Regulatory Exploitation and the Market for Corporate Control

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I. Introduction

Most economic studies of consolidation activity focus on the ability of merging firms to exercise market power or to generate economies of scale and scope. However, the business press is replete with examples of takeovers implemented to replace ineffective management through the "market for corporate control." Whether such takeovers increase social welfare depends on the criteria used to define "ineffective." For example, acquisitions to replace managers who do not deploy assets to their most productive uses will likely enhance social welfare. However, if managers are ineffective at exploiting regulatory failures, acquirers who replace them may prosper at the expense of consumers and taxpayers. Due to the deadweight loss associated with tax revenue raised to offset these transfers, together with the nontrivial costs of executing mergers, the net welfare effect of such acquisitions is likely to be negative.

While there are substantial bodies of literature on merger rationales larger writ, few studies assess the nature of managerial ineffectiveness, and none to our knowledge examines whether firms pursue acquisitions for the purpose of exploiting regulatory failures. However, a long literature documents the ability of firms to increase profits in this manner, beginning with Averch and Johnson's 1962 paper on investment by public utilities subject to rate-of-return regulation. More recent papers include Duggan and Scott Morton (2005) and Kyle (2005) on pharmaceutical companies' responses to price regulation, Desai and Hines (2002) on American corporations' efforts to avoid U.S. taxes on foreign income, and Goolsbee (2000), Rose and Wolfram (2002), and Hall and

Leibman (2000) (among others) on the responsiveness of executive compensation to tax incentives. This body of literature suggests that consolidations may be motivated by acquirers' ability or willingness to take advantage of regulatory loopholes.

We examine empirical evidence for such acquisitions using panel data on the U.S hospital industry between 1985 and 1996. There was a wave of consolidation activity during this period, and data on the identity of realized and potential targets and acquirers is readily available. The industry is highly-regulated at both the state and federal level, presenting many opportunities for exploiting regulatory failure. Our empirical analysis is based on an unexpected change in the payment system used by Medicare to reimburse hospitals for inpatient care. This change widened a pre-existing loophole in the system, presenting hospitals with an opportunity to increase operating margins by 5 or more percentage *points* simply by "upcoding" patients to more lucrative codes. Given typical operating margins of less than 2 percent during this time period, this is a substantial figure.

The exact amount of the potential increase in payments depended on the mix of patients in each hospital and the extent to which the hospital was exploiting the loophole prior to the regulatory change. Dafny (2005) finds evidence that hospitals upcoded significantly more following the increase in the incentive to do so. The response of for-profit hospitals was dramatically larger than that of not-for-profit or government-owned hospitals, indicating a greater willingness or ability to exploit this opportunity. In this paper, we examine whether hospitals with greater "room to upcode" (*RTU*) following the 1988 reform were more likely to be targeted for acquisition by for-profit hospital systems. We compare the predictors of acquisition in 1985-1987 (the "pre-period"),

1989-1992 (the "treatment" period), and 1993-1996 (the "post period", during which there was a massive federal crackdown on Medicare fraud).[1] We also consider two other motives for acquisition: poor financial performance and the ability to exercise market power. We obtain three main results: (1) during the period immediately following the implementation of the new Medicare rules, 1989-1992, *RTU* was a statistically and economically significant predictor of whether an independent hospital was acquired by a for-profit system; (2) hospitals acquired during this period subsequently increased the extent of upcoding activity relative to similar hospitals that were not acquired; and (3) *RTU* is not associated with not-for-profit system acquisitions in any time period, nor with for-profit acquisitions before 1988 or after 1992.

II. Background

Hospital Ownership and Consolidation in the 1980s and 1990s

Over the past few decades, U.S. hospitals have been subject to increasing financial pressure exerted by public and private payers. These pressures stimulated a major transformation of the industry, including large numbers of closures, mergers, and acquisitions by groups of affiliated hospitals ("systems"). Table 1 presents the number of community hospitals, by ownership status, at the start and end of our study period.[2] Despite a decline of 13 percent in the number of facilities, the shares by ownership have remained virtually unchanged. The vast majority of hospitals are not-for-profit or government-owned; for-profit facilities account for roughly 15 percent of community hospitals.

[1] The "pre period" is one year shorter than the others because the data are not available prior to 1985.
[2] Community hospitals are non-federal, non-state hospitals where the average length of stay is less than 30 days.

These stable shares belie a hectic pace of acquisitions (and divestitures). Table 2 reports the total number of hospitals that were independent in 1985 and part of a system by 1996, separately by ownership type of the acquirer and target.[3] Of 3259 independent community hospitals in the United States in 1984, 742 became part of a hospital system by 1996. These hospitals (henceforth "targets") came from all ownership types, while the systems (henceforth "acquirers") tended to be privately-owned. Although the analysis below focuses on the predictors of acquisition by for-profit systems, the large number of not-for-profit acquisitions facilitates a comparison of the strategies employed by the two ownership types.

Prior Research

To our knowledge, there are no prior studies examining regulatory exploitation as a motive for consolidation, nor the possibility of takeover to eliminate X-inefficiency. However, this research question touches on at least two distinct branches of literature, which we use to inform our analysis and frame the results. The first is the extensive literature on hospital consolidation. Town and Vogt (2006) provide an up-to-date synthesis of this literature. The most recent research on one-to-one consolidations finds evidence for post-merger increases in price and decreases in costs. While consistent with the general hypothesis of takeover to install "superior" management, these results are also consistent with alternative explanations, such as economies of scale and the ability to exercise post-merger market power. In addition, the nature of any possible managerial ineffectiveness cannot be inferred from these findings.

[3] Some hospitals may have changed hands more than once during this time period. We list the ownership status as of 1996.

Within the literature on hospital consolidation, a number of studies specifically address the formation and function of hospital systems. The most recent evidence suggests that integration into multi-hospital systems has no impact on hospital costs (Dranove and Lindrooth 2003, Connor et al 1997). Several other studies provide useful descriptive information regarding the characteristics of hospitals affiliating with systems. Cuellar and Gertler (2005) find that system membership is more likely among hospitals that are for-profit, located in urban areas, or have high managed care loads. Mobley (1997) documents that not-for-profit systems tend to acquire multiple hospitals in a local market area, while for-profits have broader geographic spread. Although the former would be a more effective way to obtain market power, and possibly to achieve cost efficiencies as well, for-profit systems may have rejected this strategy due to concern over antitrust enforcement actions. Setting aside the issue of different objective functions and penalties (perceived and actual) faced by chains of different ownership type, these patterns suggest that not-for-profit and for-profit acquisition strategies differ dramatically, a prediction that is corroborated by our findings.

The second related branch of literature, "gaming" of government regulations, extends across many industries. Most relevant to this paper are studies within healthcare, including Duggan and Scott Morton (2006), Duggan (2002), Silverman and Skinner (2004) and Dafny (2005). Duggan and Scott Morton find strong evidence that pharmaceutical companies exploit Medicaid's prescription drug pricing rules, introducing "me too" versions of drugs in order to escape limits on price growth for existing drugs, and increasing prices to other healthcare consumers to raise the average selling price on which Medicaid reimbursement is based. Duggan (2002) studies the responsiveness of

hospitals to non-linear incentives presented by the implementation of the California Disproportionate Share Program, which provides subsidies that vary based on the fraction of a hospital's caseload that is indigent. He finds that private hospitals responded to the new incentives by "cream-skimming" the most profitable indigent patients away from public facilities. Silverman and Skinner (2004) and Dafny (2005) find evidence that hospitals respond to financial incentives to upcode, and further that for-profits upcode more than not-for-profits.

III. Medicare Payment Rules and Opportunities for Exploitation

Medicare is the largest source of revenue for most hospitals, accounting for nearly one third of all hospital revenues nationwide.[4] Prior to 1984, the Center for Medicare and Medicaid Services (CMS, known at that time as the Health Care Financing Administration) reimbursed hospitals for Medicare inpatients on a cost basis. Under the Prospective Payment System (PPS) introduced in 1984, CMS pays hospitals a fixed fee per admission, where the fee depends on the patient's medical condition, or diagnosis related group (DRG). CMS requires hospitals to classify patients into about 500 DRGs based on clinical information. It is well-known that this gives hospitals an incentive to report diagnostic codes that classify patients into more remunerative DRGs, a practice that has led to substantial "DRG creep."

To understand how upcoding is operationalized, consider a patient who arrives at the hospital with pneumonia. During the hospital stay, the patient is also diagnosed with heart failure. It is difficult to assess which condition caused the other, and reimbursement

[4] Winter, A. and Pettengill, J., 2003, "Relationships among Medicare inpatient, overall Medicare and total margins for hospitals" Report to the Medicare Payment Advisory Commission.

is based on the *primary* diagnosis. In 1992 (midway through our study period), a diagnosis of pneumonia with complications would be compensated at approximately $4,175, while heart failure would earn the hospital approximately $3,568.[5] Given that the expense of treating the patient is the same regardless of the diagnosis, clearly it is financially advantageous to code pneumonia as the primary diagnosis.

Critics have raised the concern that patient care could be compromised if hospitals manipulate the medical record to maximize reimbursements rather than to paint the most medically useful picture of a patient's health.[6] In addition, CMS' approach to reining in the costs associated with upcoding -- decreasing the annual cost inflation factor applied to all reimbursements – punishes hospitals equally, regardless of the extent to which they upcode. When upcoding involves intentionally misstating the diagnosis, it rises to the level of fraud and is covered under Federal False Claims Act of 1986. During the 1990s, the Department of Justice (DOJ) successfully brought numerous charges of fraudulent upcoding. In the highest-profile case, against the for-profit Columbia/HCA hospital system, the DOJ secured an $850 million settlement for charges that included upcoding. The DOJ has also targeted nonprofit hospitals for similar infractions.

The 1988 Change in Coding

Although upcoding was known to be a problem with PPS since its inception, a change to the DRG coding system in 1988 offered hospitals substantial new opportunities to upcode. The change pertained to DRG codes belonging to a DRG "pair." A DRG pair

[5] Estimates calculated for a large urban hospital with the national average wage index.
[6] Many organizations including the American Academy of Otolaryngology and the Texas Medical Foundation have stated that upcoding is unethical and should not be practiced. Some groups, such as the American Academy of Family Physicians, state that upcoding is unethical when it rises to the level that might constitute fraud.

consists of two codes for the same diagnosis. Of 473 codes in 1987, 190 belonged to DRG pairs. Prior to 1988, the "top code" within a pair was utilized for all patients over age 69 and younger patients with complications (CC); the "bottom code" was for younger, uncomplicated patients with the same diagnosis. Analyses performed in 1987 revealed that, on average, charges for patients with CC were much higher than charges for patients without CC, but older patients were not significantly more expensive to treat than younger patients (who were primarily aged 65-69). CMS concluded that "in all but a few cases, grouping patients who are over 69 with the CC patients is inappropriate" (52 *Federal Register* 18877), and they removed the age qualifiers and recalculated the reimbursement amounts to reflect the new categories.

Table 3 provides examples of the three most common DRG pairs and their DRG weights before and after the policy change. Actual reimbursements are calculated by multiplying DRG weights by a hospital-specific "base" amount (approximately $4000 in 2005), so that a one percent increase in a DRG weight corresponds to a one percent increase in price. The recalibration following the policy change produced a weighted average increase of 11.3 percent in the payments for top codes, and a decrease of 6.2 percent in the payments for bottom codes. This resulted in a substantial increase in the value of coding complications, as compared to the preceding years (1984-1987). Using a 20 percent sample of Medicare discharges for 1985-1996, we calculate *room to upcode* (*RTU*) for every hospital and year. *RTU* is defined as the increase in the hospital's average DRG weight that would result from a shift of all patients in bottom codes to the associated top codes; given that hospitals in 1987 had an average DRG weight of 1.14, *RTU* is approximately equal to the percentage increase in Medicare revenues that could

be obtained by coding all patients with complications. Figure 1 presents annual boxplots of *RTU* for general, non-federal community hospitals in the non-territorial U.S. The data reveal a large increase in *RTU* beginning in 1988, and a steady decline thereafter.

Upcoding as a Motivation for Acquisition

One possible explanation for the variation in *RTU* is that some managers are more efficient at upcoding. Successful upcoding requires careful attention to medical records, sophisticated software, and trained coding personnel. The annual fees charged by independent coding consultants reach into the millions, with uneven results. Hence hospital systems may enjoy substantial expertise and economies of scale arising from centralized coding policies.

Another possibility is that some managers are more willing to upcode, or are provided with stronger incentives to do so. One for-profit hospital chain awarded bonuses to managers based on the coded incidence of complications (Lagnado 1997). It is also possible that not-for-profits avoid the "gray area" of upcoding in order to preserve their "trust capital" in the community (Glaeser et al.).[7] Many other studies find that when it comes to balancing profits against more "altruistic" objectives such as providing community benefits, for-profit hospitals lean more heavily towards profits.[8]

[7] The potential fraud suggests an additional reason why upcoding may be a motive for acquisition. As described by Dafny (2005), the extent of upcoding involves a tradeoff that accounts for the expected punishment cost. A manager who is already engaging in questionable upcoding at one hospital may reason that doing so at additional hospitals might have only an incremental effect on the punishment cost. If so, it makes sense for one manager to bear the punishment risk for many hospitals.

[8] For example, see Roomkin, M. and B. Weisbrod, "Managerial Compensation and Incentives in For-profit and Nonprofit Hospitals," *Journal of Law, Economics, and Organization*, October 1999, pp. 750-781. Many other papers document differences between nonprofits and for-profits that suggest they have different objectives. For example, see Brickley, J, Van Horn, R.L. "Managerial Incentives in Nonprofit Organizations: Evidence from Hospitals," *Journal of Law and Economics* 2002 v95 (1) p.227-250, and Horwitz, Jill, "". This raises the question of why a hospital that did not upcode prior to acquisition would

A system seeking to acquire a hospital could easily calculate *RTU* using discharge totals by DRG together with DRG weights, which are reported annually in *The Federal Register*. Because other public and private insurers often use the Medicare DRGs as the basis for their reimbursements, *RTU* likely reflects revenue opportunities outside the Medicare population as well.

Although the 1988 reform substantially heightened the incentive to upcode and hence to acquire hospitals for the purpose of upcoding, the window to do so effectively ended a few years later. By the early 1990s, researchers and policy makers were raising red flags about upcoding, potentially spelling an end to the practice. For example, a 1993 study published in the *New England Journal of Medicine* presented evidence that hospitals in New England had systematically engaged in upcoding so as to increase reimbursements.[9] The Federal Bureau of Investigation ramped up its health care anti-fraud efforts in 1992; within three years, it had tripled the number of agents working on health probes.[10] In 1994, U.S. Senator William Cohen proposed to stiffen Medicare anti-fraud laws, stating that Medicare fraud cost Americans as much as $100 billion annually.[11] A Boston Globe exposé that year suggested that "of all the areas under investigation (by the Department of Health and Human Services), it is coding fraud that might be the most prevalent and costly."[12] In January 1995, Cohen took over as chair of

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agree to be acquired by a system that intended to upcode. Even if managers had a choice and were aware of the acquirer's intentions, they may have felt that their responsibility to eschew upcoding ended when management changed hands.

[9] As an example of the growing research on upcoding, Assaf et al.,, 1993, "Possible Influence of the Prospective Payment System on the Assignment of Discharge Diagnoses for Coronary Heart Disease *New England Journal of Medicine*, 329(13): 931-5.

[10] Lipman, L. "FBI Chief: Health-care Fraud Endemic" *Denver Post*, 3/22/1995, p. A-13.

[11] Thomas, J., "Senator: Health Care Fraud Costs Staggering" *St. Petersberg Times*, 7/9/1994, p. 6a.

[12] Golden, D. and Kurkjian, S. "The Fraud Factor: Hidden Costs of Health Care" *Boston Globe*, 7/31/1994, p. 1.

the Senate Special Committee on Aging, where he promised to continue investigations of health care fraud.[13]

By the mid-1990s, payers were also responding to the challenge of detecting upcoding. Beginning in 1995, HCFA contracted with two Clinical Data Abstraction Centers to validate the accuracy of DRG coding.[14] As of 1996, at least 6 vendors had developed software to help private payers detect upcoding.[15]

Given the resources allocated to halting upcoding and the threats of criminal prosecution, we anticipate that the upcoding motive for acquisition lessened substantially by the early 1990s. Our main analysis focuses on the effect of *RTU* on for-profit acquisitions between 1989 and 1992, immediately after opportunities to upcode increased.[16] We contrast these results with identical specifications estimated for 1985-1987 (the pre-policy years for which data are available), and 1993-1996.

IV. Data

We use the *Annual Survey of Hospitals* conducted by the American Hospital Association in 1984-1997 to identify hospitals and system affiliations, and to obtain descriptive

[13] In 1994, the Department of Justice in 1994 concluded its multi-year investigation of fraud by National Medical Enterprises, a large for-profit hospital chain, by accepting a cash settlement of $350 million. Though the case did not involve upcoding, it was further evidence of the government's determination to crack down on perceived fraud.

[14] These centers reviewed tens of thousands of inpatient records of Medicare patients with selected diagnoses that are prone to upcoding, such as septicemia and metabolic disorders. For example, see DHHS Office of Inspector General (1999.) While the total number of records reviewed represents less than 1 percent of total Medicare hospitalizations, they represent a much larger percentage of the chosen diagnoses.

[15] See USDHHS, "Using Software to Detect Upcoding of Hospital Bills" August 1998. This study evaluated software that was commercially available in 1995 and 1996.

[16] *RTU* does not fully capture all upcoding possibilities available to a hospital. First, many private insurers use the same DRG system. Second, there are other diagnoses that present different opportunities for upcoding that we cannot measure. Third, there are opportunities to upcode outpatients. Moreover, the Medicare system offered the potential for other potentially fraudulent activities besides upcoding. Our measure of "room to upcode" might therefore serve as an indicator of whether the hospital was taking full advantage of Medicare rules.

characteristics such as number of beds and services provided. *RTU* is calculated using annual data on DRG weights from the *Federal Register* and the 20% MEDPAR dataset for fiscal years 1985-1997. This dataset is a random 20% sample of discharge records (including DRG codes) for Medicare hospitalizations. Hospital financial data is obtained from the Health Care Reporting Information Set (HCRIS) for fiscal years 1985-1997, also known as the Medicare Cost Reports. Exact latitude and longitude coordinates for the full set of hospitals in every year were purchased from geocode.com.

Our sample is restricted to non-federal, non-state, general service hospitals located in the non-territorial U.S. For each time period we examine, we include only those hospitals that were independent (i.e. unaffiliated with a system) at the start of the time period (the "base year").[17] We exclude hospitals in any year in which they have fewer than 50 observations in the MEDPAR sample which is used to calculate *RTU*; *RTU* is very noisily measured when the number of admissions is low. We drop hospitals with religious affiliations, as none were acquired by for-profits during the study period.[18] Finally, in some specifications we exclude hospitals with 30 or fewer beds; only 1 out of 168 such hospitals was acquired by a for-profit system during the treatment period.

The dependent variable in the first (second) set of specifications is an indicator for acquisition by a FP (NFP) system. Table 4 presents the number of acquisitions during each period, together with summary statistics for all independent variables during the

[17] The AHA data report several hospitals that belonged to a system in a year t, did not belong in year t+1, and belonged in year t+2. Usually, the system is identical. If we treated these hospitals as independent in year t+1, this would augment our sample of independent hospitals by a third. We were hesitant to do so, mainly based on face validity. We performed a Lexus-Nexis search for ten such hospitals and could find no independent evidence that they had changed ownership during this time period. Nor could we confirm such changes at the hospital web sites. We elected not to treat these hospitals as independent. This did not affect our qualitative results, but did improve precision. We also identified 6 hospitals that were the only members of their "systems." We treated them as independent. This did not materially affect our results.

[18] Bearing in mind that targets must agree to be acquired, perhaps non-secular targets were concerned about whether for-profit systems would fulfill their religious missions.

base year for each period (1985, 1989, and 1993). (Note that in the hazard model, all variables vary annually, but for ease of interpretation we report descriptive statistics for a single year.) To be included in a sample, a hospital must be independent in the year prior to the base year. The variables include:

Room to Upcode (*RTU*): As described above, *RTU* represents the increase in the hospital's average DRG weight that would result if a hospital switched all patients it had assigned to the bottom codes of DRG pairs to the corresponding top codes of these pairs. We multiply *RTU* by 100 to facilitate the presentation of the results.

FP (NFP) Distance: This variable measures the straight-line distance, in miles, from a hospital to the nearest hospital belonging to a for-profit (not-for-profit) system. This measure reflects the potential for a target to enhance the market power of an acquiring system.[19]

Residual Profits: To obtain a measure of how well a hospital is performing relative to expectations, we obtain the residual from a regression of operating margins on a set of variables that might be used by an acquirer to predict the potential profitability of a hospital.[20] Ceteris paribus, a well-run hospital should be less likely to be acquired. We multiply residual profits by 100 to facilitate the presentation of the results.

RTU, Distance, and Residual Profits are measures of the three potential acquisition motives discussed above: upcoding to increase reimbursements, market power, and improving operating performance in general. We also considered several

[19] We experimented with many versions of this variable and found none to be significant predictors of acquisition.

[20] These include local zip code demographics, including urban status and MSA size, income, sex and racial composition, percentage of patients on Medicare and Medicaid, bed size, ownership type, membership in the Council of Teaching Hospitals the level of technological sophistication, the county Herfindahl, and state and year fixed effects. Regression results are available by request.

control variables that are commonly used in health services research, including bed size, teaching status, length of stay, ownership type, and occupancy. None of the controls affected the statistical significance or economic magnitude of the coefficients of interest, and only one was a significant predictor of acquisition. Hence, the results we present include the following measure as a control variable:

High Tech: A simple count of the number of high tech services offered by the hospital. The services considered include: cardiac catheterization lab, certified trauma center, computed tomography (CT) scanner, megavoltage radiation therapy and open-heart surgery.

We also include dummies for 9 geographic regions. These dummies primarily capture differences in the dominance of FP chains across the country. These chains are most active in the South and the West.[21]

Table 5 presents descriptive statistics for our key predictors.

[21] The nine regions (as defined by the American Hospital Association) are: New England, Mid-Atlantic, South Atlantic, East North Central, East South Central, West North Central, West South Central, Mountain, and Pacific.

V. Methods

We analyze the role of upcoding in acquisitions in three steps. First, we determine if *RTU* is a predictor of acquisition by a for-profit system. Second, we determine if acquired hospitals increased their upcoding more than a matched sample of independent hospitals that were not acquired. Last, we perform both steps for acquisitions by not-for-profits systems.

Predicting Acquisition

Our specification assumes that potential acquirers observe each independent hospital's characteristics in a given year and decide whether to acquire the hospital in the next year.[22] This implies that the acquisition decision can be modeled as a series of conditional logits, where the sample in each period consists of those hospitals that have not yet been acquired:

(1) $\text{ACQUIRED}_t = f(RTU_{t-1}, \text{Residual Profits}_{t-1}, \text{Distance}_{t-1}, \text{Hitech}_{t-1}, \text{Region Fixed Effects})$.

We estimate equation (1) using a Cox proportional hazard model with time-varying covariates. In some specifications, we classify hospitals into quintiles of the key predictors so as to allow for nonlinear effects.

In our main specifications, t=1989-1992.[23] We also examine t=1993-1996 to determine whether upcoding remained a motive for acquisition after the initiation of the federal crackdown on Medicare fraud. As a check on our identification strategy, we also

[22] In unreported regressions, we suppose that the acquirers take the average of the previous two years values of each predictor; the results are very similar to those reported herein.

[23] We exclude 1988, the first year during which the revised DRGs were in place, as RTU is measured based on the year prior to acquisition and would therefore be severely underestimated.

present results for acquisitions during 1985-1987, using *RTU* from 1988 as an independent variable. One alternative explanation for our main result is that omitted factors correlated with high post-reform *RTU* are driving the increased propensity to be acquired; by confirming that 1988 *RTU* is not associated with acquisitions during 1985-1987, we can rule out the possibility of such a pattern during the pre-period.

Change in Upcoding

After demonstrating that upcoding was a motive for for-profit acquisitions between 1989 and 1992, we determine if the acquired hospitals increased the extent of upcoding relative to a matched set of hospitals that remained independent. We estimate the following equation:

(2) $RTU_{t+n} - RTU_t = f(\text{ACQUIRED}_{BY\ 1992}, \text{Residual Profits}_t, \text{Distance}_t, \text{Hitech}_t, \text{Region Fixed Effects})$

where t denotes the year of the acquisition and n is the number of years over which we measure the change in *RTU*. We report results for n=4 but obtain similar findings for n=3 and n=5.

The sample for this analysis includes all acquired hospitals together with a matched set of hospitals that remained independent. We match hospitals in two ways. First, we do propensity score matching based on the likelihood of being acquired, using the same predictors as in equation (2). Second, we match solely on *RTU* in 1988. In both cases, we use the five closest matches for each acquired hospital.[24] Our results provide estimates of the average effect of acquisition on the acquired sample. The identifying

[24] Some control hospitals may appear more than once in the regression if they are matched to more than one acquired hospital. Results are similar when we limit each control hospital to one observation.

assumption is that, absent the acquisition, *RTU* in the acquired sample would have increased by the same amount as in the matched sample. To test this assumption, we also estimate the pre-period change in RTU for acquired hospitals and the matched sample; a small and statistically-insignificant estimate would buttress the assumption that the matched sample is an appropriate control group.[25]

VII Results

Predicting Acquisition Probabilities

Table 6 presents the results of our Cox proportional hazard models with time-varying covariates for the treatment period. Column 1 presents estimates in which the predictors enter linearly in the hazard function; column 2 uses quintiles. Coefficients are reported as hazard rates, where the baseline hazard of 1 indicates no association between the independent variable and the probability of acquisition and a coefficient greater (less) than 1 indicates a positive (negative) association. Standard errors are reported in parentheses and significance levels are computed relative to the null hypothesis that the hazard rate is one.

The results reveal that *RTU* is a positive predictor of acquisition, while residual profits are a negative predictor. The coefficient on *RTU* is statistically significant at $p<.07$. The coefficient on the highest quintile is significantly larger than all other quintiles at $p<.05$. The magnitude of the *RTU* effect on the probability of an acquisition is substantial. To see this, consider that the average independent hospital with more than

[25] This test helps to rule out the possibility that the results are biased by time-invariant omitted variables correlated with the change in *RTU* as well as the propensity to be acquired. However, as with all "differences in differences" estimates, we assume there are no omitted time-varying factors with these properties.

30 beds had a 3.1 percent chance of being acquired between 1989 and 1992. Given that the standard deviation of *RTU* for hospitals in the regression sample was approximately 2.5, the coefficient estimate of 1.083 therefore implies that a hospital with an *RTU* one standard deviation above the mean value had a .040 chance of being acquired, versus a .028 acquisition probability for a hospital with an *RTU* one standard deviation below the mean. The effect is even larger if we examine the highest quintile of RTU. The coefficient of 2.0 implies that hospitals in this quintile were approximately twice as likely to be acquired as those in the middle quintile.[26]

High residual profits are associated with a lower probability of acquisition, whereas distance has no effect.[27] Finally, the results also show that hospitals with high tech services were markedly less likely to be acquired.

Table 7 presents results for the pre and post-period (using samples without small hospitals). *RTU* does not predict acquisitions in either of these periods. The pre-period coefficient, which is estimated using the 1988 value of *RTU*, suggests that high post-reform *RTU* is not correlated with some other unobservable determinant of acquisitions around this time period. The latter result is consistent with the anecdotal evidence of a government crackdown at that time.

Nonprofit acquirers

Tables 8 and 9 present results from analogous specifications for NFP acquisition. The coefficient on *RTU* equals 1 or smaller, indicating *RTU* does not positively predict NFP acquisitions. This finding is consistent with prior research, which finds stronger

[26] The exact formula is exp(2.0-1.28) = 2.05.
[27] We obtain similar results if we enter residual profits nonlinearly. The coefficient and significance level of *RTU* remains unchanged.

evidence of upcoding among for-profits. We also note that the point estimate of the effect of Residual Profit is identical in the NFP and FP acquisition equations.

Change in Uproom

Tables 10 and 11 report the results from specification (2), which examines changes in RTU immediately before and after acquisitions. In column (1), matching is based on the propensity to be acquired. In column (2), matching is based on the value of *RTU*.

The results indicate that acquisitions were not associated with RTU before mergers, but were associated with statistically significant reductions in *RTU* afterwards. The estimated magnitude in column (1) of Table 11 indicates that for profit acquirers increased Medicare revenues by 0.71 percent relative to similar hospitals that were not acquired. How much money does this amount to? Consider that the average target hospital in our sample had Medicare revenues of just over $4.5 million annually (out of total revenues of $14 million.) Thus, the reduction in *RTU* of .0.71 percent would generate additional annual revenues of about $30,000. Many private insurers and some Medicaid plans used the same DRG system for reimbursements, so the additional revenue from increasing upcoding for all patients at target hospitals could approach $60,000 annually.[28] This could make or break many target hospitals – the interquartile range of net profits at targets was approximately -$1 million to +$30,000. It is apparent that the

[28] If reductions in *RTU* are accompanied by the exploitation of other oppo*RTU*nities to increase revenues, such as described earlier, then the resulting profits would be even higher.

observed increase in upcoding could make a substantial improvement in a target's bottom line.[29]

VI. Conclusion

Firms in highly regulated industries may find that government rules create considerable scope for enhancing profits. Those that fail to exploit these opportunities, either due to the lack of the requisite capabilities or managerial incompetence, may find themselves ripe targets for acquisition. When Medicare in 1988 changed the rules for reimbursing hospitals for inpatient care, it created exactly the kind of scenario we have just described.

Following the rule change, hospitals could increase their revenues by several percentage points if they could manipulate diagnostic coding in a way that did not raise regulators' eyebrows. Dafny (2005) had shown large for-profit systems were better able to exploit these changes than their peers. We show here for-profits targeted for acquisition those hospitals that did a particularly poor job of upcoding. Consistent with the argument that it was upcoding *per se* that motivated the acquisitions, rather than some unobservable but correlated hospital characteristic, we further find that hospitals with room to upcode were not targeted prior to the rule change. Moreover, once the Department of Justice initiated a crackdown on upcoding, this motive for acquisition disappeared. Even so, targeted hospitals did increase their upcoding slightly relative to peers.

Many researchers have challenged the motives for hospital acquisitions. Most critics complain that acquisitions often enhance market power at the expense of

[29] Hospital purchase prices are typically not disclosed. However a search of the trade literature suggests that a typical 100 bed hospital (around the median of our target population) would have sold for under $10 million during our sample period.

consumers. Our results suggest that acquisitions may also come at the expense of taxpayers, who must foot the bill when acquires exploit regulations.

References

Assaf, A.R., Lapane, K.L., McKenney, J.L. and Carleton, R.A., 1993, "Possible Influence of the Prospective Payment System on the Assignment of Discharge Diagnoses for Coronary Heart Disease", *New England Journal of Medicine*, 329(13): 931-5.

Averch, H. and Johnson, L., 1962, "Behavior of the Firm under Regulatory Constraints", *American Economic Review,* 52(5): 1052-1069.

Brickley, J, Van Horn, R.L. "Managerial Incentives in Nonprofit Organizations: Evidence from Hospitals," *Journal of Law and Economics* 2002, 95 (1): 227-250.

Connor, R.A., Feldman, R.D., Dowd, B.E., and Radcliff, T.A., 1997, "Which types of hospital mergers save consumers money?", Health Affairs, 16(6): 62-74

Cuellar, A. and P. Gertler, 2005, "How the Expansion of Hospital Systems Has Affected Consumers," *Health Affairs* 24(1): 213-220.

Dafny, L., 2005, "How Do Hospitals Respond to Price Changes", *American Economic Review*, 95(5): 1525-1547.

Desai, M. and James R. Hines, Jr.,2002, "Expectations And Expatriations: Tracing The Causes And Consequences Of Corporate Inversions," *National Tax Journal,* 55(3): 409-440.

Dranove, D. and Lindrooth, R., 2003, "Hospital Consolidation and Costs: Another Look at the Evidence", Journal of Health Economics, 22: 983-997.

Duggan, M., 2002, "Hospital Market Structure and the Behavior of Not-For-Profit Hospitals", *RAND Journal of Economics,* Autumn: 433-446.

Duggan, M. and Scott Morton, F., 2006. "The Distortionary Effects of Government Procurement: Evidence from Medicaid Prescription Drug Purchasing," *Quarterly Journal of Economics*, forthcoming.

Glaeser, E., Laibson, D., Scheinkman, J. and Soutter, C.,2000, "Measuring Trust", Quarterly Journal of Economics, 115(3): 811-846.

Golden, D. and Kurkjian, S. "The Fraud Factor: Hidden Costs of Health Care" *Boston Globe*, 7/31/1994, p. 1.

Goolsbee, A., 2000. "What Happens When You Tax the Rich? Evidence from Executive Compensation," *Journal of Political Economy*, 108(2): 352-378.

Hall, B. and Leibman, J., 1998, "Are CEOs Really Paid Like Bureaucrats?", *Quarterly Journal of Economics*, 113(3): 653-691

Hall, B. and Liebman, J., 2000. "The Taxation of Executive Compensation," *Tax Policy and the Economy*, ed. James M. Poterba (14).

Horwitz, J., 2005, "Making Profits and Providing Care: Comparing Nonprofit, For-Profit and Government Hospitals", *Health Affairs*, 24(3): 790-801.

Kyle, M., 2005, "Pharmaceutical Price Controls and Entry Strategies", *Review of Economics and Statistics,* forthcoming.

Lagnado, L. "Columbia/HCA Graded Its Hospitals on Severity of Their Medicare Claims," *The Wall Street Journal*, May 30 1997, pp. A1, A6.

Lipman, L. "FBI Chief: Health-care Fraud Endemic" *Denver Post*, 3/22/1995, p. A-13.

Mobley, L.R., 1997. "Multihospital Chain Acquisitions and Competition in Local Health Care Markets," *Review of Industrial Organization,* 12(2): 185-202.

Roomkin, M. and B. Weisbrod,, 1999, "Managerial Compensation and Incentives in For-profit and Nonprofit Hospitals," *Journal of Law, Economics, and Organization*, October: 750-781.

Rose, N. and Wolfram, C., 2002, "Regulating Executive Pay: Using the Tax Code to Influence CEO Compensation," *Journal of Labor Economics*, 20 (2): S138-S175.

Silverman, E., and J. Skinner, 2004, "Medicare Upcoding and Hospital Ownership", *Journal of Health Economics*, 23(2): 369-90.

Thomas, J., "Senator: Health Care Fraud Costs Staggering" *St. Petersberg Times*, 7/9/1994, p. 6a.

Town, R. and W. Vogt, 2006, "How Has Hospital Consolidation Affected the Price and Quality of Hospital Care?" *Robert Wood Johnson Foundation.*

Winter, A. and Pettengill, J., 2003, "Relationships among Medicare inpatient, overall Medicare and total margins for hospitals" *Report to the Medicare Payment Advisory Commission*.

Table 1: Ownership Status of U.S. Non-Federal Community Hospitals

Year	NFP	GOV	FP system	FP other	Total Hospitals
1985	3221	1503	653	148	5525
%	58%	27%	12%	3%	100%
1996	2878	1248	562	123	4811
%	60%	26%	12%	3%	100%

Table 2: Acquisitions by Ownership Type, 1985-1996

	NFP Acquirer		GOV Acquirer		FP Acquirer	
NFP Target	379	82.2%	1	9.1%	94	34.8%
GOV Target	78	16.9%	10	90.9%	93	34.4%
FP Target	4	0.9%			83	30.7%
Total	461		11		270	

Table 3. Examples of Policy Change

DRG code	Description in 1987 (Description in 1988)	1987 weight	1988 weight	percent change in weight	1987 volume (20 percent sample)
96	bronchitis and asthma age>69 and/or CC (bronchitis and asthma age>17 with CC)	0.8446	0.9804	16%	44,989
97	bronchitis and asthma age 18-69 without CC (bronchitis and asthma age>17 without CC)	0.7091	0.7151	1%	4,611
138	cardiac arrhythmia and conduction disorders age>69 and/or CC (cardiac arrhythmia and conduction disorders with CC)	0.8136	0.8535	5%	45,080
139	cardiac arrhythmia and conduction disorders age<70 without CC (cardiac arrhythmia and conduction disorders without CC)	0.6514	0.5912	-9%	4,182
296	nutritional and misc. metabolic disorders age>69 and/or CC (nutritional and misc. metabolic disorders age>17 with CC)	0.8271	0.9259	12%	45,903
297	nutritional and misc. metabolic disorders age 18-69 without CC (nutritional and misc. metabolic disorders age>17 without CC)	0.6984	0.5791	-17%	2,033

Notes: Of the 95 DRG pairs, these three occur most frequently in the 1987 20 percent MedPAR sample. DRG weights are fr

Source: Dafny (2005).

Table 4: Acquisitions in Study Sample

Period	# indep hospitals at start	Acquired by FP	Acquired by NFP
1985-1987	**2656**	**134**	**176**
1989-1992	**2451**	**75**	**81**
1993-1996	**2266**	**131**	**212**

Table 5: Descriptive Statistics – 1985, 1989 and 1993

Variable	N	Mean	Std. Dev.
Base year = 1985			
RTU	2645	0.822	0.365
FP distance	2647	66.404	119.114
NFP distance	2650	24.717	22.294
Residual Profits	2612	0.425	7.346
High Tech	2648	1.498	1.724
Base Year=1989			
RTU	2437	6.031	2.552
FP distance	2429	77.982	131.570
NFP distance	2430	25.380	24.464
Residual Profits	2418	7.069	7.624
High Tech	2443	1.657	1.706
Base Year=1993			
RTU	2261	4.629	2.215
FP distance	2259	83.366	126.811
NFP distance	2254	27.362	26.259
Residual Profits	2246	0.511	7.275
High Tech	2264	1.965	1.74

Table 6: Determinants of FP Acquisition 1989-1992[30]

	(1)	(2)
Time Period	1989-1992	1989-1992
RTU	1.083[c]	
	(.046)	
RTU Quintiles		
2		1.438
		(.542)
3		1.280
		(.507)
4		1.034
		(.439)
5		2.005[b]
		(.708)
Residual Profit	.976[c]	
	(.013)	
Residual Profit Quintiles		
2		1.207
		(.405)
3		.865
		(.313)
4		.871
		(.308)
5		.454[c]
		(.186)
Distance	1.000	
	(.001)	
Distance Quintiles		
2		.913
		(.372)
3		1.083
		(.434)
4		.530
		(.266)
5		1.313
		(.619)
High Tech	.645[a]	.644[a]
	(.069)	(.072)
Region FE	Included[a]	Included[a]
Number of independent hospitals in base year	2451	2451

[30] Sample in all regressions includes all non-federal, non-religious hospitals in 1988 reporting valid data. Some regressions include further data restrictions, as noted.

Number acquired	75	75

[a]Significant at p<.01; [b]Significant at p<.05 [c]Significant at p<.10 The null hypothesis is that the coefficient equals 1.

Table 7: Determinants of FP Acquisition, other years[31]

	(1)	(2)
Time Period	1985-1987	1993-1996
RTU Quintiles		
2	1.127 (.284)	.942 (.250)
3	1.058 (.281)	.997 (.271)
4	.762 (.216)	.993 (.277)
5	.732 (.204)	.921 (.253)
Residual Profit Quintiles		
2	.679 (.173)	.803 (.197)
3	.668 (.170)	.432[a] (.127)
4	.422[a] (.122)	.469[a] (.131)
5	.452[a] (.117)	.469[a] (.120)
Distance Quintiles		
2	.598 (.168)	.805 (.195)
3	.608 (.172)	.710 (.185)
4	.773[c] (.228)	.640 (.210)
5	.671[c] (.229)	.357 (.177)
High Tech	.707[a] (.055)	.912 (.051)
Region FE	Included[a]	Included[a]
Number of independent hospitals in base year	2656	2266
Number acquired	134	131

[31] Sample in all regressions includes all non-federal, non-religious hospitals in 1988 reporting valid data. Some regressions include further data restrictions, as noted.

[a]Significant at p<.01; [b]Significant at p<.05 [c]Significant at p<.10 The null hypothesis is that the coefficient equals 1.

Table 8: Determinants of NFP Acquisition 1989-1992[32]

	(1)	(2)
Time Period	1989-1992	1989-1992
RTU	1.004 (.045)	
RTU Quintiles		
2		.883 (.332)
3		1.068 (.381)
4		1.133 (.394)
5		1.140 (.401)
Residual Profit	.977[c] (.013)	
Residual Profit Quintiles		
2		.599 (.210)
3		.668 (.224)
4		.890 (.277)
5		.430[b] (.165)
Distance	.990[c] (.006)	
Distance Quintiles		
2		.955 (.334)
3		.871 (.321)
4		.890 (.333)
5		.570 (.235)
High Tech	.990 (.067)	1.009 (.072)
Region FE	Included	Included
Number of independent hospitals in base year	2452	2452
Number acquired	81	81

[32] Sample in all regressions includes all non-federal, non-religious hospitals in 1988 reporting valid data. Some regressions include further data restrictions, as noted.

[a]Significant at p<.01; [b]Significant at p<.05 [c]Significant at p<.10 The null hypothesis is that the coefficient equals 1.

Table 9: Determinants of NFP Acquisition, other years[33]

	(1)	(2)
Time Period	1985-1987	1993-1996
RTU Quintiles		
2	.739 (.181)	.986 (.206)
3	.948 (.218)	.808 (.176)
4	.836 (.198)	.882 (.189)
5	.973 (.225)	.833 (.188)
Residual Profit Quintiles		
2	.986 (.207)	.974 (.202)
3	.652[c] (.153)	.921 (.197)
4	.547[b] (.136)	1.018 (.212)
5	.587[b] (.143)	.696 (.169)
Distance Quintiles		
2	.669[c] (.152)	1.120 (.213)
3	.516[b] (.134)	.813 (.188)
4	.703 (.173)	.784 (.178)
5	.487[a] (.136)	.464 (.129)
High Tech	.988 (.047)	1.142 (.046)
Region FE	Included	Included
Number of independent hospitals in base year	2660	2261
Number acquired	176	212

[33] Sample in all regressions includes all non-federal, non-religious hospitals in 1988 reporting valid data. Some regressions include further data restrictions, as noted.

[a]Significant at p<.01; [b]Significant at p<.05 [c]Significant at p<.10 The null hypothesis is that the coefficient equals 1.

Table 10: Determinants of Change in Uproom[34] before Merge

Note this is sample acquired from 89-92, but data for 3 year change prior to acquisition

	(1)	(2)
Time Period	1989-1992	1989-1992
Matching Criterion	Propensity Score	RTU
Acquired	-.196 (.541)	-.238 (.530)
Residual Profit	.011 (.024)	.021 (.027)
Distance	-.001 (.002)	-.008[b] (.003)
High Tech	-.381[b] (.186)	.030 (.120)
Region FE	Included[a]	Included[a]
N	391	393
R^2	.023	.030

[a]Significant at p<.01; [b]Significant at p<.05 [c]Significant at p<.10 The null hypothesis is that the coefficient equals 1.

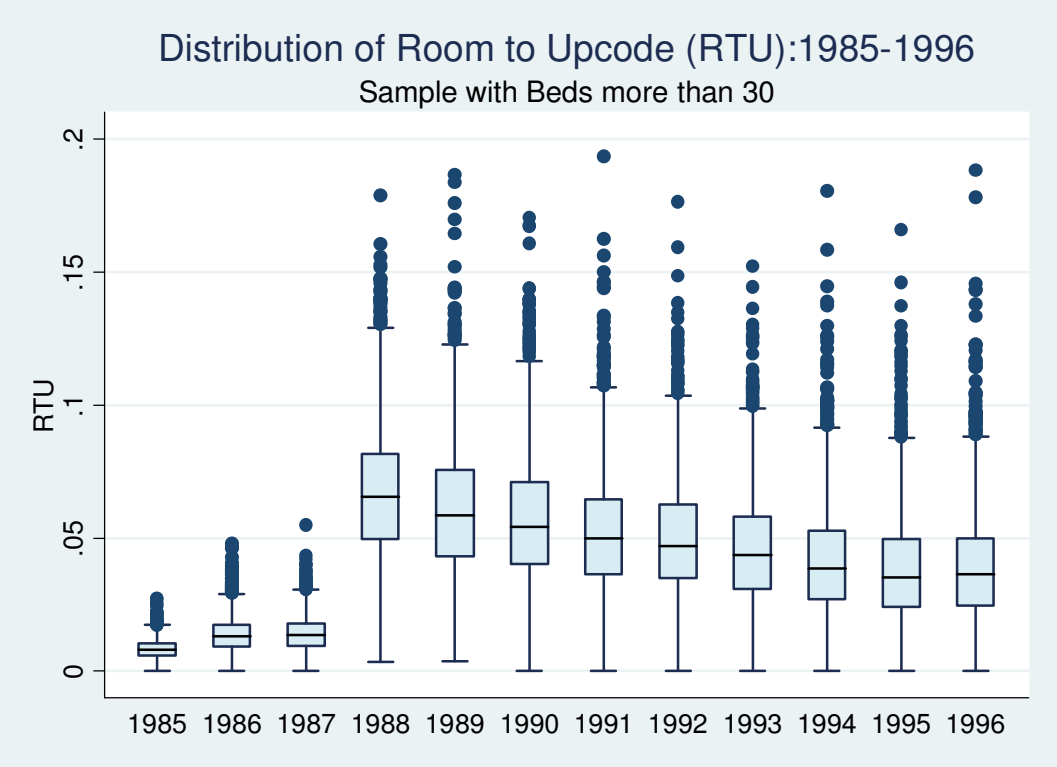
[34] All changes measured from year of acquisition to 3 years post acquisition.

Table 11: Determinants of Change in Uproom[35] after Merge

	(1)	(2)
Time Period	1989-1992	1989-1992
Matching Criterion	Propensity Score	RTU
Acquired	-.714[b] (.355)	-.560b (.254)
Residual Profit	-.003 (.015)	.021 (.015)
Distance	-.0001 (.001)	-.0005 (.002)
High Tech	-.148[c] (.128)	-.132 (.086)
Region FE	Included[a]	Included[a]
N	412	421
R^2	.036	.076

[a]Significant at p<.01; [b]Significant at p<.05 [c]Significant at p<.10 The null hypothesis is that the coefficient equals 1.

[35] All changes measured from year of acquisition to 3 years post acquisition.


Distribution of Room to Upcode (RTU):1985-1996
Sample with Beds more than 30
RTU
0
.05
.1
.15
.2
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996