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ABSTRACT

Although doctors and hospitals own their patients' medical records, state and federal laws require that they provide patients with a copy at "reasonable cost." We examine the effects of state laws that cap the fees that doctors and hospitals are allowed to charge patients for a copy of their records. We test whether these laws affected patients' propensity to switch doctors and the prices of new- and existing-patient visits. We also examine the effect of laws on hospitals' adoption of electronic medical record (EMR) systems. We find that patients from states adopting caps on copy fees were significantly more likely to switch doctors, and that hospitals in states adopting caps were significantly more likely to install an EMR. We also find that laws did not have a systematic, significant effect on prices.

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Introduction

Property rights in a patient's medical records are effectively shared between the doctor or hospital that created them and the patient on whom the records are based. The general rule in American law is that information (such as that contained in a medical record) can not be formally owned, but a tangible manifestation of information (such as a medical record itself) is the property of the party that produced it (Samuelson 2000). In this sense, both printed and electronic medical records are owned by doctors and hospitals. However, these ownership rights are not absolute. Federal law regulates how doctors and hospitals can use patients' records, including requiring that patients be allowed to obtain a copy at "reasonable cost."

This hybrid approach to records ownership is a topic of considerable debate. Some health policy analysts have suggested that the "reasonable cost" standard is an ineffective way to ensure patients can get access to their information because it leaves room for doctors and hospitals to demand significant fees (Hall and Schulman 2010). This hypothesis is consistent with a survey that found that the charges for a copy of a medical record ranged from nothing to hundreds of dollars (Fioriglio and Szolovits 2005). Although the most obvious implications of this claim are distributional, it may also have consequences for efficiency.

First, allowing doctors to impose copying costs may enable them to make it difficult for patients to switch to a competitor (Parente 2010; Ozdemir, Barron, and Bandyopadhyay 2011). The strategic opportunity to impose switching costs arises because most medical care involves a series of encounters over time, each of which is more useful when it is coordinated with the others. Care is highly customized, and through repeated interaction, a physician gains information about the patient's clinical characteristics, preferences and health behaviors which enables her to provide more effective treatment. Switching doctors is therefore easier when medical records are more transferable. Economic theory suggests three ways that strategic imposition of switching costs could reduce welfare in markets for physician services: by leading to higher prices (through reduced competition), less switching (even when it would be otherwise efficient), or the delivery of treatment in more costly or lower quality ways (Farrell and Klemperer 2007).

Second, allowing doctors and hospitals to impose copying costs may reduce their incentives to adopt electronic medical records systems (EMRs). EMRs reduce the cost of creating a copy of a medical record (Fioriglio and Szolovits 2005). Thus, making patients responsible for the costs of copying contributes to the disconnect between who pays for EMRs and who benefits from them (Hillestad et al. 2005). If contracts were complete and markets for health services were perfectly competitive, this would be irrelevant; but because these stylized conditions are unlikely to be true in practice, assignment of copying costs may affect the medical care production process (Coase 1960). This too could have important effects on social welfare. Miller and Tucker (2011) show that hospitals' failure to adopt EMRs leads to higher rates of neonatal mortality, driven by an increase in deaths from conditions requiring careful monitoring. They calculate that the adoption of EMRs would be a cost-effective way of improving health outcomes.

The importance of these hypotheses is an open empirical issue. Although there are reasons to believe that giving patients greater rights to their records would reduce switching costs and enhance incentives for EMR adoption, there is no evidence about their likely consequences for patient or provider behavior. Few papers have sought to assess the current approach to records ownership or whether alternatives could lower the cost or improve the quality of care.

This paper seeks to fill this gap. We examine the effects of state laws that cap the fees that doctors and hospitals are allowed to charge patients for a copy of their records. These laws effectively reallocate property rights in medical records from physicians and hospitals to patients. As such they are an important example of the broader class of reform that seeks to expand patients' control of their personal health information.

We test whether these laws affected patients' propensity to switch doctors and the prices of new- and existing-patient visits. We also examine the effect of laws on hospitals' adoption of EMR systems. We find that patients from states adopting caps on copy fees were significantly more likely to switch doctors, and that hospitals in states adopting caps were significantly more likely to install an EMR. We also find that laws did not have a systematic, significant effect on prices. Because we do not have information on patient health outcomes or other measures of quality of care, we cannot definitively conclude that assigning the cost of records transfer to providers would create benefits for consumers that exceed the cost burden imposed on providers. However, combining the results of other research with reasonable assumptions, we conjecture that it would.

The paper proceeds in five sections. Section I outlines the law governing ownership of medical records, the role of state statutes capping copy fees, and previous research into the effects of medical records ownership on markets for health care.

Section II describes the data that we use to investigate the effects of caps on medical record costs. Section III presents our empirical models. Section IV presents our results, and Section V concludes.

I. Medical Records Ownership Law: Previous Research

The law governing ownership of medical records is an example of the broader phenomenon of property rights that are not absolute. The historical rule has been that providers could use medical records however they would like, as long as they satisfied their common-law duties arising out of the doctor-patient relationship (Hall and Schulman 2010). Starting in the 1970s, states began to codify these duties in statutes, focusing on the protection of patients' privacy. State privacy laws limited the circumstances in which providers could disclose information without patient consent, imposed requirements for obtaining consent, and specified penalties for violations (Miller and Tucker 2009). The passage of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) extended these efforts to the federal level. In addition, HIPAA required the Department of Health and Human Services (HHS) to ensure individuals' access to their personal health information. In December of 2000, HHS promulgated the "Privacy Rule," which specified (among other things) that providers could charge individuals at most a reasonable, cost-based fee (including labor) for a copy of their records.[1]

States have also passed statutes that required providers to take explicit steps to provide patients with access to their records, including floors on the length of time that records needed to be retained, ceilings on the time that providers had to respond to a

[1] Federal Register, Vol. 65, No. 250, December 28, 2000, p. 82824.

records request, and limits on the fees that could be charged for copying and release. Prior to the Privacy Rule's taking effect in 2001, 30 states had imposed specific restrictions on what providers could charge patients for a copy of their records. Between 2002 and 2007, eleven additional states adopted specific caps on what providers could charge. Although the language in the statutes varied, the effective caps that they imposed were similar. As Pritts, Kayne, and Jacobson (2009) show, with the exception of Kentucky (which required providers to provide patients with a free copy of their medical record), most states with a specific law capped the cost of a 100 page record at between $40 and $70. Table 1 shows which states had specific caps, when they adopted them, and their location in state statutes.

Previous research has examined the implications of state privacy laws. Miller and Tucker (2009) show that, by inhibiting hospitals' ability to exchange information across platforms and facilities, more stringent privacy laws reduce hospital adoption of EMRs. Although this work suggests that privacy regulation has had real effects on the process by which health services are produced, it does not provide direct evidence on the consequences of reforming laws explicitly governing the allocation of property rights between patients and providers. According to Miller and Tucker (2009), the principal consequence of enhanced privacy protection is to raise providers' compliance costs. While high compliance costs on the part of providers may raise the cost of providing patients with a copy of their medical records, these effects operate through an increase in the cost of transferring information rather than a reallocation of the cost between providers and patients.

Despite potential consequences of giving patients greater control over their medical records, no empirical work has investigated either the practical importance of reallocating such rights or the effectiveness of states' policy response in this context. We examine how patient switching among physicians, physician prices, and hospital information-technology adoption changed in response to the adoption of caps on medical record copying fees. To address the first two questions, we use MarketScan claims data from 2001-07, matched with data on state laws from Pritts, Kayne, and Jacobson (2009) and data on physician markets from Baker, Bundorf, and Royalty (2013) and the Area Health Resource File (AHRF, 2001-2007). We analyze claims for two common types of outpatient visits: an evaluation and management visit for a new (CPT 99203) and an existing (CPT 99213) patient. We test whether the proportion of visits by new patients in states that adopted caps from 2001-07 differs from the proportion from states that did not, holding county fixed effects, time fixed effects, the competitiveness of physician markets, and other time-varying characteristics of counties constant. We also test whether the prices charged to new and existing patients changed differentially in adopting versus non-adopting states.

To address the third question, we use data from the Healthcare Information and Management Systems Society (HIMSS) Analytics database on the adoption of EMRs by 1,947 US hospitals from 2001-07, matched with the data on state laws above and data on hospitals and hospital market competitiveness from Medicare Cost Reports. We test whether hospitals in states that adopted caps were more likely to install an EMR that hospitals in states that did not.

II. Data

<u>Physician claims data</u>

We use data from Truven Analytics MarketScan on approximately 30 million physician claims from nonelderly individuals enrolled in a fee-for-service health plan between 2001 and 2007. The MarketScan data contain information from claims filed by privately insured individuals who obtain insurance through a participating employer. Though (as we discuss below) these data are not representative of the entire U.S. population, they contain claims from all states (except Alaska and Hawaii) which should be sufficient to characterize patterns of variation in prices from area to area and over time.

We extracted claims for two specific services, CPT codes 99203 and 99213, from doctors identified in the data as being in family practice, internal medicine, or one of a set of selected medical specialties.[2] A code of 99203 represents an office visit with a new patient (i.e. a patient new to the physician) of intermediate length and complexity. A code of 99213 is an intermediate office visit with an established patient. A new patient is defined as one who has not received any professional services from the physician or another physician of the same specialty who belongs to the same group practice, within the past 3 years. These are the most commonly billed of the 9920x and 9921x series. We also imposed the additional selection criteria in Baker, Bundorf, and Royalty (2013).

From each claim, we analyze what is commonly referred to as the "allowed amount" – the amount the plan allows the physician to be paid for the service, after the application of contractual discount provisions and other plan rules but before adjustment

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[2] Other medical specialties include allergy/immunology, cardiology, dermatology, gastroenterology, neurology, ophthalmology, pulmonary disease, nephrology, infectious disease, endocrinology, and rheumatology.

for patient copayments or deductibles. The physician may receive this amount partly from the insurance plan and partly from the patient in the form of applicable copayments or deductibles. Note that the "allowed amounts" we study are not the amounts charged by physicians, but the actual transaction payments under physician contracts with health plans, including payments made both by the patient and by the insurer.

Ideally, to test whether caps affect switching, we would know each patient's history of encounters with each physician. However, specific physicians are not reliably identified in the MarketScan data throughout our study period. Thus we define a patient as having switched in a given year if she has a new-patient visit (CPT code 9920x) with a physician of a given specialty that was preceded, within the past 3 years, by either a new- or an existing-patient visit (CPT code 9920x or 9921x) with a physician of that specialty. Our approach is likely to be valid because physicians are paid more for new-patient visits, yet at the same time, insurers can easily verify whether a not a patient has previously received services from a given physician.

We use this rule to construct two measures of switching. Both measures are based on the seven repeated cross-sections of individuals who were enrolled in a fee-for-service health plan for one of the years 2001-07 and for the three preceding years.[3] The first measure specifies a patient as switching her primary care physician if she had a new-patient family practice or internal medicine claim that was preceded, within the past 3 years, by either a new- or an existing-patient family practice or internal medicine claim. The second measure specifies a patient as switching her specialist physician if she had a

[3] For example, the 2001 cross-section would include everyone enrolled for all of 2001 in a fee-for-service plan who also reported full-year enrollment in a fee-for-service plan in 2000, 1999, and 1998.

new-patient claim in at least one of the medical specialties that was preceded, within the past 3 years, by either a new- or existing-patient claim in that same specialty.

We omit claims and patients from Massachusetts, which adopted a statewide health reform law during our study period, which other research has shown affected the cost of care (Cogan, Hubbard, and Kessler 2010).

Hospital technology adoption data

We use data on hospital adoption of EMRs from the 2001-2007 releases of the Healthcare Information and Management Systems Society (HIMSS) Analytics (until 2003, known as the Dorenfest Complete Integrated Healthcare Delivery System Database). These data include detailed information on the majority of US general medical, acute care hospitals, including their name and address, Medicare ID number, number of beds, and the type of EMR (if any). We follow the approach of Miller and Tucker (2009, 2011) and code a hospital as having an EMR if it reported installing an "enterprise EMR" system. As they point out, "enterprise EMR" software is the backbone of a system that underlies other potential information systems such as clinical decision support and computerized order entry. As in our analysis of the physician claims data, we omit hospitals from Massachusetts.

Other data

We use data from four other sources, to control for the characteristics of hospitals and geographic areas that may be correlated with the price of physician services and hospital technology adoption (Abraham et al. 2011; McCullough 2008). First, we use the AHRF (2001-2007) to obtain information on time-varying county-level market characteristics, including the number of hospital beds, enrollment in Medicare, median household income, and population. Second, we use the American Hospital Association (AHA) survey to obtain information on the system membership status of hospitals.[4] We match this to the HIMSS data at the hospital level. Third, we use Medicare claims data from 2001-07 to calculate at the county-year level the number and Hirchman-Herfindahl Index (HHI) of physicians in each specialty, according to the method in Baker, Bundorf, and Royalty (2013). We match the number of physicians to both the physician claims and the HIMSS data by county and year; we match the physician HHI to the physician claims data only by county and year. Fourth, we use data from the 2001-07 Medicare cost reports to calculate the HHI of hospital markets at the county-year based on the number of general medical, acute-care beds.

Table 2 presents descriptive statistics on enrollees from the MarketScan data for 2001 and 2007. The first row and column of the table shows that, among enrollees who had a visit to a primary care physician in 2001, 22.7 percent were seeing that physician as a new patient, after having had an office visit with a primary care physician in the past 3 years. By comparison, among enrollees who had a visit to a specialist in 2001, 7.8 percent were seeing that physician as a new patient, after having had an office visit with a specialist of the same type in the past 3 years. The proportion of patients who switch remained roughly constant over our study period. The second row of the table reports the proportion of enrollees from states with a cap on copy fees. In 2001, 87-89 percent of enrollees (depending on the sample) lived in states with a cap on fees, but by 2007, caps on fees covered essentially all (96 percent) enrollees.

[4] The AHA assigns each hospital that is a member of a multihospital system an identification number in the public use version of its survey. We classify a hospital as being a system member if it has a non-missing system identifier.

Table 2 also presents trends in the prices of physician visits by specialty. Between 2001 and 2007, prices rose by 13 to 17 percent, depending on type of visit and specialty. The price of a new-patient visit was approximately 70 percent higher than an existing-patient visit, reflecting the fact that physicians are expected to spend twice as much time on the former. There are virtually no differences in prices between primary-care and specialist physicians for a similarly-coded visit. All of these characteristics of the distribution of prices for standard evaluation and management encounters (CPT 99203 and 99213) are consistent with the results from a national survey of physician fees described in Moore (2008). Finally, Table 2 presents some basic demographic statistics about our sample. By 2007, 44-46 percent of patients were women, which very closely tracks the gender distribution of the employed population (US Bureau of Labor Statistics 2007). However, MarketScan enrollees are slightly older and much more heavily employed in manufacturing than the national average worker.

Table 3 compares the characteristics of the hospitals in the HIMSS panel to the national average of general medical, acute-care hospitals that report to Medicare. The table shows that the HIMSS hospitals are systematically different from the average hospital: they are more likely to be part of a system (68.6 percent in 2007, as compared to 58.4 percent on average), less likely to be government-owned, more likely to be a teaching hospital, larger, and in more competitive areas. Still, the HIMSS data include approximately two-thirds of all hospitals (accounting for around three-quarters of all hospital beds). Thus, although estimates based on HIMSS may not be generalizable to the average hospital, they are certainly informative about the majority of hospital services produced in the U.S.

III. Models

We estimate three types of models. The first type specifies the probability of switching (S_{ict}^{M}) for patient i = 1, ..., N_{ct} in county c = 1,..., C during year t = 2001, ..., 2007 from a physician of specialty M = {primary care, other medical specialties}:

$$S_{ict}^{M} = \alpha_c + \gamma_t + \lambda Z_{ict} + \beta X_{ct}^{M} + \delta L_{ct} + \varepsilon_{ict} , \tag{1}$$

where

S_{ict}^{M}	is an indicator = 1 if the patient switched, 0 otherwise;
α_c, γ_t	are county- and year-fixed effects;
Z_{ict}	are a set of age, gender, and industry indicator variables;
X_{ct}^{M}	is a set of time-varying county-level market characteristics, including the number of hospital beds, enrollment in Medicare, median household income, population, the number of physicians in specialty M and the competitiveness of physician markets in specialty M, as measured by the Hirschman-Herfindahl index of physicians in the specialty[5];
L_{ct}	is an indicator variable = 1 if county c is in a state with a cap on medical record copying costs in effect in year t; and
ε_{ict}	is an error term which we allow to be arbitrarily correlated across claims, counties, and years within a state.

This model identifies the effect of caps on the propensity to switch doctors as long as there are no time-varying characteristics of states that are both correlated with (but not

[5] The number of hospital beds, Medicare enrollment, household income, and population do not vary across specialties. The number of physicians and HHI are measured at the specialty level (i.e., cardiology). The models, however, group together all of the listed specialties in one regression, which is equivalent to imposing the restriction that the effect of physician market characteristics are equal across specialties.

caused by) caps and correlated with the probability of a switching. The presence of omitted factors that simply affect overall demand for medical care would not bias our estimates, as our measure of switching is invariant to this factor. We control for the competitiveness of physician markets to account for the possibility that market structure might affect the propensity of states to adopt caps. To the extent that caps affect market structure, however, our approach will understate caps' total effect.

The second type of model specifies the price of a patient visit (P_{jct}^{M}), a new-patient visit ($PNEW_{jct}^{M}$), and the price of an existing-patient visit ($POLD_{jct}^{M}$) as a function of the same variables:

$$\left.\begin{array}{l} \ln(P_{jct}^{M}) \\ \ln(PNEW_{jct}^{M}) \\ \ln(POLD_{jct}^{M}) \end{array}\right. = \alpha_c + \gamma_t + \lambda Z_{ict} + \beta X_{ct}^{M} + \delta L_{ct} + \varepsilon_{ict}, \tag{2}$$

where $j = 1, ..., J_{ct}$ indexes claims.

The third type specifies the probability of EMR adoption (EMR_{kct}) by hospital $k = 1, ..., K_{ct}$ in county c during year t:

$$EMR_{kct} = \alpha_c + \gamma_t + \theta W_{kct} + \beta X_{ct} + \delta L_{ct} + \varepsilon_{kct}\ , \tag{3}$$

where

EMR_{kct} is an indicator variable =1 if the hospital had adopted an EMR by year t;

W_{kct} is a set of hospital characteristics, including indicators for ownership (for-profit, public, non-profit) and teaching status, size (small (<100 beds), medium (100-299 beds) and large (>300 beds), and system membership;

X_{ct} is a set of time-varying county-level market characteristics, including the number of hospital beds, enrollment in Medicare, median household income, population, the number of physicians, and the competitiveness of hospital markets, as measured by the Hirschman-Herfindahl index of hospital beds;

and α_c , γ_t , L_{ct} , and ε_{kct} are defined as above.

This model identifies the effect of caps on the propensity to adopt EMRs as long as there are no time-varying characteristics of states that are both correlated with (but not caused by) caps and correlated with EMR adoption.[6] To investigate whether our estimates are sensitive to our use of county-fixed effects, we also estimate models with state- and hospital-fixed effects.

IV. Results

Table 4 presents estimates of δ and selected elements of β from equation (1), the effect of caps on copy fees and time-varying county characteristics on the probability that a patient switches primary care or specialist physician. The table also reports heteroscedasticity-consistent standard errors allowing for arbitrary correlation of ε_{ict} within each state. The first row of the table shows that people from states that adopt caps are more likely to switch both their primary-care and specialist physicians, although the effect of caps on primary-care-physician switching is only marginally statistically significant. These effects are also economically significant. For primary care physicians, for example, caps on copy fees increase switching by 2.5 percentage points, which translates into an increase of approximately 11 percent, given the base switching rate of approximately 22 percentage points from Table 2 ($0.11 \approx 0.025 / 0.22$). For

[6] We do not control for laws protecting patient privacy, which have been shown by Miller and Tucker (2009) to affect hospital EMR adoption, because no state changed its privacy protection law over our study period. Thus any effect of privacy protection law would be captured by the county fixed effects.

specialists, the magnitude of the effect of caps in percentage terms is slightly larger. Caps on copy fees increase switching by 1 percentage point, which translates into an increase of approximately 13 percent ($0.13 \approx 0.010 / 0.075$).

Competitiveness does not have a systematic, significant effect on switching. Increases in the HHI relative to the first (most competitive) quartile affect switching rates by at most one percentage point, and generally less, and are rarely statistically significant. This may be an artifact of the way that a new-patient visit is defined. Aggregation of physicians into group practices tends not only to decrease the probability of a new-patient visit (because patients who switch to a new physician in the same group are not formally considered to have switched) but also to increase the HHI. Thus, use of the HHI (or any measure that responded positively to the number of group practices in an area) could mask a negative association between competition and switching; patients from less competitive areas would appear to be less likely to switch, even if the true effect were in the other direction. However, the fact that competitiveness has no effect on measured switching does allow us to rule out a significant positive association between competition and switching, which would be the theoretically more likely effect.

Table 5 presents estimates of δ and selected elements of β from equation (2). The leftmost two columns of the table present estimates of effects on the ln(price) of a visit for new and existing patients together; the other panels present estimates of effects on the price of a visit for new and existing patients separately. The first row of the table shows that caps on copy fees do not have a statistically significant effect on prices, even accounting for the greater number of new visits that they induce; point estimates range from around 1-2 percent, with the upper bound of 95 percent confidence intervals generally 5 percent or less. On a base of the price of an existing-patient visit of approximately $62 in 2007, this amounts to around $1 (with an upper bound of $3). In contrast, competitiveness has a much larger and statistically significant effect on prices, consistent with Baker, Bundorf, and Royalty (2013) and previous analyses of analyses of the MarketScan data such as Dunn and Shapiro (2014) and Schneider et al. (2008).

Taken together, the estimates in Tables 4 and 5 suggest that caps on copy fees create benefits for consumers that exceed the burden imposed on providers. Because caps increase patient switching, we can infer that they bind (i.e., actually result in lower copying fees) and were not simply a transfer from patients to physicians, but were discouraging patients from switching when they otherwise would have preferred to do so. The fact that the base price of either a new- or existing-patient visit did not increase in response to caps suggest that either the copy fees or the base prices exceeded competitive levels ex ante.

For several reasons, however, we can not draw definitive conclusions about social welfare from our analysis. First, although we do not reject that there was no effect of caps on prices, we also fail to reject that caps increase base prices; the upper bound of the 95 percent confidence interval around our estimates includes a price increase of around $3 per visit, which is sufficiently large to account for a plausible offset from the revenue effects of a cap. Second, the fact that caps do not significantly decrease visit prices implies that any equilibrium benefits of reducing switching costs through lower visit prices are relatively small. Third, because we do not know the true cost of providing copies of medical records, we can not exclude the possibility that the caps we study were set too low.

Fourth, we can not exclude the possibility that caps otherwise affect the quality of a visit. The quality consequences of switching costs are theoretically indeterminate (Farrell and Klemperer 2007, Section 3.7.1-3.7.2); by implication, so is the effect of caps. Even if we had data on physician quality, detecting changes in quality of the (small) magnitude that would be likely to result from a cap on copy fees would be difficult. Physician quality is multi-dimensional and, for a non-elderly patient population unlikely to suffer any serious adverse health events, highly imprecisely measured.

Table 6 presents estimates of δ, θ and selected elements of β from equation (3). The first column presents estimates that control for state fixed effects; the second and third columns present estimates that control for county and hospital fixed effects, respectively. The first row of the table shows that caps on copy fees provide a powerful incentive for hospitals to adopt EMRs. Hospitals from states that imposed a cap were approximately 8 percentage points more likely to adopt an EMR. On a 2007 base of EMR adoption of 66 percentage points, this amounts to 12 percent. The magnitude of the estimated effect declines very slightly when we substitute hospital fixed effects for county fixed effects, but remains statistically and economically significant.

The table also shows how the market environment and hospital characteristics affect EMR adoption. Hospitals in more competitive markets are more likely to adopt EMRs, although this effect is only marginally statistically significant, and only for hospitals in the second quartile of the HHI distribution relative to the first quartile. For-profit hospitals are significantly less likely to adopt EMRs, and teaching hospitals significantly more likely to adopt EMRs, consistent with Abraham et al. (2011, Table 3) and Miller and Tucker (2009, Table 2).

The findings in Table 6 suggest another, possibly more important, channel through which caps on copy fees create benefits for consumers: by encouraging the adoption of EMRs. Whether the cap-induced expansion of EMR use is worth its costs, of course, is a difficult question that we can not answer with our data. However, other work suggests that it would be. The relatively low level of EMR use in the US is widely believed to contribute to fragmentation of care that is not in patients' interests (e.g., Hall and Schulman 2010). In addition, at least in the realm of childbirth, Miller and Tucker (2011) show that the incremental adoption of EMRs attributable to the relaxation of state privacy regulation is highly cost-effective. Whether the margin along which caps operate is same as the margin affected by privacy regulation is an open question that could be investigated in future research.

We also estimated several variants of equations (1)-(3) to explore the robustness of our results. First, we estimated models that added indicator variables =1 in the year or 1-2 years prior to a state's adoption of a cap on copy fees, in order to investigate whether our effects were due to preexisting trends that were either unrelated to or due to factors that precipitated adoption of the laws in question. In no model was the year or 1-2 year lead of the law statistically significant. In addition, in no model did the inclusion of the leads of the law substantively change our estimates of the effect of interest.

Second, we estimated models that decomposed the effect of the cap into two parts, a short-term effect (within 2 years of adoption) and a long-term effect (3 or more years after adoption). The long-term effect of caps on the probability of switching primary-care physicians was larger than but not statistically distinguishable from the short-term effect; the long-term effect of caps on the probability of switching specialist physicians was smaller than but not statistically distinguishable from the short-term effect (compare to estimates of equation (1) in Table 4). Neither the long- nor the short-term effects of caps had statistically significant effects on prices (compare to estimates of equation (2) in the leftmost two columns of Table 5). The long-term effect of caps on the probability of EMR adoption was larger than but not statistically distinguishable from the short-term effect (compare to estimates of equation (3) in Table 6).

Third, we estimated probit models of equations (1) and (3) allowing for arbitrary correlation of the error term across claims, counties, and years within a state. Based on probit estimates of equation (1), the marginal effect of caps for the average patient on the probability of switching primary care physicians was 3.0 percentage points (standard error 2.0 percentage points); the effect on the probability of switching specialist physicians was 1.2 percentage points (standard error 0.7 percentage points). Based on probit estimates of equation (3), the marginal effect of caps for the average hospital on the probability of EMR adoption was 11.0 percentage points (standard error 2.4 percentage points, based on a model with state and year fixed effects).

V. Conclusion

The current approach to medical records ownership -- which gives providers substantial (although not absolute) control over patients' health information -- may create incentives for two types of inefficient behavior. First, it may encourage physicians to take advantage of imperfections in implementation and enforcement of laws mandating patient access to records in order to strategically inflate the costs of switching to a competing provider. Some of the costs of switching are unavoidable: it takes time to learn about a patient's medical condition and to develop a relationship that is conducive to optimal care. But some switching costs are endogenous and dependent on strategic decisions. In non-medical care settings, empirical studies have documented evidence of strategic switching costs in a variety of industries including, but not limited to, credit cards, computer software, supermarkets, air travel, phone services and bookstores (Farrell and Klemperer 2007).

Second, the current approach may discourage physicians and hospitals from adopting EMRs. Despite some evidence that the incentives provided by Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 have increased adoption, there is still widespread agreement among health policy analysts that EMR use in the US is still lower than would be in patients' best interests (DesRoches et al. 2013).

Yet, few papers have sought to understand how allocation of property rights in medical records affects markets for health services. We take advantage of variation across states and over time in laws that cap the fees that doctors and hospitals are allowed to charge patients for a copy of their medical records. We test whether these laws affected patients' propensity to switch doctors and the price of a new- and existing-patient visit. We also examine the effect of laws on hospitals' propensity to install an EMR system. We find that patients from states adopting caps on copy fees were significantly more likely to switch doctors, and that hospitals in states adopting caps were significantly more likely to install an EMR. We also find that laws did not have a systematic, significant effect on prices.

Our analysis has at least two limitations. First, it assumes that the causes of caps' adoption are uncorrelated with unobserved determinants of the outcomes we examine. This assumption could be violated if, for example, states' regulatory environments affected both caps' adoption and switching, prices, or EMR use. Because we control for fixed differences across states in all of our models, our results are necessarily robust to correlation of caps' adoption with time-invariant unobservables. However, our results might be biased if policy changes are endogenous. At least in the case of medical records privacy laws, Miller and Tucker (2009) find no evidence that changes in laws were correlated with changes in states' political environments. Insofar as adoption of caps on medical record copy fees and medical records privacy laws arise out of similar processes -- concern over appropriate access to medical records -- this result suggests that endogeneity is not likely to be important.

Second, because we do not directly observe the quality of care or patient health outcomes, we cannot offer any definitive conclusions about the welfare effects of caps. However, combining the results of previous work with plausible assumptions, we conclude that caps create benefits for consumers that exceed the burden imposed on providers. First, because caps do not have significant or economically substantial effect on the price of a physician visit but do increase patient switching, we conclude that they reduce switching costs, and that the reduction makes patients better off by better matching their preferences with their physicians' characteristics. Second, because caps make hospitals more likely to adopt EMRs (which have been shown by Miller and Tucker (2011) to reduce neonatal mortality), we conclude that they have a second benefit: improving patient health outcomes.

The effect of caps on outcomes is qualitatively important. According to Miller and Tucker (2011), a 10 percent increase in EMR adoption would reduce neonatal mortality rates by 16 deaths per 100,000 live births, or about 3 percent. Combining their estimate with the estimated effect of caps on EMR adoption of 12 percent (Table 6) implies that the average cap would reduce neonatal mortality by 19 deaths per 100,000 live births, or approximately 3.7 percent. This is approximately half of the magnitude of the effect of state privacy laws reported by Miller and Tucker (2009).

Our findings also have broader implications for policies governing the ownership of medical information. As Hall and Schulman (2010) point out, property rights in medical records are poorly defined. On one hand, the underlying medical information is not property, and must be provided to patients on demand under federal law. On the other hand, the party that compiles and holds a medical record owns the embodiment or expression of the information in that particular form. Caps on copy fees effectively sharpen the boundaries of ownership of medical records and strengthen patients' rights to it. Our findings suggest that similar policies might also create benefits for consumers that exceed their costs. Hall and Schulman (2010) propose a range of changes to law that would make it easier for patients to authorize use of their medical information for profit, and transfer that right, while still protecting their privacy.

Despite this, it may be necessary from a political economy perspective to allow providers to retain some de facto ownership rights. For example, some states have restricted the extent to which information gathered as part of a private, voluntary medical error reporting system can be used in medical malpractice cases (Kessler 2011). Such restrictions involve a tradeoff between gains from enhanced incentives for quality improvement and losses from limiting injured plaintiffs' access to information; imposing similar restrictions on the use of EMRs would involve the same sort of judgment. Alternatively, physically locating the information with the patient herself (e.g., on an encrypted USB drive) rather than with a third-party purchaser could limit or slow down the process by which EMRs would be used to reduce provider bargaining power. Investigation of the plausibility and potential consequences of these options is an important topic for future research.

Table 1: State Caps on Medical Record Copying Fees As Of 2007
(States that switched during 2001-07 study period in bold)

State	Year Adopted	Code Section
AK		
AL	1994	12-21-6.1
AZ		
AR	1991	16-46-106
CA	1995	123110(a)-(b)
CO	2001	25-1-801(b)(I)
CT	1993	20-7c(c)
DE		
DC		
FL	1988	395.3025(1); Admin. Code 64B8-10.003
GA	1984	31-33-3(a)
HI		
ID		
IL	**2002**	**735 Comp. Stat. 5/8-2001**
IN	**2006**	**760 Admin. Code 1-71-3**
IA		
KS	**2003**	**65-4971**
KY	1994	422.317(1)
LA	1990	40:1299.96 (A)(2)(b)
ME	**2004**	**22:1711-A**
MD	1994	4-304(c)
MA*	**2005**	**Gen. Laws 112:12CC**
MI	**2004**	**333.26269(9)**
MN	1992	144.292(6)
MS	1972	11-1-52
MO	1995	191.227

State	Year Adopted	Code Section
MT	1999	50-16-540
NE	1999	71-8404
NV	1990	629.061
NH	**2002**	**332-I-1**
NJ	1990	Admin. Code 13:35-6.5(c)(4)
NM**	**2007**	**16.10.17.8(B)**
NY	1991	Pub. Health 18(2)(e)
NC	1994	90-411
ND	2000	23-12-14(2)
OH	**2002**	**3701.741**
OK	1977	Tit. 76: 19(A)(2)
OR	**2004**	**192.521**
PA	1999	Cons. Stat. 6152(a)(2)
RI	1996	Phys. Lic. Rules 11.2
SC	1993	44-115-80
SD	1996	Admin. Rules 47:03:05:09
TN	1997	63-2-102
TX	1998	Admin. Code Rule 165.2
UT		
VT	1999	18:9419
VA	2000	32.1-127.1:03
WA	1996	Admin Code. 246-08-400
WV	2000	16-29-2
WI	**2004**	**146.83(3m)(b)**
WY		

* Massachusetts omitted from analysis because of its passage of broad health reform contemporaneous with medical record copying cost reform.
** New Mexico cap applies only to physicians.

Table 2: Means and (Standard Deviations), Enrollees and Physician Claims MarketScan Data, 2001 and 2007

	Enrollees with a visit to…			
	Primary Care		Specialist	
	2001	2007	2001	2007
Proportion of enrollees switching physicians	0.227	0.218	0.078	0.074
Cap on copy fees	0.869	0.957	0.885	0.964
County HHI	0.084	0.090	0.319	0.284
for physician services	(0.080)	(0.101)	(0.215)	(0.225)
Price of new-patient	92.38	106.56	91.95	104.20
visit (CPT 99203)	(16.19)	(22.48)	(17.52)	(23.14)
Price of existing-	53.72	62.64	53.39	61.02
patient visit (CPT 99213)	(11.91)	(13.70)	(12.68)	(14.54)
age	44.91	42.09	45.54	43.26
	(15.11)	(16.08)	(15.51)	(16.43)
female	0.427	0.467	0.415	0.435
Industry				
missing	0.518	0.601	0.567	0.619
oil/gas/mining	0.000	0.006	0.000	0.005
manufacturing	0.364	0.306	0.351	0.285
transport/utilities	0.020	0.014	0.029	0.014
retail trade	0.000	0.021	0.000	0.016
finance/insur/real est	0.022	0.023	0.024	0.027
other services	0.076	0.030	0.029	0.034
Number of enrollees	56,318	950,599	33,931	542,115
Number of claims	468,902	8,202,324	154,028	2,376,663

Table 3: Means and (Standard Deviations), Hospitals
HIMSS and Medicare cost reports, 2001 and 2007

	HIMSS sample		All Medicare	
	2001	2007	2001	2007
EMR adoption	0.178	0.660		
Cap on copy fees	0.753	0.955	0.737	0.949
System member	0.664	0.686	0.549	0.584
Non-profit	0.688	0.663	0.690	0.640
For-profit	0.208	0.227	0.181	0.231
Government-owned	0.104	0.110	0.130	0.129
Teaching status	0.369	0.367	0.346	0.325
Number of beds	245.094	250.130	188.454	189.093
	(187.840)	(188.287)	(164.054)	(175.276)
County HHI	0.506	0.501	0.537	0.522
for hospital services	(0.357)	(0.356)	(0.360)	(0.358)
Number of hospitals	1,906	1,906	3,078	3,285

Table 4: Effect of Caps on Copy Fees on the Probability of Switching Physicians, 2001-07
(Standard Errors in Parentheses)

	Primary Care	Specialist
Cap on copy fees	**0.025 ***	**0.010 ****
	(0.014)	**(0.005)**
Second quartile HHI	0.011 **	0.000
	(0.005)	(0.002)
Third quartile HHI	0.004	-0.006
	(0.010)	(0.004)
Fourth quartile HHI	0.001	-0.011
	(0.018)	(0.007)
R squared	0.035	0.014
Number of clusters	48	48
Number of observations	2,181,427	1,265,504

Notes: Also includes year and county fixed effects; specialty fixed effects; enrollee age (< 19 years, 19-34, 35-44, 45-54, 55-64), gender, and industry; number of hospital beds; number of physicians; medicare enrollment; median household income; and population. Heteroscedasticity-consistent standard errors allowing for within-state correlation of errors in parentheses. Specialties include allergy/immunology, cardiology, dermatology, gastroenterology, neurology, ophthalmology, pulmonary disease, nephrology, infectious disease, endocrinlogy, rheumatology. Stars (*, **, ***) denote statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 5: Effect of Caps on Copy Fees on the Prices of New-Patient and Existing-Patient Visits, 2001-07 (Standard Errors in Parentheses)

	All Visits		New-patient Visit		Existing-patient Visit	
	Primary Care	Specialist	Primary Care	Specialist	Primary Care	Specialist
Cap on copy fees	**0.006**	**0.018**	**0.007**	**0.020**	**0.006**	**0.016**
	(0.019)	**(0.021)**	**(0.019)**	**(0.017)**	**(0.016)**	**(0.023)**
Second quartile HHI	0.010 ***	-0.008	0.000	0.006	0.007	0.003
	(0.003)	(0.005)	(0.007)	(0.007)	(0.004)	(0.004)
Third quartile HHI	0.023 *	0.005	0.017	0.006	0.021 *	0.009
	(0.013)	(0.007)	(0.016)	(0.012)	(0.013)	(0.007)
Fourth quartile HHI	0.390 ***	0.014 **	0.044 ***	0.033 *	0.035 ***	0.025
	(0.013)	(0.007)	(0.016)	(0.019)	(0.013)	(0.007)
R squared	0.271	0.285	0.399	0.443	0.402	0.420
Number of clusters	48	48	48	48	48	48
Number of observations	23,258,214	6,384,055	1,627,737	746,254	21,630,477	5,637,801

Notes: See Table 4.

Table 6: Effect of Caps on Copy Fees on the Probability of Hospitals' Adoption of Electronic Medical Records, 2001-07 (Standard errors in Parentheses)

Cap on copy fees	**0.087 *** (0.027)**	**0.083 *** (0.030)**	**0.079 *** (0.030)**
Second quartile HHI	0.015 (0.040)	-0.084 * (0.048)	-0.082 * (0.048)
Third quartile HHI	0.070 (0.055)	-0.124 (0.084)	-0.116 (0.085)
Fourth quartile HHI	0.058 (0.054)	-0.101 (0.103)	-0.094 (0.106)
System member	-0.060 *** (0.022)	-0.057 (0.035)	0.005 (0.032)
Small (<100 beds)	-0.013 (0.033)	0.034 (0.052)	-0.001 (0.041)
Medium (101-300 beds)	-0.015 (0.029)	0.032 (0.037)	0.012 (0.023)
For-profit ownership	-0.042 (0.069)	-0.250 ** (0.111)	0.058 (0.087)
Non-profit ownership	-0.014 (0.056)	-0.145 (0.111)	-0.011 (0.057)
Teaching hospital	0.030 (0.032)	0.034 (0.027)	0.022 (0.031)
Fixed effects	State+year	County+year	Hospital+year
R squared	0.159	0.505	0.754
Number of clusters	49	49	49
Number of hospitals	1,906	1,906	1,906
Number of observations	13,342	13,342	13,342

Notes: Also includes controls for number of hospital beds; number of physicians; medicare enrollment; median household income; and population. Heteroscedasticity-consistent standard errors allowing for within-state correlation of errors in parentheses. Includes all general medical/acute care hospitals in HIMSS data base reporting data from 2001-07. Stars (*, **, ***) denote statistical significance at the 10, 5, and 1 percent levels, respectively.

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