, 2003b). We then employed information from the household survey to provide instrumental variables for the measure of consumerist patients in each physician's practice area.

The 2000-2001 CTS household survey asked each respondent a direct question about consumerism.

> *During the past year, did you look for or get information about a*
> *personal health concern from sources other than your physicians:*
> *(1) Internet; (2) friends or relatives; (3) TV or radio; (4) book or*
> *magazines; (5) health care professionals (excluding physicians);*
> *(6) health care organizations; or (7) somewhere else?*

Respondents in the CTS household survey answered whether they received information from each of above 7 sources, and we initially constructed 7 binary variables representing a "yes" or "no" answer to each information source. However, these measures were highly collinear because a respondent may use several sources for medical information. Friends or relatives were the most commonly cited source of information, though other sources were important as well. This is consistent with findings in the literature that people often trust the medical information from their friends and relatives as well as from their doctors (see e.g., Marshall et al., 2000; Schwartz et al., 2005; Wilson et al., 2007). We therefore constructed two instrumental variables from these data:

> *Instrument 1: A dummy variable equal to 1 if the respondent got*
> *medical information about a personal health concern from friends*
> *or relatives and equal to 0 otherwise;*

and

Instrument 2: A count variable indicating the total number of sources beyond his or her physician from which the respondent obtained medical information.

We then calculated the mean values of the two instrumental variables for the 60 CTS survey areas. Each instrumental variable thus measures the extent to which patients in a survey area acquire medical information from sources other than their physicians. Both variables are strongly and positively correlated with the percentage of consumerist patients that each physician treats. Because these two variables are strongly correlated, however, they are used separately.

4. ESTIMATION STRATEGY

4.1. Model Specification

We estimate the effect of consumerism on each of the three quality measures described above. We assume that the quality of care that a physician perceives takes the following functional form:

$$Q = \beta_0 + X\beta_1 + C\beta_2 + \varepsilon, \tag{3}$$

where
Q	=	quality of care measure: Q_1, Q_2, or Q_3;
X	=	a vector of physician demographic/practice characteristics;
C	=	the consumerism measure;
$\beta_0 - \beta_2$	=	the coefficients to be estimated; and
ε	=	a disturbance term.

The key parameter of interest is coefficient β_2, which shows the effect of consumerism on the quality of care measure. If β_2 is positive, then consumerism improves the quality of care. Our theoretical model hypothesized that consumerist patients take more physician time and showed the conditions under which either positive or negative effects on care of quality are possible.

4.2. Endogeneity

The above specification does not recognize that the measure of consumerism may be endogenous. Endogeneity may enter due to either unobservable omitted variables or simultaneity (reverse causality) (Wooldridge, 2001). If it is present,

the estimated coefficient β_2 in equation (3) will be biased because the consumerism measure C and the disturbance term ε are correlated. To illustrate a potential source of bias, physicians and patients are not randomly selected, and consumerist patients may choose their physicians based on some criteria that researchers cannot observe. Those physicians who tend to match with consumerist patients may be more tolerant of these patients, have more time for each patient, and/or may have distinctive views on how consumerism affects their ability to provide high-quality care. In other words, there exist some omitted variables (such as unobservable physician demographic and/or practical characteristics) that affect both the share of consumerist patients that individual physicians face and the quality of care they offer. These unobservable omitted variables enter into the disturbance term in the equation (3), which makes the share of consumerist patients reported by individual physicians potentially endogenous. The endogeneity due to such matching would bias the measurement of consumerism on quality found in equation (3). The sign of this bias is not predicted, and it depends on whether the relationships between unobservable omitted variables and the share of consumerist patients by individual physicians are positive or negative. If positive (negative), equation (3) will overestimate (underestimate) the true effects (absolute magnitudes) of consumerist on physicians' health care quality.

In addition, endogeneity may arise if patients who receive poor care feel a greater need to acquire information about their care (become consumerist patients). This would produce reverse causality, whereby reported health care quality (the dependent variable) would be related to a physician's share of consumerist patients (the main explanatory variable), even though consumerism in no way affected quality. Such reverse causality would lead the single-equation approach to overestimate the negative effect of consumerism or underestimate the positive effect of consumerism.

To address this endogeneity issue, we write the consumerism equation as:

$$C = \alpha_0 + X\alpha_1 + Z\alpha_2 + u , \tag{4}$$

where
Z = instrumental variable(s);
$\alpha_0 - \alpha_2$ = the coefficients to be estimated; and
u = a disturbance term.

If both the quality measure and consumerism were continuous, traditional two-stage least squares would yield a consistent estimate of β_2. But when, as in the present case, all the quality measures are ordered and categorical variables, two-stage least squares is not appropriate (Terza et al., 2008).

The control function model is a two-step method that can consistently estimate the effect of consumerism on the quality of care in this case (Smith and Blundell, 1986; Rivers and Vuong, 1988; Wooldridge, 2001).[9] The first step for implementing the control function approach estimates equation (4) via ordinary least squares (OLS) and obtain the estimated residual $\hat{u}$. Then the estimated residual in equation (3) is appended as a new covariate to estimate the following equation:

$$Y = \beta_0 + X\beta_1 + C\beta_2 + \hat{u}\beta_3 + e \; . \tag{5}$$

This estimation approach also provides an exogeneity test of the consumerism variable (Hausman, 1978, 1983; Wooldridge, 2001). Although pure maximum likelihood estimation is more efficient, this two-step method as a limited information procedure is quite straightforward and still produces consistent estimates of the model coefficients β_0 - β_3 (Terza et al., 2008). In addition, maximum likelihood estimation depends on the joint distribution assumed between two disturbance terms, and "sometimes it can be computationally difficult to get iterations to converge" (Wooldridge, 2001). In the case where the second-stage dependent variable is continuous, so that two-stage least squares estimation is appropriate, this two-step method as a limited information procedure produces exactly the same results as two-stage least squares (Anderson, 2005). Shih and Ming (2011) also use the two stage residual inclusion estimation to address the endogeneity of more-informed patients on the demand-induced supply of medical services.

Due to the two-step feature of the model, the standard errors in the second step will be adjusted by nonparametric bootstrap techniques using 200 replications (Terza et al., 2008). Bias-corrected statistical levels are reported for estimated coefficients in the tables. Although OLS and two-stage least squares do not account for the ordered and categorical features of our dependent variables, we also report estimates from those models as a robustness check, and compare them with the control function model results.

5. RESULTS

Table 1 provides descriptive statistics for our study sample. The mean values of the three quality measures are 3.40, 3.96 and 3.82, respectively, on the ordered and categorical scales between 1 and 5. The independent variable that is our focus is the measure of the percentage of patients who are consumerist. On average, 16.7 percent of patients are in this category.

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[9] Terza et al. (2008) term this model as two-stage residual inclusion estimation.

Table 1: Variable names and summary statistics, N = 11,936.

Variables	Mean		Min	Max
Quality of care 1				
Physicians have adequate time to spend with patients during typical office visits	3.396	(1.422)	1	5
Distribution (%)				
1. disagree strongly	12.930		0	100
2. disagree somewhat	23.190		0	100
3. neither agree nor disagree	2.350		0	100
4. agree somewhat	34.390		0	100
5. agree strongly	27.140		0	100
total	100.000			
Quality of care 2				
Physicians can provide high quality care to all of patients	3.956	(1.216)	1	5
Distribution (%)				
1. disagree strongly	5.100		0	100
2. disagree somewhat	14.560		0	100
3. neither agree nor disagree	1.940		0	100
4. agree somewhat	36.480		0	100
5. agree strongly	41.920		0	100
total	100.000			
Quality of care 3				
Physicians can maintain continuing relationships with patients to promote high quality care	3.825	(1.294)	1	5
Distribution (%)				
1. disagree strongly	7.630		0	100
2. disagree somewhat	15.170		0	100
3. neither agree nor disagree	2.670		0	100
4. agree somewhat	36.150		0	100
5. agree strongly	38.380		0	100
total	100.000			
Consumerist patient percentage	16.709	(16.868)	0	85

Data source: Community Tracking Study (CTS) physician survey 2000-2001. Instrumental variables are from Community Tracking Study (CTS) household survey 2000-2001. Standard deviations shown in parentheses.

Table 1 (continued): Variable names and summary statistics, N = 11,936.

Variables	Mean		Min	Max
Instrumental variables for consumerist patient percentage				
Mean percentage of people in CTS survey areas who get medical information from friends or relatives[1]	19.211	(2.149)	11.912	27.249
Mean number of sources from which people in CTS survey areas get medical information[1]	0.708	(0.081)	0.439	1.024
Other explanatory variables				
Annual practice income in $100,000	1.579	(0.828)	0	4.000
Annual practice hours in 1,000	2.521	(0.813)	0	8.400
Proportion of revenue from managed care	0.459	(0.277)	0	1
Proportion of revenue from Medicare	0.297	(0.229)	0	1
Proportion of revenue from Medicaid	0.154	(0.178)	0	1
Male (dummy variable)	0.739		0	1
Board certified (dummy variable)	0.879		0	1
Foreign medical school graduate (dummy variable)	0.207		0	1
Race (dummy variables)				
White	0.791		0	1
Black	0.040		0	1
other race	0.169		0	1
Practice experience (dummy variables)				
less than or equal to 5 years	0.043		0	1
6-14 years	0.404		0	1
15-24 years	0.317		0	1
more than or equal to 25 years	0.236		0	1
Practice specialty (dummy variables)				
general/family practice	0.265		0	1
internal medicine	0.205		0	1
pediatrics	0.146		0	1
medical specialty	0.193		0	1
surgical specialty	0.113		0	1
psychiatry	0.043		0	1
obstetrics/gynecology	0.036		0	1
Practice type (dummy variables)				
solo/2 physicians	0.346		0	1
group practice >=3 physicians	0.291		0	1
HMO	0.045		0	1
medical school	0.078		0	1
hospital based	0.133		0	1
other practice type	0.107		0	1
Practice market competition status (dummy variables)				
not at all competitive	0.339		0	1
somewhat competitive	0.450		0	1
very competitive	0.210		0	1

Data source: Community Tracking Study (CTS) physician survey 2000-2001. Instrumental variables are from Community Tracking Study (CTS) household survey 2000-2001. Standard deviations shown in parentheses

5.1. Associations between consumerism and the quality of care.

Figure 7 provides information on the association between the percentage of a physician's patients who are consumerist and the quality of care. For all three quality measures, there is a negative relationship. That is, physicians who disagree more, or equivalently agree less, about their ability to provide high quality services have more consumerist patients. The negative correlation for each of the three measures is statistically significant at the 1 percent level.[10] Thus, leaving aside any other factors, there is a negative relationship between consumerism and reported quality. The remainder of our paper incorporates other factors by focusing on multivariate evidence, and takes particular care to overcome potential endogeneity problems.

5.2. Multivariate evidence.

It is possible that some third intervening variable affects both consumerism and the quality of care. Hence, it is essential to determine whether our findings persist in multivariate analysis. Table 2 provides the results of OLS and two-stage least squares estimates. Due to space limitations, we only report the estimated coefficients of consumerism measures in Table 2; the full tables of results for the three quality measures are in Appendix Tables A1-A3. OLS produces a statistically significant, negative effect of consumerism on each quality measure. However, while the OLS estimates support the contention that consumerism lowers quality, the magnitude of the coefficient is small.

Columns 2 and 3 of Table 2 control for endogeneity, as discussed above, using two different instruments. We use each instrument separately to check the robustness of the results to an alternative choice of instruments. Using two-stage least squares we continue to find negative coefficients on consumerism, with the coefficient estimates increasing in magnitude relative to OLS.

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[10] By the test of analysis of variance (ANOVA).

Figure 7: Percentage of physicians saying they have adequate time to spend with patients during typical office visits.

Quality of Care 1: Have Adequate Time to Spend with Patients during Typical Office Visits

Data source: Community Tracking Study (CTS) physician survey 2000 - 2001

Quality of Care 2: Can Provide High Quality Care to All of Patients

Data source: Community Tracking Study (CTS) physician survey 2000 - 2001

Quality of Care 3: Can Maintain Continuing Relationships with Patients to Promote High Quality Care

Data source: Community Tracking Study (CTS) physician survey 2000 - 2001

Table 2: Selected estimates of OLS and two-stage least squares.

Variables	OLS	Two-stage least squares	
		Instrument 1[1]	Instrument 2[2]
Q1: Physicians have adequate time to spend with patients during typical office visits			
Consumerist patient percentage	-0.003***	-0.133***	-0.150***
	(0.001)	(0.037)	(0.047)
Q2: Physicians can provide high quality care to all of patients			
Consumerist patient percentage	-0.004***	-0.036*	-0.039*
	(0.001)	(0.019)	(0.022)
Q3: Physicians can maintain continuing relationships with patients to promote high quality care			
Consumerist patient percentage	-0.002***	-0.040*	-0.081**
	(0.001)	(0.021)	(0.032)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives. Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

The first stage results of the two-stage least squares estimates, provided in Appendix A4, show that each instrumental variable correlates strongly and positively with the percentage of consumerist patients; moreover, their coefficients are highly statistically significant. We also perform various tests of endogeneity, and tests of our instrumental variables. The results of these tests using quality measure 1 are reported in Appendix A4 and indicate that our instruments are valid. The F statistics for excluded instrument tests are 17.73 for the first instrument and 12.78 for the second instrument, which are larger than the threshold value of 10. The tests also indicate that our instruments do not have under-identification or weak instrument issues. The Wu-Hausman F test supports our conclusion that the consumerist measure reported by physicians is endogenous. The tests using the other two quality measures produce similar results and are available from the authors upon request. As noted previously, the OLS and two-stage least squares tests do not take the ordered and categorical feature of quality measures into account, implying that the estimates may not be efficient. Table 3 provides the results of multivariate ordered probit regression analyses predicting three quality of care measures respectively. Due to space limitations, we only report the estimated coefficients on consumerism measures in Table 3; the full tables of results for the three quality measures are in Appendix

Table 3: Selected estimates of ordered probit single equation model and ordered probit control function model.

Variables	Q[1]: Physicians have adequate time to spend with patients during typical office visits		
	Ordered probit model (coefficient)		
	Single equation model	Control function model	
		Instrument 1[1]	Instrument 2[2]
Consumerist patient percentage	-0.003***	-0.098***	-0.109**
	(0.001)	(0.030)	(0.048)
Fitted residual from the first stage	N/A	0.096***	0.107**
		(0.030)	(0.048)

Variables	Q[2]: Physicians can provide high quality care to all of patients		
	Ordered probit model (coefficient)		
	Single equation model	Control function model	
		Instrument 1[1]	Instrument 2[2]
Consumerist patient percentage	-0.004***	-0.037	-0.038*
	(0.001)	(0.023)	(0.021)
Fitted residual from the first stage	N/A	0.033	0.034
		(0.023)	(0.021)

Variables	Q[3]: Physicians can maintain continuing relationships with patients to promote high quality care		
	Ordered probit model (coefficient)		
	Single equation model	Control function model	
		Instrument 1[1]	Instrument 2[2]
Consumerist patient percentage	-0.002**	-0.040***	-0.070**
	(0.001)	(0.015)	(0.031)
Fitted residual from the first stage	N/A	0.039**	0.069**
		(0.015)	(0.031)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives. Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

Tables A5-A7. In the single equation model, there is a statistically significant, negative relationship between consumerism and quality (Q1). The second and third columns control for endogeneity, each using one of the two instrumental variables. To implement the control function correction for endogeneity, we first

estimate the models predicting the percentage of consumerist patients. The fitted residuals from the control function models in Table 3 are statistically significant, indicating that the consumerism measure is endogenous. (The two-stage least squares estimation in Table 2 and Appendix A4 also show that the consumerism measure is endogenous.) Controlling for endogeneity, we find a negative and significant effect of consumerism on the first quality-of-care measure. That is, this effect is substantially larger in absolute value than it is in the uncontrolled single equation model.

The coefficients on the fitted residuals are positive, indicating that the disturbance terms between the quality equation and consumerism equation are positively correlated (Wooldridge, 2001). What factors might produce this pattern? Patients might have preferences for their physicians' choices. Consumerist patients, who are both more informed and more demanding, might prefer physicians who are more likely to have adequate time to spend with patients and are willing to listen to their patients. If so, the single equation model, which does not adjust for patient selection effects, would understate the negative effects of consumerism on the time adequacy measure.

Table 3 also reports the multivariate results for the other two quality measures. The control function models again reveal negative and statistically significant relationships between consumerism and these quality measures. The control function models also indicate that the consumerism measure is endogenous. Consistent with the results for the first quality of care measure, the endogeneity-corrected estimates for the second and third quality of care measures again reveal a stronger negative relationship between consumerism and the quality of care than did the single equation model. Once again, selection effects – that consumerist patients choose higher-quality doctors – could explain or contribute to these patterns.

5.3. Marginal effects.

To gain a better sense of the magnitude of the effects of consumerism on quality, we estimated marginal effects (Table 4). These results are based on the control function model using instrument 1 (very similar results obtain for the model that uses instrument 2). As the table indicates, a 1 percent increase in consumerist patients reduces the probability of physicians' strongly agreeing that they have adequate time to provide high-quality care to all patients (quality measure 1) by 3.2 percent; reduces the probability of strongly agreeing that they can provide high-quality care to their patients by 1.5 percent (quality measure 2); and reduces the probability of strongly agreeing that they can keep continuing relationships with their patients by 1.5 percent. The table provides marginal effects for other possible responses as well. Two consistent patterns emerge from these marginal effects. First, a larger number of consumerist patients in a practice reduces the

physician's perceptions of quality. Second, these effects are meaningful in magnitude.

Table 4: Marginal effect of consumerism on quality of care.

The probabilities (%) changed[1]	Marginal effect of 1% more consumerist patient on the quality of care					
	Quality of care 1		Quality of care 2		Quality of care 3	
1. disagree strongly	1.90%	***	0.40%	**	0.50%	**
2. disagree somewhat	1.70%	***	0.60%	**	0.60%	**
3. neither agree nor disagree	0.08%	***	0.06%	**	0.08%	**
4. agree somewhat	-0.50%	***	0.40%	**	0.30%	**
5. agree strongly	-3.20%	***	-1.50%	**	-1.50%	**

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. The marginal effects are calculated after the ordered probit estimation using the control function method with the instrument 1.

We also consider larger changes in the percentage of consumerist patients on the distribution of the doctors' responses to the quality questions. We calculate the predicted probabilities for the first quality measure (time adequacy) with different consumerism levels, controlling for the endogeneity of consumerism with instrument 1. We set the shares of consumerist patients among all the patients from 5 percent (25th percentile of consumerism measure), 10 percent (50th percentile of consumerism measure), and 20 percent (75th percentile of consumerism measure). We find that, as the share of consumerist patients rises, substantially more physicians disagree strongly or disagree somewhat that they have adequate time to spend with patients. This suggests that consumerist patients do take more physician time during office visits. When the level of consumerism lies at the 25th percentile, 6.6 percent of physicians strongly disagree that they have adequate time to spend with patients during typical office visits. These predicted probabilities of disagreeing strongly increase to 13.3 percent when the level of consumerism is 50th percentile and 35.3 percent when the level of consumerism is 75th percentile. The predicted probabilities that a physician would agree strongly that she has adequate time are 55.21 percent, 42.83 percent, and 23.97 percent, respectively, as the levels of consumerism rise from 25th percentile to 75th percentile.

The predicted probabilities of the second and third quality measures using instrument 1 are also calculated. The trends are similar to those in the time measure. The predicted probabilities of quality measures using the instrument 2 are similar to those using the instrument 1. These results are available from the authors.

We also look at the effects of consumerism on quality across medical specialties. Almost all the results by various medical specialties with and without correcting for endogeneity of the share of consumerist patients by individual physicians are similar to those reported in the paper[11]. However, once we focus by specialty the sample sizes shrink considerably. For the quality of care 1, the results in the simple ordered probit estimation after correcting endogeneity for all the medical specialties (except psychiatry) show consumerism hurting quality, but only the results for general/family practice, internal medicine, pediatrics, and surgical specialty are statistically significant (p values < 0.01). For the quality of care 2, all the medical specialties (except surgical specialty) also show consumerism reduces quality after correcting endogeneity, but only the result for general/family practice is statistically significant (p value = 0.02). For the quality of care 3, five specialties (general/family practice, internal medicine, pediatrics, psychiatry, and obstetrics/gynecology) believe that consumerism decreases their quality after correcting endogeneity, but only the results for general/family practice and internal medicine are statistically significant (p values < 0.01).

Though our focus is on the effects of consumerism, this study yields additional insights about the quality of care. For example, other results indicate that physicians in various group practices perceive greater difficulty in providing high-quality care than those in solo practices. Physicians in managed care perceive less ability to provide high-quality care. Relative to general and family practitioners (the reference specialty), most specialists perceive a greater ability to provide high-quality care. Younger physicians are generally more likely to believe that they can provide high-quality care.

6. CONCLUSION

The changing relationships between physicians and their patients stimulated by the rise of consumerism may have profound implications for the quality of medical care. To date the literature has not examined, much less quantified, this relationship. Our theoretical model identifies a new channel through which consumerism may affect quality – by changing how the doctor optimally allocates her time to different kinds of patients. In the presence of this effect, our theoretical model shows that consumerism may hurt, not improve, quality. The empirical results show strong and consistent evidence that physicians with more consumerist patients are substantially less likely to believe that they can deliver high-quality care. These results are found with a single equation model (OLS or ordered probit estimation). They are much stronger when we employ instrumental variables to correct for endogeneity of the consumerism measure (i.e., employ a

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[11] Results are available from the authors upon request.

two-stage least squares or control function ordered probit estimation). The findings apply for each of our three alternative quality indicators.

A strong caveat is that our results rely on physicians' perceptions of quality, which may differ from actual quality. However, as long as perceived quality is positively correlated with actual quality, and this divergence does not vary systematically with consumerism, our results still have merit. Further, while it would be desirable to have evidence relating consumerism to health outcomes, objective outcome measures are rare, and it may take many years before it can be determined whether consumerism has an impact on mortality, for example. While such a study should be the subject of future research, our results provide more timely evidence on the relationship between consumerism and quality of care.

The negative association between consumerism and our quality-of-care measures holds potentially serious implications for the success of patient empowerment. Though perhaps more knowledgeable, consumerist patients may turn out to claim excess time to the detriment of other patients. If many patients in a practice are consumerist, a form of rat race may emerge among them. Efforts by many patients to claim disproportionate amounts of time – as may happen with grabby parents on a teacher's night – may lead to none of them getting it, and all being dissatisfied. This raises the additional risk that their physician may feel attacked and underappreciated.

These findings remind us that providing consumers with more health care information and increasing their role in medical decision making bring costs as well as benefits. Our theoretical model shows the possibility that the net results of consumerism for quality due to the effects on time demands could well be negative. Our empirical results indicate that they are.

The rise in consumerism has changed the nature of the agency relationship between physicians and their patients. This agency relationship lies at the heart of the performance of medical markets, as Arrow (1963) noted many years ago. We have long known that faithful agents are critical for effective medical performance. Modern developments have made it important to study the impact of better-informed but more demanding principals.

Appendix

Table A1: Full results of OLS and two-stage least squares estimation for the first quality of care measure.

Variables	Q1: Physicians have adequate time to spend with patients during typical office visits		
	OLS	Two-stage least squares	
		Instrument 1[1]	Instrument 2[2]
Consumerist patient percentage	-0.003***	-0.133***	-0.150***
	(0.001)	(0.037)	(0.047)
Other explanatory variables			
Annual practice income in $100,000	0.015	-0.024	-0.029
	(0.018)	(0.036)	(0.040)
Annual practice hours in 1,000	-0.183***	0.043	0.072
	(0.017)	(0.071)	(0.089)
Proportion of revenue from managed care	-0.568***	-0.188	-0.140
	(0.050)	(0.141)	(0.170)
Proportion of revenue from Medicare	-0.075	0.250*	0.291*
	(0.063)	(0.148)	(0.173)
Proportion of revenue from Medicaid	-0.266***	-1.082***	-1.185***
	(0.078)	(0.271)	(0.334)
Male	0.215***	-0.411**	-0.490**
	(0.032)	(0.186)	(0.235)
Board certified	-0.198***	-0.189**	-0.188**
	(0.041)	(0.075)	(0.082)
Foreign medical school graduate	0.061*	0.053	0.052
	(0.036)	(0.067)	(0.073)
Race			
White (reference)			
Black	-0.032	-0.269*	-0.298*
	(0.065)	(0.139)	(0.158)
other race	0.086**	-0.136	-0.163
	(0.039)	(0.095)	(0.112)
Practice experience			
less than or equal to 5 years	-0.007	0.239*	0.270*
	(0.065)	(0.139)	(0.158)
6-14 years (reference)			
15-24 years	-0.003	-0.215***	-0.242**
	(0.030)	(0.082)	(0.098)
more than or equal to 25 years	0.344***	0.044	0.007
	(0.035)	(0.106)	(0.129)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives. Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

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Table A1 (continued): Full results of OLS and two-stage least squares estimation for the first quality of care measure.

Variables	Q1: Physicians have adequate time to spend with patients during typical office visits		
	OLS	Two-stage least squares	
		Instrument 1[1]	Instrument 2[2]
Practice specialty			
general/family practice (reference)			
internal medicine	0.028	0.190**	0.210**
	(0.038)	(0.084)	(0.097)
pediatrics	0.241***	-0.172	-0.224
	(0.044)	(0.143)	(0.174)
medical specialty	0.249***	0.184**	0.175**
	(0.040)	(0.076)	(0.084)
surgical specialty	0.443***	0.464***	0.467***
	(0.050)	(0.092)	(0.101)
psychiatry	0.187***	0.692***	0.755***
	(0.066)	(0.188)	(0.227)
obstetrics/gynecology	0.334***	0.912***	0.984***
	(0.073)	(0.211)	(0.256)
Practice type			
solo/2 physicians (reference)			
group practice >=3 physicians	-0.321***	-0.360***	-0.365***
	(0.033)	(0.063)	(0.069)
HMO	-0.396***	-0.388***	-0.387***
	(0.066)	(0.122)	(0.133)
medical school	-0.268***	-0.166	-0.153
	(0.052)	(0.101)	(0.112)
hospital based	-0.180***	-0.398***	-0.426***
	(0.042)	(0.100)	(0.116)
other practice type	-0.369***	-0.536***	-0.557***
	(0.046)	(0.097)	(0.110)
Practice market competition status			
not at all competitive (reference)			
somewhat competitive	-0.070**	0.047	0.062
	(0.029)	(0.063)	(0.072)
very competitive	-0.125***	0.203*	0.244*
	(0.036)	(0.114)	(0.139)
Constant	4.214***	6.292***	6.553***
	(0.075)	(0.601)	(0.766)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives. Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

Table A2: Full results of OLS and two-stage least squares estimation for the second quality of care measure.

Variables	Q2: Physicians can provide high quality care to all of patients		
	OLS	Two-stage least squares	
		Instrument 1[1]	Instrument 2[2]
Consumerist patient percentage	-0.004***	-0.036*	-0.039*
	(0.001)	(0.019)	(0.022)
Other explanatory variables	0.082***	0.072***	0.072***
Annual practice income in $100,000	(0.016)	(0.019)	(0.019)
	-0.092***	-0.036	-0.032
Annual practice hours in 1,000	(0.015)	(0.036)	(0.041)
	-0.220***	-0.124*	-0.117
Proportion of revenue from managed care	(0.043)	(0.073)	(0.081)
	0.001	0.082	0.088
Proportion of revenue from Medicare	(0.055)	(0.076)	(0.082)
	-0.346***	-0.547***	-0.563***
Proportion of revenue from Medicaid	(0.068)	(0.139)	(0.157)
	0.149***	-0.004	-0.017
Male	(0.028)	(0.094)	(0.110)
	-0.052	-0.049	-0.049
Board certified	(0.035)	(0.039)	(0.039)
	0.024	0.023	0.023
Foreign medical school graduate	(0.032)	(0.035)	(0.035)
	-0.073	-0.130*	-0.135*
Race			
White (reference)			
Black	(0.057)	(0.071)	(0.075)
	0.091***	0.036	0.031
other race	(0.034)	(0.049)	(0.053)
	0.119***	0.160***	0.163***
Practice experience			
less than or equal to 5 years	0.104*	0.165**	0.170**
	(0.056)	(0.071)	(0.075)
6-14 years (reference)			
15-24 years	-0.081***	-0.134***	-0.138***
	(0.026)	(0.042)	(0.046)
more than or equal to 25 years	0.095***	0.021	0.015
	(0.030)	(0.054)	(0.061)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives. Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

Table A2 (continued): Full results of OLS and two-stage least squares estimation for the second quality of care measure.

Variables	Q2: Physicians can provide high quality care to all of patients		
	OLS	Two-stage least squares	
		Instrument 1[1]	Instrument 2[2]
Practice specialty			
general/family practice (reference)			
internal medicine	(0.033)	(0.043)	(0.046)
	0.362***	0.260***	0.252***
pediatrics	(0.039)	(0.073)	(0.082)
	0.103***	0.084**	0.083**
medical specialty	(0.035)	(0.040)	(0.041)
	0.142***	0.148***	0.148***
surgical specialty	(0.043)	(0.047)	(0.048)
psychiatry	-0.301***	-0.175*	-0.165
	(0.058)	(0.097)	(0.107)
obstetrics/gynecology	0.216***	0.357***	0.369***
	(0.064)	(0.108)	(0.120)
Practice type			
solo/2 physicians (reference)			
group practice >=3 physicians	0.054*	0.044	0.043
	(0.029)	(0.032)	(0.033)
HMO	0.323***	0.325***	0.325***
	(0.058)	(0.063)	(0.064)
medical school	0.073	0.098*	0.100*
	(0.045)	(0.052)	(0.053)
hospital based	0.095***	0.041	0.037
	(0.037)	(0.051)	(0.055)
other practice type	-0.040	-0.082*	-0.086
	(0.040)	(0.050)	(0.053)
Practice market competition status			
not at all competitive (reference)			
somewhat competitive	-0.074***	-0.044	-0.042
	(0.025)	(0.033)	(0.035)
very competitive	-0.187***	-0.106*	-0.099
	(0.032)	(0.058)	(0.066)
Constant	4.118***	4.630***	4.672***
	(0.065)	(0.306)	(0.358)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives. Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

Table A3: Full results of OLS and two-stage least squares estimation for the third quality of care measure.

Variables	Q3: Physicians can maintain continuing relationships with patients to promote high quality care		
	OLS	Two-stage least squares	
		Instrument 1[1]	Instrument 2[2]
Consumerist patient percentage	-0.002***	-0.040*	-0.081**
	(0.001)	(0.021)	(0.032)
Other explanatory variables			
Annual practice income in $100,000	0.081***	0.070***	0.058**
	(0.017)	(0.020)	(0.027)
Annual practice hours in 1,000	-0.051***	0.012	0.080
	(0.016)	(0.040)	(0.058)
Proportion of revenue from managed care	-0.456***	-0.351***	-0.237**
	(0.047)	(0.079)	(0.111)
Proportion of revenue from Medicare	0.028	0.114	0.207*
	(0.059)	(0.082)	(0.111)
Proportion of revenue from Medicaid	-0.001	-0.223	-0.463**
	(0.074)	(0.149)	(0.214)
Male	0.071**	-0.106	-0.298*
	(0.031)	(0.105)	(0.155)
Board certified	-0.065*	-0.064	-0.064
	(0.038)	(0.043)	(0.055)
Foreign medical school graduate	0.126***	0.119***	0.111**
	(0.034)	(0.038)	(0.049)
Race			
White (reference)			
Black	0.107*	0.039	-0.036
	(0.062)	(0.079)	(0.105)
other race	0.165***	0.097*	0.023
	(0.036)	(0.056)	(0.077)
Practice experience			
less than or equal to 5 years	0.202***	0.279***	0.362***
	(0.062)	(0.081)	(0.109)
6-14 years (reference)			
15-24 years	-0.169***	-0.231***	-0.298***
	(0.029)	(0.047)	(0.066)
more than or equal to 25 years	-0.018	-0.110*	-0.208**
	(0.033)	(0.063)	(0.090)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives. Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

Table A3 (continued): Full results of OLS and two-stage least squares estimation for the third quality of care measure.

Variables	Q3: Physicians can maintain continuing relationships with patients to promote high quality care		
	OLS	Two-stage least squares	
		Instrument 1[1]	Instrument 2[2]
Practice specialty			
general/family practice (reference)			
internal medicine	-0.066*	-0.017	0.037
	(0.036)	(0.049)	(0.066)
pediatrics	0.180***	0.056	-0.078
	(0.042)	(0.084)	(0.120)
medical specialty	-0.110***	-0.099**	-0.087
	(0.039)	(0.044)	(0.056)
surgical specialty	-0.094**	-0.085	-0.075
	(0.047)	(0.052)	(0.067)
psychiatry	-0.370***	-0.229**	-0.077
	(0.062)	(0.105)	(0.148)
obstetrics/gynecology	-0.136**	0.030	0.210
	(0.068)	(0.120)	(0.170)
Practice type			
solo/2 physicians (reference)			
group practice >=3 physicians	0.059*	0.053	0.046
	(0.031)	(0.035)	(0.045)
HMO	0.428***	0.433***	0.439***
	(0.062)	(0.069)	(0.088)
medical school	0.107**	0.140**	0.176**
	(0.050)	(0.058)	(0.076)
hospital based	0.069*	0.014	-0.045
	(0.040)	(0.054)	(0.074)
other practice type	0.035	-0.016	-0.070
	(0.044)	(0.056)	(0.075)
Practice market competition status			
not at all competitive (reference)			
somewhat competitive	-0.110***	-0.084**	-0.057
	(0.028)	(0.034)	(0.045)
very competitive	-0.258***	-0.172***	-0.080
	(0.034)	(0.061)	(0.087)
Constant	4.147***	4.763***	5.428***
	(0.071)	(0.354)	(0.525)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives. Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

Table A4: Estimation of the first stage and endogeneity tests.

Variables	Consumerist patient percentage[1]	
	Instrument 1	Instrument 2
Instrumental variables for consumerist patient percentage		
Instrument 1: mean percentage of people in CTS survey areas who get medical information from friends or relatives	0.301***	N/A
	(0.071)	
Instrument 2: mean number of sources from which people in CTS survey areas get medical information	N/A	6.840***
		(1.913)
Other explanatory variables		
Annual practice income in $100,000	-0.257	-0.258
	(0.223)	(0.223)
Annual practice hours in 1,000	1.754***	1.761***
	(0.201)	(0.201)
Proportion of revenue from managed care	2.777***	2.744***
	(0.598)	(0.599)
Proportion of revenue from Medicare	2.729***	2.731***
	(0.755)	(0.756)
Proportion of revenue from Medicaid	-6.084***	-6.087***
	(0.938)	(0.938)
Male	-4.752***	-4.753***
	(0.387)	(0.387)
Board certified	0.038	0.034
	(0.489)	(0.489)
Foreign medical school graduate	-0.094	-0.095
	(0.437)	(0.437)
Race		
White (reference)		
Black	-1.829**	-1.852**
	(0.788)	(0.789)
other race	-1.719***	-1.740***
	(0.465)	(0.465)
Practice experience		
less than or equal to 5 years	1.933***	1.918***
	(0.780)	(0.780)
6-14 years (reference)		
15-24 years	-1.681***	-1.667***
	(0.364)	(0.364)
more than or equal to 25 years	-2.333***	-2.339***
	(0.419)	(0.419)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. N/A: not applicable. The estimated coefficients in the first stage are same for all three quality measures, and the tests of instrumental variables and tests of endogeneity are for the quality measure 1.

Table A4 (continued): Estimation of the first stage and endogeneity tests.

Variables	Consumerist patient percentage[1]	
	Instrument 1	Instrument 2
Practice specialty		
general/family practice (reference)		
internal medicine	1.062**	1.082**
	(0.462)	(0.462)
pediatrics	-3.232***	-3.212***
	(0.535)	(0.535)
medical specialty	-0.618	-0.619
	(0.481)	(0.482)
surgical specialty	0.046	0.049
	(0.598)	(0.598)
psychiatry	3.728***	3.725***
	(0.800)	(0.801)
obstetrics/gynecology	4.406***	4.417***
	(0.875)	(0.875)
Practice type		
solo/2 physicians (reference)		
group practice >=3 physicians	-0.244	-0.250
	(0.400)	(0.401)
HMO	0.066	0.025
	(0.793)	(0.793)
medical school	0.819	0.809
	(0.628)	(0.628)
hospital based	-1.567***	-1.552***
	(0.509)	(0.510)
other practice type	-1.252**	-1.251**
	(0.550)	(0.550)
Practice market competition status		
not at all competitive (reference)		
somewhat competitive	0.917***	0.930***
	(0.348)	(0.349)
very competitive	2.483***	2.490***
	(0.437)	(0.437)
Constant	10.117***	11.049***
	(1.650)	(1.638)
Tests of endogeneity		
Wu-Hausman F test	43.846***	40.021***
Durbin-Wu-Hausman Chi-square test	43.791***	39.984***
Tests of instrumental variables		
Test of excluded instruments, F statistic	17.730***	12.780***
Under-identification test, Anderson canon. LM statistic	17.741***	12.798***
Weak-instrument-robust inference, Anderson-Rubin Wald test	45.890***	41.680***

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. N/A: not applicable. The estimated coefficients in the first stage are same for all three quality measures, and the tests of instrumental variables and tests of endogeneity are for the quality measure 1.

Table A5: Full results of ordered probit single equation model and ordered probit control function model for the first quality of care measure.

Variables	Q1: Physicians have adequate time to spend with patients during typical office visits		
	Ordered probit model (coefficient)		
	Single equation model	Control function model	
		Instrument 1[1]	Instrument 2[2]
Consumerist patient percentage	-0.003***	-0.098***	-0.109**
	(0.001)	(0.030)	(0.048)
Fitted residual from the first stage	N/A	0.096***	0.107**
		(0.030)	(0.048)
Other explanatory variables			
Annual practice income in $100,000	0.015	-0.034**	-0.037
	(0.018)	(0.016)	(0.044)
Annual practice hours in 1,000	-0.183***	0.020	0.039
	(0.017)	(0.055)	(0.084)
Proportion of revenue from managed care	-0.568***	-0.191	-0.159
	(0.050)	(0.125)	(0.247)
Proportion of revenue from Medicare	-0.075	0.155	0.183
	(0.063)	(0.157)	(0.204)
Proportion of revenue from Medicaid	-0.266***	-0.840***	-0.908***
	(0.078)	(0.255)	(0.261)
Male	0.215***	-0.294**	-0.346
	(0.032)	(0.134)	(0.235)
Board certified	-0.198***	-0.180***	-0.179*
	(0.041)	(0.057)	(0.101)
Foreign medical school graduate	0.061*	0.066***	0.065
	(0.036)	(0.024)	(0.068)
Race			
White (reference)			
Black	-0.032	-0.190	-0.209
	(0.065)	(0.139)	(0.145)
other race	0.086**	-0.097	-0.116
	(0.039)	(0.060)	(0.101)
Practice experience			
less than or equal to 5 years	-0.007	0.156	0.176
	(0.065)	(0.120)	(0.130)
6-14 years (reference)			
15-24 years	-0.003	-0.152**	-0.170**
	(0.030)	(0.069)	(0.081)
more than or equal to 25 years	0.344***	0.081	0.056
	(0.035)	(0.101)	(0.131)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. N/A: not applicable.
Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives.
Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

Table A5 (continued): Full results of ordered probit single equation model and ordered probit control function model for the first quality of care measure.

Variables	Q1: Physicians have adequate time to spend with patients during typical office visits		
	Ordered probit model (coefficient)		
	Single equation model	Control function model	
		Instrument 1[1]	Instrument 2[2]
Practice specialty			
general/family practice (reference)			
internal medicine	0.028	0.144**	0.157
	(0.038)	(0.061)	(0.118)
pediatrics	0.241***	-0.127	-0.162
	(0.044)	(0.111)	(0.177)
medical specialty	0.249***	0.161***	0.155***
	(0.040)	(0.041)	(0.045)
surgical specialty	0.443***	0.398***	0.399***
	(0.050)	(0.100)	(0.079)
psychiatry	0.187***	0.543***	0.585**
	(0.066)	(0.177)	(0.297)
obstetrics/gynecology	0.334***	0.709***	0.757***
	(0.073)	(0.129)	(0.279)
Practice type			
solo/2 physicians (reference)			
group practice >=3 physicians	-0.321***	-0.293***	-0.296***
	(0.033)	(0.042)	(0.033)
HMO	-0.396***	-0.339***	-0.338***
	(0.066)	(0.083)	(0.081)
medical school	-0.268***	-0.170**	-0.161
	(0.052)	(0.070)	(0.124)
hospital based	-0.180***	-0.316***	-0.335***
	(0.042)	(0.049)	(0.121)
other practice type	-0.369***	-0.429***	-0.443***
	(0.046)	(0.100)	(0.119)
Practice market competition status			
not at all competitive (reference)			
somewhat competitive	-0.070**	0.008	0.018
	(0.029)	(0.050)	(0.060)
very competitive	-0.125***	0.131	0.159
	(0.036)	(0.102)	(0.139)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. N/A: not applicable.
Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives.
Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

Table A6: Full results of ordered probit single equation model and ordered probit control function model for the second quality of care measure.

Variables	Q2: Physicians can provide high quality care to all of patients		
	Ordered probit model (coefficient)		
	Single equation model	Control function model	
		Instrument 1[1]	Instrument 2[2]
Consumerist patient percentage	-0.004***	-0.037	-0.038*
	(0.001)	(0.023)	(0.021)
Fitted residual from the first stage	N/A	0.033	0.034
		(0.023)	(0.021)
Other explanatory variables			
Annual practice income in $100,000	0.080***	0.070***	0.070***
	(0.015)	(0.026)	(0.024)
Annual practice hours in 1,000	-0.083***	-0.026	-0.024
	(0.014)	(0.047)	(0.036)
Proportion of revenue from managed care	-0.219***	-0.121*	-0.119
	(0.040)	(0.071)	(0.073)
Proportion of revenue from Medicare	-0.015	0.068	0.070
	(0.051)	(0.057)	(0.084)
Proportion of revenue from Medicaid	-0.319***	-0.526***	-0.530***
	(0.063)	(0.177)	(0.143)
Male	0.143***	-0.016	-0.019
	(0.026)	(0.138)	(0.124)
Board certified	-0.048	-0.046	-0.046
	(0.033)	(0.038)	(0.049)
Foreign medical school graduate	0.040	0.038*	0.038
	(0.029)	(0.022)	(0.031)
Race			
White (reference)			
Black	-0.062	-0.122	-0.124*
	(0.052)	(0.094)	(0.064)
other race	0.090***	0.033	0.031
	(0.031)	(0.043)	(0.066)
Practice experience			
less than or equal to 5 years	0.101*	0.164**	0.165***
	(0.052)	(0.077)	(0.061)
6-14 years (reference)			
15-24 years	-0.059**	-0.114***	-0.115***
	(0.024)	(0.042)	(0.031)
more than or equal to 25 years	0.130***	0.054	0.052
	(0.028)	(0.060)	(0.047)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. N/A: not applicable.
Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives.
Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

Table A6 (continued): Full results of ordered probit single equation model and ordered probit control function model for the second quality of care measure.

Variables	Q2: Physicians can provide high quality care to all of patients		
	Ordered probit model (coefficient)		
	Single equation model	Control function model	
		Instrument 1[1]	Instrument 2[2]
Practice specialty			
general/family practice (reference)			
internal medicine	0.117***	0.157***	0.158***
	(0.031)	(0.032)	(0.025)
pediatrics	0.345***	0.240**	0.237***
	(0.036)	(0.100)	(0.074)
medical specialty	0.116***	0.097***	0.097***
	(0.032)	(0.030)	(0.028)
surgical specialty	0.139***	0.145***	0.145***
	(0.040)	(0.035)	(0.045)
psychiatry	-0.248***	-0.118	-0.116
	(0.053)	(0.121)	(0.107)
obstetrics/gynecology	0.173***	0.319**	0.322***
	(0.059)	(0.132)	(0.092)
Practice type			
solo/2 physicians (reference)			
group practice >=3 physicians	0.027	0.018	0.018
	(0.027)	(0.036)	(0.038)
HMO	0.308***	0.311***	0.311***
	(0.055)	(0.093)	(0.061)
medical school	0.036	0.062	0.063
	(0.042)	(0.066)	(0.054)
hospital based	0.076**	0.020	0.019
	(0.034)	(0.078)	(0.050)
other practice type	-0.039	-0.083	-0.084*
	(0.037)	(0.057)	(0.050)
Practice market competition status			
not at all competitive (reference)			
somewhat competitive	-0.081***	-0.051*	-0.050
	(0.023)	(0.028)	(0.042)
very competitive	-0.161***	-0.077*	-0.075
	(0.029)	(0.045)	(0.074)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. N/A: not applicable.
Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives.
Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

Table A7: Full results of ordered probit single equation model and ordered probit control function model for the third quality of care measure.

Variables	Q3: Physicians can maintain continuing relationships with patients to promote high quality care		
	Ordered probit model (coefficient)		
	Single equation model	Control function model	
		Instrument 1[1]	Instrument 2[2]
Consumerist patient percentage	-0.002**	-0.040***	-0.070**
	(0.001)	(0.015)	(0.031)
Fitted residual from the first stage	N/A	0.039**	0.069**
		(0.015)	(0.031)
Other explanatory variables			
Annual practice income in $100,000	0.067***	0.056***	0.047
	(0.015)	(0.021)	(0.032)
Annual practice hours in 1,000	-0.039***	0.027	0.079
	(0.014)	(0.025)	(0.062)
Proportion of revenue from managed care	-0.412***	-0.299***	-0.211*
	(0.041)	(0.055)	(0.113)
Proportion of revenue from Medicare	0.025	0.122*	0.197*
	(0.051)	(0.066)	(0.108)
Proportion of revenue from Medicaid	-0.031	-0.271**	-0.459**
	(0.064)	(0.108)	(0.196)
Male	0.043	-0.142*	-0.286**
	(0.026)	(0.081)	(0.143)
Board certified	-0.065*	-0.063	-0.061
	(0.033)	(0.049)	(0.048)
Foreign medical school graduate	0.125***	0.123***	0.121***
	(0.030)	(0.031)	(0.046)
Race			
White (reference)			
Black	0.099*	0.029	-0.026
	(0.053)	(0.054)	(0.096)
other race	0.150***	0.083	0.031
	(0.032)	(0.053)	(0.072)
Practice experience			
less than or equal to 5 years	0.174***	0.247***	0.305***
	(0.054)	(0.051)	(0.091)
6-14 years (reference)			
15-24 years	-0.130***	-0.193***	-0.243***
	(0.025)	(0.026)	(0.065)
more than or equal to 25 years	0.022	-0.067	-0.137
	(0.028)	(0.046)	(0.084)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. N/A: not applicable.
Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives.
Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

Table A7 (continued): Full results of ordered probit single equation model and ordered probit control function model for the third quality of care measure.

Variables	Q3: Physicians can maintain continuing relationships with patients to promote high quality care		
	Ordered probit model (coefficient)		
	Single equation model	Control function model	
		Instrument 1[1]	Instrument 2[2]
Practice specialty			
general/family practice (reference)			
internal medicine	-0.057*	-0.009	0.027
	(0.031)	(0.036)	(0.059)
pediatrics	0.167***	0.044	-0.052
	(0.036)	(0.059)	(0.108)
medical specialty	-0.105***	-0.127***	-0.145***
	(0.033)	(0.028)	(0.053)
surgical specialty	-0.087**	-0.081	-0.076
	(0.040)	(0.055)	(0.068)
psychiatry	-0.301***	-0.151*	-0.034
	(0.053)	(0.086)	(0.146)
obstetrics/gynecology	-0.119**	0.050	0.182
	(0.058)	(0.129)	(0.162)
Practice type			
solo/2 physicians (reference)			
group practice >=3 physicians	0.042	0.031	0.023
	(0.027)	(0.041)	(0.046)
HMO	0.379***	0.382***	0.384***
	(0.054)	(0.089)	(0.092)
medical school	0.089**	0.119***	0.143*
	(0.042)	(0.042)	(0.082)
hospital based	0.048	-0.017	-0.067
	(0.035)	(0.038)	(0.072)
other practice type	0.024	-0.027	-0.067
	(0.038)	(0.037)	(0.063)
Practice market competition status			
not at all competitive (reference)			
somewhat competitive	-0.117***	-0.082**	-0.054
	(0.024)	(0.035)	(0.044)
very competitive	-0.215***	-0.118*	-0.042
	(0.030)	(0.061)	(0.083)

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. N/A: not applicable.
 Instrument 1 is mean percentage of people in CTS survey areas who get medical information from friends or relatives.
 Instrument 2 is mean number of sources from which people in CTS survey areas get medical information.

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