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TURBOCHARGING PROFITS?
CONTRACT GAMING AND REVENUE ALLOCATION IN HEALTHCARE

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ABSTRACT

Firms often exploit loopholes in government contracts to boost revenues. The welfare consequences of this behavior depend on how firms use the marginal windfall dollar, yet little evidence exists to guide policymakers. This paper studies how hospitals allocated over \$3 billion obtained from gaming a Medicare payment loophole. The average gaming hospital increased both Medicare and total revenue by around 10%, implying large spillovers on other payers. Consistent with theories of organizational behavior, nonprofit hospitals deployed most of the windfall toward operating costs, while for-profits deducted the entire amount off their balance sheet, distributing a substantial portion to executives and shareholders. Accordingly, we detect modest reductions in mortality rates at nonprofits but no changes at for-profits. Our results imply that the consequences of such engineered windfalls vary substantially by hospital ownership.

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A data appendix is available at <http://www.nber.org/data-appendix/w32564>

1 Introduction

Governments frequently contract with private firms to deliver goods and services. Design flaws or ambiguities in contracts provide opportunities for firms to exploit loopholes and increase revenue beyond the intention of policymakers. This behavior, in which firms “engineer” windfalls, is estimated to cost the U.S. government hundreds of billions of dollars annually (Government Accountability Office, 2023). Fraud and abuse in public contracting is also a major fiscal and policy concern in other countries (Hafner et al., 2023). Despite the prevalence and significant costs associated with the gaming of government contracts, little research exists on how firms utilize funds obtained from engineered windfalls. The welfare consequences of this behavior depend on how firms allocate the marginal dollar of excess revenue.

These issues are particularly acute in the U.S. healthcare sector, which represents one-fifth of the economy, features an outsized government presence, and is rife with information frictions and agency problems (Arrow, 1963). Medicare and Medicaid account for a quarter of federal expenditures, but more than half of all estimated improper federal payments (Government Accountability Office, 2023). Payment system design is one common contracting challenge in this setting. Policymakers’ efforts to design an efficient system can be frustrated by the actions of providers and insurers to maximize their own revenue through “gaming” (Dafny, 2005; Decarolis, 2015; Duggan, 2000; Geruso and Layton, 2020). If providers direct gaming revenue to patient care, policymakers may have less to fear from payment system weaknesses. However, if excess revenue has limited benefits for patients, it would support devoting greater resources to contract design and payment oversight (Leder-Luis, n.d.; Shi, 2024).

In this paper, we study how hospitals allocate the revenue obtained from exploiting a loophole in the Medicare outlier payments program. For most patients, Medicare uses a fixed-price contract (Laffont and Tirole, 1993) that does not pay hospitals for costs of care at the margin. Outlier payments modify that contract to pay hospitals for some of the costs of treating patients who require resource-intensive care. However, due to flawed implementation, hospitals could inflate outlier payments by “turbocharging”: rapidly increasing their list prices, commonly referred to as charges. We conservatively estimate that hospitals that gamed this program received \$3 billion in excess Medicare payments between 1998 and 2003 before the loophole was closed.

Several features of this episode make it an ideal setting to study hospital gaming and its consequences. First, turbocharging involves a top-down administrative decision by hospital managers to inflate charges across all patients via a simple change in hospital

bookkeeping. Second, turbocharging appears to have been driven by geographic coincidence. Some hospitals were subject to large policy-driven payment cuts that may have incentivized gaming and were located near consulting firms that advised hospital managers on this practice (U.S. Department of Justice, 2008).¹ These features allow us to exploit conditionally random variation in gaming behavior. Third, the revenue at stake from this behavior was substantial, with turbocharging hospitals raising their effective Medicare payment rates by 22% at the peak of the episode in 2002.

We first show that hospitals that engaged in turbocharging, which we refer to as “gamers”, experienced larger Medicare payment cuts under the Balanced Budget Act of 1997 (BBA97), suggesting the cuts spurred hospitals to search for offsetting revenues. We also find that type of ownership is highly predictive of turbocharging. Government-owned hospitals have little incentive to exploit loopholes to increase revenue because they operate under soft budget constraints (Kornai, Maskin and Roland, 2003). In contrast, managers of for-profit hospitals have more incentive to maximize profits since they can distribute profits to themselves (Hansmann, 1980). Consistent with these theories, we find that for-profit hospitals are heavily over-represented among gamers, while almost no government hospitals engaged in turbocharging.

We use a matched difference-in-differences approach to estimate the causal effect of gaming outlier payments on hospital revenue, the allocation of the windfall gain, and its downstream effects on patients. We match on BBA97 payment cut parameters to compare gamer hospitals to those that had a similar motive to engage in manipulation but did not do so. Our analytic sample includes 120 gamers and 1,396 matched comparator hospitals.

We find that, on average, hospitals that game Medicare by turbocharging obtain nearly \$17 million in excess outlier payments, which translates to a 10% increase in total Medicare inpatient revenue between 1998 and 2003. The rapid growth in hospital list prices may also impact other payers because they often benchmark their payment rates to list prices (Bai and Anderson, 2016; Cooper et al., 2019) or piggyback on Medicare’s contract design, thus inheriting its flaws (Clemens, Gottlieb and Molnár, 2017; Clemens and Gottlieb, 2017). Indeed, we detect large spillover effects on other insurers: Total hospital revenue increases by \$67 million, a similar amount to Medicare revenue in percent terms.

What do hospitals do with the engineered windfall? We trace the flow of funds into three mutually exclusive and exhaustive categories. First, we find that nearly half of the revenue obtained from turbocharging flowed toward operating costs, though the estimate is

¹While all hospitals could, in theory, engage in turbocharging, not all hospitals had the same motives or incentives to do so. For example, hospitals may have been concerned about violating the False Claims Act and the negative publicity from excessive charge growth, especially hospitals already facing regulatory scrutiny. Hospitals that treat few outlier patients would also have less to gain from manipulating payments.

imprecise. Second, we study changes in net worth (defined as assets less liabilities) and find minimal effects here, including no detected change in fixed assets that might benefit patients, such as land, buildings, and equipment. Third, we consider the only remaining destination for revenue: to flow off the hospital’s balance sheet. These funds often flow to a hospital’s parent organization, where they could be used for various purposes, such as executive compensation or, in the case of for-profit hospitals, paid out to shareholders. We find nearly \$40 million per hospital flows off the balance sheet or over half of the estimated total revenue obtained from turbocharging.

These findings obscure economically meaningful and statistically significant differences between the way nonprofit and for-profit hospitals allocate this revenue. Among nonprofits – but *not* at for-profits – revenues flow predominantly to operating costs. In particular, nonprofits increase spending on non-labor direct operating costs, which could enhance care delivery. Given these differences in behavior, we find a modest improvement in mortality rates at nonprofit hospitals but no changes at for-profit hospitals. Our estimates imply that nonprofit gamers reduce mortality rates by 3% following an 8% increase in Medicare spending. This is lower than the return on hospital spending reported by prior studies but aligns remarkably well once we account for the fact that a quarter of the revenue was not directed to patient care (Doyle et al., 2015; Silver, 2021).

For-profit hospitals transfer all of the excess revenue off their balance sheets. We, therefore, trace the funds to the hospital’s parent organization. Via SEC filing data, we show that Tenet Corporation, whose hospitals account for three-fourths of the for-profits engaging in turbocharging, dramatically increased compensation for its highest-paid executives during the gaming period. The system also engaged in stock buybacks, which resulted in millions paid to shareholders. Back-of-the-envelope calculations suggest that roughly a billion dollars were funneled toward their executives and shareholders.

This paper contributes to several strands of literature. First, we extend research studying how firms respond to windfall gains. Much of this literature has focused on firm responses to winning lawsuits, grants, or bonuses (Blanchard, Lopez-de Silanes and Shleifer, 1994; Howell and Brown, 2022; Cespedes, Huang and Parra, 2023). Within healthcare, adjacent literature has studied how healthcare providers respond to policy-driven price and wealth shocks (Duggan, 2000; Kaestner and Guardado, 2008; Clemens and Gottlieb, 2014; Cabral, Geruso and Mahoney, 2018; Gross et al., n.d.; Cooper et al., 2017). Some prior studies have examined how firms exploit loopholes, for example, by “upcoding” patient or beneficiary risk to increase their revenue (Dafny, 2005; Sacarny, 2018; Silverman and Skinner, 2004; Cook and Averett, 2020; Geruso and Layton, 2020).

However, little is known about how firms allocate revenue obtained from exploiting

loopholes. Managers may view revenue derived from loopholes as less legitimate and less permanent than revenue obtained from intended policy changes (Wang, Stuart and Li, 2021). Such compartmentalization of revenue into separate “mental accounts” may lead managers to spend engineered windfalls differently (Thaler, 1985). For example, while several studies on policy-driven windfalls find that the cash is invested into the firm or to benefit employees (Saez, Schoefer and Seim, 2019; Howell and Brown, 2022), we find minimal evidence of such behavior. For-profit hospitals invest no revenue in the hospital and instead transfer the majority of funds off the balance sheet. Even among nonprofit hospitals, no excess revenue is spent on long-term commitments such as fixed capital, additional staff, or higher wages; instead, it is spent on more immediate operating needs.

Second, we contribute to the literature on ownership and performance of healthcare organizations. Many studies of US hospitals have found evidence that nonprofits often behave like for-profits (Dranove and Ludwick, 1999; Duggan, 2000; Sloan et al., 2001; Capps, Carlton and David, 2020). However, in theory, nonprofit and government-owned organizations should provide public goods or services that might be under-supplied by purely profit-driven organizations (Weisbrod, 1988; Shleifer, 1998). Our results are consistent with these theoretical predictions of distinct responses by government, nonprofit, and for-profit hospitals in their propensity to exploit the loophole and, conditional on doing so, how they allocate the excess revenue (Newhouse, 1970; Rose-Ackerman, 1996; Glaeser and Shleifer, 2001; Garthwaite, Gross and Notowidigdo, 2018). In particular, we find that nonprofit hospitals appeared to increase quality and admit sicker patients, while for-profits admit healthier patients with no detected improvements in quality. These results highlight that payment loopholes can influence quality and reallocate patients across hospitals.

Third, our results demonstrate the potential for large spillover effects of loopholes in government payment contracts onto other payers (Clemens and Gottlieb, 2017; Clemens, Gottlieb and Molnár, 2017; Einav et al., 2020). Benevolent policymakers would internalize these spillovers when considering investments in contract design or provider oversight. These findings are also relevant to other instances in which providers manipulate charges or costs to increase their revenue. For example, such behavior has been noted in insurer-provider surprise billing disputes (Gordon et al., 2022) and among nursing homes aiming to appear less profitable to raise reimbursements from public payers (Gandhi and Olenski, 2024).

Lastly, we contribute to the literature on forensic economics (Zitzewitz, 2012), which includes research on employee gaming of incentive contracts (Oyer, 1998; Larkin, 2014) and fiscal shenanigans by state governments (Baicker and Staiger, 2005). A related literature also demonstrates the value of improving payment design and investing in disciplinary mechanisms to curb fraud and abuse (Howard and McCarthy, 2021; Leder-Luis, n.d.; Perez

and Wing, 2019; Shi, 2024). These studies typically quantify how providers respond to specific disciplinary mechanisms, assuming that the targeted behavior is socially undesirable. We complement these studies by showing that the social value of such healthcare spending is not uniformly high or low and varies significantly by provider ownership type.

2 Background

2.1 Medicare and outlier payments

The origins of this episode can be traced to 1983 when Medicare implemented a prospective payment system to reimburse hospitals for inpatient stays (Appendix A.1 reviews the history in more detail). The system paid hospitals a fixed price per inpatient episode irrespective of realized costs of treatment, aiming to provide a strong incentive to minimize production costs (Laffont and Tirole, 1993). In practice, the system used diagnosis and procedure codes to classify patients into payment categories called Diagnosis-Related Groups (DRGs). Each DRG had a standardized relative price called a weight; to pay hospitals, a weight was converted to dollars based on market and hospital characteristics. Within a DRG, hospitals incurred the full marginal cost of treatment.

This payment system created two potential problems. First, it gave hospitals an incentive to avoid admitting patients who would be costly to treat within a DRG. For example, hospitals would lose money by treating a patient who was likely to need ventilator support for months. Second, hospitals now had an incentive to shirk on care for patients who were admitted by discharging them earlier than medically appropriate.

To address these issues, the system included an insurance program called outlier payments. The program had the form of an insurance policy in which hospitals paid the full cost of treatment until costs in excess of the DRG payment exceeded a deductible, at which point Medicare paid 80% of further costs. For example, consider a procedure with a DRG payment of \$10,000. If the outlier payments deductible is \$20,000 and the hospital's reported cost to treat a very ill patient is \$100,000, then the hospital receives 80% of the cost beyond \$30,000, or \$56,000 in outlier payments.

However, as in many contracting settings, the federal government agency administering Medicare, the Centers for Medicaid and Medicare Services (CMS), could not observe the true costs of treatment, and so it relied on costs reported by hospitals. These were calculated in a convoluted fashion, where the hospitals reported the list price or "charges" for each patient stay, and CMS deflated this list price using a cost-to-charge ratio to arrive at the expected cost. Hospitals calculate a patient's charges by finely tracking the procedures, supplies, and other services used in their care and then pricing them according to a set of list prices called the chargemaster. Hospitals have wide latitude to set these list prices, untethering them from

actual costs (Dobson et al., 2005).² While some details have changed over time, the essence of the outlier payment system has remained unchanged since the 1980s (Appendix B).

2.2 Opportunities to game payments

Medicare’s approach to calculating outlier payments gave hospitals the opportunity to game the system by inflating their charges – a practice referred to as “turbocharging” (CMS, 2016). A hospital’s charges rendered in year t were typically deflated by cost-to-charge ratios from year $t - 3$ or $t - 4$. This delay occurred because the ratios came from hospital cost reports that could take years to finalize.

If costs and charges grew at the same rate in the intervening years, the delay would not matter. However, if hospitals grew their charges rapidly, Medicare would not account for that growth for several years. Therefore, a hospital’s patients would appear much costlier than they actually were and yield more outlier payments in the interim.³

Figure 1 illustrates this phenomenon by showing the evolution of “costs” at the most extreme gamer hospital in our data, a nonprofit facility in New Jersey. Specifically, it shows histograms of deflated charges, less DRG payments, across patients in each fiscal year. Beyond the deductible (the vertical red line), Medicare paid the hospital 80% of the remaining cost. In the lead-up to the turbocharging period (1997), only 5.3% of patients surpassed the deductible. As turbocharging grew (2000–2003), the cost distribution shifted to the right. CMS concurrently raised the deductible from under \$10,000 in 1997 to over \$30,000 in 2003, attempting to curtail the growth in outlier payments. Even still, 22.0% of patients cleared the deductible in 2003. After the loopholes were closed, the cost distribution perceived by CMS shifted back to the left, and in 2004, only 6.6% of patients cleared the deductible.

In the 1990s, there were three key developments that gave hospital managers more reason to consider gaming. First, the return to gaming slowly rose as Medicare directed more funds to the outlier program we study, taking funds away from another form of outlier payment that reimbursed hospitals for unusually long patient stays. To do so, Medicare lowered the deductible for high-cost outlier payments, increasing the number of patients triggering these payments. Second, the scope for gaming also grew as bureaucratic delays

²The cost-to-charge ratio used to deflate charges is taken from a hospital’s most recently settled cost report. It represents the sum of all hospital costs divided by the sum of charges across all patients treated in a given reporting year.

³Hospitals with particularly extreme turbocharging could also exploit a related loophole. If a hospital’s log-cost-to-charge ratio were more than 3 standard deviations away from the national average, Medicare considered it a data error and instead used the average ratio of other rural or urban hospitals in the state. By rapidly increasing charges, hospitals could drive down the ratio to the point that Medicare treated it as an error. Going forward, their heavily marked-up charges would be deflated by the markup of the average hospital, making patients look exceptionally expensive.

led to longer lag times to settle cost reports. In turn, the charges were deflated by older cost-to-charge ratios, “providing hospitals with a longer timeframe within which to continue gaming the system” (United States Senate, 2003). Third, and most acutely, the Balanced Budget Act of 1997 (BBA97) substantially reduced Medicare DRG payments to hospitals, while leaving outlier payments largely unchanged (O’Sullivan et al., 1997). The law froze or cut annual payment updates and add-on payments for teaching and safety net hospitals. The cuts began in fiscal year 1998 and were so substantial that for the first time in its history, Medicare paid hospitals less in one year than it had the previous year (Merck et al., 2001).

Hospital stakeholders suggested that pressures from BBA97 led hospitals to game outlier payments as a new source of revenue. For instance, a New Jersey Hospital Association economist suggested that hospitals in the state gamed because they were disproportionately hit by BBA97 cuts (Jaklevic, 2003). Likewise, the president of the California Nurses Association described the outlier payment gaming as “an end run around” BBA97 and efforts by HMOs to control costs (Rawlings and Aaron, 2005). Some consulting firms also counseled nearby hospital managers to exploit the payment loopholes, driving geographic clustering of gaming behavior. For example, a New Jersey consulting firm settled with the US Department of Justice (DOJ) to resolve allegations that it advised nearly a dozen hospitals to increase charges and inflate their outlier payments (U.S. Department of Justice, 2008).

As the BBA97 cuts phased in, many hospitals began rapidly growing their charges and came to reap higher outlier payments. These charge increases also applied to all billing at the hospital, including non-Medicare insurers. Gaming continued for several years with little recognition by CMS. The agency noticed that outlier payments were coming in above target (see Figure 2) but did not connect these developments to excess charge growth (United States Senate, 2003). Their strategy to curb payments was to raise the deductible, tripling it between late 1998 and late 2002, as indicated in Figure 1. Raising the deductible reduces outlier payments, all else equal, but hospitals were gaming the system so aggressively that aggregate payments remained above Medicare’s target.

2.3 The legal disputes and aftermath

In October 2002, a financial analyst released a report showing that the for-profit chain Tenet relied much more heavily on outlier payments than was previously known (Galloro, 2002). At roughly the same time, a whistleblower suit was filed in federal court alleging that Tenet and several other hospitals, including many nonprofit facilities, had fraudulently manipulated the outlier payment system (Leder-Luis, n.d.; U.S. v. Tenet et al., 2002). News stories in the ensuing period highlighted that several hospitals and hospital systems were receiving surprisingly high outlier payments, including clusters around Philadelphia and New Jersey

(Stark and Goldstein, 2002; Jaklevic, 2003). See Appendix A.2 for more details on the legal disputes.

Following these events, CMS closed the loopholes with a series of policy changes in August and October 2003. It instructed contractors to use more recent cost reports to calculate the cost-to-charge ratio so that charge growth would be reflected more quickly in payment calculations. It also created a framework to recompute outlier payments later and, if necessary, recover them. These changes ended this era of gaming. Figure 2 shows the sudden drop in payments in 2004, and Figure 1 shows that the perceived cost distribution of the most extreme gamer in our data shifted far to the left in 2004.

In the aftermath, federal agencies sued dozens of hospitals and hospital systems for fraudulent billing under the False Claims Act. Tenet, in particular, agreed to pay \$788 million to settle the allegations on outlier payments (U.S. Department of Justice, 2006). While federal agencies called turbocharging fraud, hospitals claimed it was “flawed public policy, not fraud or illegal activity” (United States Senate, 2003). This dispute, therefore, perfectly illustrates the type of “gray” area frequently encountered in government contracts, which is exploited by firms to their advantage. Given the legal uncertainty, federal agencies mainly sued hospitals where whistleblowers stepped forward with evidence of payment manipulation. In the analysis that follows, we provide systematic evidence that the scope of gaming went far beyond the hospitals that were sued.

3 Theoretical Background

In this section, we draw on economic theory to generate predictions on which types of firms are more likely to exploit loopholes and, conditional on doing so, differences in how firms may use these funds.

3.1 Incentive to Game

A hospital’s governance structure varies by whether it is owned by a nonprofit, for-profit, or government organization. Nonprofits are exempt from paying most income and property taxes. In return, they must provide some charity care or services to the local community. Nonprofits cannot disburse surplus revenue to private shareholders or individuals, including managers.⁴ For-profits pay corporate taxes and can distribute profits to managers and shareholders. Both nonprofit and for-profit managers have a fiduciary responsibility to act in the best interests of their organization, which in nonprofits is often perceived as fulfilling a

⁴However, nonprofits can make salary adjustments to increase executive compensation, where according to IRS rules, compensation must be reasonable and not excessive relative to peer organizations.

charitable mission, and in for-profits, it is often perceived as maximizing shareholder returns. Government-owned hospitals are subsidized by taxpayers and primarily aim to provide services to underserved populations, including low-income and uninsured patients.

These differences in governance inform theories of hospital and nonprofit behavior more broadly (see [Sloan 2000](#) and [David, Philipson and Malani 2007](#) for a review). For example, the altruist model views nonprofits and government firms as maximizing social welfare and, therefore, more focused on maximizing quality. These organizations are more likely to attract altruistic decision-makers who prioritize the organization’s mission and societal welfare over personal gain ([Rose-Ackerman, 1996](#); [Besley and Ghatak, 2005](#)). However, managers of government entities may have less incentive to maximize revenue than nonprofits because they face a “soft” budget constraint: the government subsidizes their losses but also taxes away their surplus ([Kornai, Maskin and Roland, 2003](#); [Baicker and Staiger, 2005](#)).

A related model considers how nonprofit status can be a signal of noncontractible quality: since patients cannot easily observe hospital quality, and nonprofits do not face pressure to distribute profits to owners, patients may trust nonprofits more than for-profits to prioritize quality over profits ([Arrow, 1963](#); [Hansmann, 1980](#); [Glaeser and Shleifer, 2001](#); [Jones, Propper and Smith, 2017](#)). Nonprofits may commit to the norms and expectations of their institutional environment to maintain their legitimacy. Alternatively, nonprofits may operate as “for-profits in disguise,” seeking to maximize profits while disguised as charitable organizations ([Weisbrod, 1988](#)). In practice, nonprofits are likely neither pure profit nor pure welfare maximizers ([Newhouse, 1970](#)).

Drawing on this literature, for-profits may be more likely to engage in potentially improper behavior, such as exploiting loopholes in payment contracts, than nonprofit or government-owned hospitals. In particular, for-profit managers have more to gain from such behavior since they can distribute profits to themselves. Nonprofits may have more taste to engage in such profit-maximizing schemes than government hospitals but less taste to do so than for-profits. Consistent with this hypothesis, [Horwitz \(2005\)](#) finds that for-profit hospitals are more likely to offer profitable medical services, government hospitals are more likely to offer unprofitable services, and nonprofits fall in the middle.

3.2 Use of Excess Revenue

These theories of hospital ownership provide insights into how hospitals may allocate excess revenue obtained from a loophole. For example, nonprofits have implicit constraints based on their reputation as providers of charity care and explicit constraints on their use of funds that may motivate them to spend excess revenue on patient care. More altruistic managers may also be more aligned with furthering nonprofit goals, such as expanding access to care

or improving quality. Bound by their fiduciary responsibilities, for-profit managers could instead use surplus funds as an opportunity to distribute profits to their shareholders, as well as themselves.

Hospitals may also spend profits differently based on the source and permanence of funds. Individuals, for example, often deviate from a standard consumption model and instead tend to compartmentalize their finances into separate “mental accounts”, influencing their decisions on spending, saving, and investing (Thaler, 1985). Applying this logic to hospital managers, they may view funds obtained from exploiting loopholes as less legitimate than those obtained from an intended policy change and, therefore, hold them in a separate mental account. Accordingly, managers may choose to immediately spend the unearned windfall rather than increase reserves or invest in capital projects (Wang, Stuart and Li, 2021). Managers may also view funds obtained from loopholes as temporary, whereas budgetary and other policy changes can lead hospitals to experience more permanent changes in reimbursement. Hospitals may be reluctant to spend revenue from temporary sources on long-term commitments and instead spend it on more immediate operating needs. Indeed, the loophole studied in this setting proved to be transitory.

A related phenomenon is the “flypaper” effect, which suggests organizations use government funds in accordance with their intended purpose rather than integrating them into their budget for more optimal use (Hines and Thaler, 1995; Singhal, 2008). The flypaper effect could be interpreted as an application of mental accounts to the use of funds by organizations (Thaler, 1990). In our setting, since hospitals receive outlier payments as reimbursements for care provided during costly inpatient stays, hospitals may deploy the excess revenue toward inpatient care, even though other uses may be more optimal. Such a finding may be more likely to manifest in nonprofits than for-profits, given their non-distribution constraints and the implicit contract to provide community benefits for tax subsidies. To the extent that nonprofits view these funds as unearned via gaming, they may also justify this “improper” behavior by using funds obtained from the outlier payments program for their intended purpose.

4 Data

This study combines a wide array of data sources to identify the set of hospitals eligible for outlier payments, determine which hospitals potentially gamed these payments, and observe their clinical and financial behavior. We observe almost all data between 1994–2006 and use this period unless otherwise noted. We adjust all monetary outcomes for inflation and display them in real 2000 dollars. Our set of hospitals is essentially the universe of those paid

by Medicare under DRGs and thus eligible for outlier payments. We draw this list from a Dartmouth Institute tracking file.⁵ To observe hospital characteristics, we link this file with CMS Providers of Services data and American Hospital Association survey data.

We directly observe the parameters that CMS contractors used to calculate payments through the CMS Impact file and Provider-Specific File. We use hospital cost report data rebased to calendar years to track financial information, including revenues and expenses. Because cost reports occasionally contain extreme values that are likely errors, we winsorize all cost report variables 1% on each side within year. For all-payer revenue and operating costs, where transient changes are particularly common, we suppress values that are more than double the average of the previous and next year. To observe patient-level charges and Medicare payments, including outlier payments, we use 100% fee-for-service Medicare hospital claims.

We also use Medicare claims and enrollment data to track hospital clinical performance. We assemble a cohort of Medicare patients hospitalized for non-deferrable conditions via the emergency department (Card, Dobkin and Maestas, 2009; Doyle et al., 2015). The data includes rich patient covariates, including demographics, diagnosis histories, and the diagnosis for which the patient was admitted.⁶ As outcomes, we track 30-day risk-adjusted mortality and readmission rates, the same metrics currently used by CMS to measure hospital quality (Gupta, 2021). The non-deferrability of these conditions helps mitigate concerns about the selection of patients into hospitalization (Card, Dobkin and Maestas, 2009). Studies have also validated these observational quality metrics by showing that they are strongly correlated with the quality measured from patients who were quasi-randomized to hospitals (Doyle, Graves and Gruber, 2019; Hull, 2020).

Lastly, we use SEC filing data available through Compustat to determine executive compensation and shareholder payouts for publicly traded hospital systems. Specifically, we present the total salary and bonus for the top five highest-paid executives. We also present a measure of total compensation realized by executives in a given year, including the value realized from option exercises (Kaplan and Rauh, 2010). For nonprofit hospitals, we use IRS form 990 data to determine total compensation for top executives, defined as officers,

⁵We use this file to track hospitals even if they switch Medicare identifiers. To focus on hospitals eligible for outlier payments, we drop hospitals that ever convert to critical access facilities, which are paid using a different system.

⁶The cohort consists of patients admitted through the ED for any of 29 principal diagnosis categories described in Doyle et al.. The cohort construction approach is described in Chandra, Kakani and Sacarny (n.d.) and Gaynor et al. (n.d.). The data consists of index admissions, defined as the patient’s first admission for a non-deferrable emergency in a year. Patient covariates include demographics, defined as age-race-sex interactions; histories of 23 diagnoses drawn from previous hospitalizations in the prior year; and fixed effects for the principal diagnosis ICD-9 category.

directors, trustees, and other key employees.⁷

5 Research Design

5.1 Designating hospitals as gamers

The first task is to determine which hospitals likely did and did not game the outlier payment system. We develop an algorithm focusing on growth in charges and outlier payments, drawing on the methods CMS used while addressing their weaknesses.⁸ Our algorithm uses a simulated payments strategy that holds patient mix and the payment formulas fixed. This strategy isolates the growth in outlier payments that came from the hospital’s pre-existing distribution of charges across its patients and its realized charge growth. Specifically, we use the hospital’s fiscal year 1995-1996 patient mix and simulate the payments the hospital would have received for them in fiscal years 1993–2003. The simulation leaves patients’ DRGs unchanged, fixes the formula that calculates outlier payments (e.g., the deductible), but scales patients’ charges so that they grow according to their actual trajectory during this period. We describe the method in detail in Appendix B.

We then fit a hospital-specific trend break model for two outcomes, the logarithm of observed average charges and the ratio of simulated outlier to non-outlier (DRG) payments:

$$o_{ht} = \alpha_h + \alpha_t + \beta_h^{pre}t + \beta_h^{post}(t - B) 1[t \geq B] + \delta \ln(drgweight_{ht}) + \epsilon_{ht}, \quad (1)$$

where h indexes hospitals, t indexes time in quarters, and o_{ht} is the outcome. The model controls for hospital and quarter fixed effects, hospital-specific pre- and post-break trends, and the logarithm of the average DRG weight at the facility. B is the break, defined as the end of fiscal year 1996. This approach uses long periods to estimate the pre- and post-trends to limit the influence of transitory shocks and regression to the mean. It also controls for patient mix through DRG weights to account for growth in charges that might come from admitting sicker patients rather than gaming. We estimate this model using data from fiscal years 1993–2003 and limit to hospitals that treated patients in every quarter during this time.

⁷To link our individual hospital sample to the 990 data, we identified the tax EIN of hospitals using information from <https://www.communitybenefitinsight.org>, when available. If not, we matched hospitals to the 990 data based on their name and location.

⁸One logical but flawed approach would be to simply adopt CMS’s approach. Like us, CMS focused on charge and outlier growth. However, they used only 3-4 years of data, raising the risk of flagging hospitals that experienced transient shocks. Moreover, they used realized outlier payments, which were affected by changes in payment formulas. In turn, CMS’s efforts to cut payments, like raising the deductible, could have blunted a hospital’s growth in outlier payments and made gaming less apparent. Our approach addresses these concerns.

We define the estimated increase in the outcome, \hat{d}_h , as the hospital’s fitted value at the end of the sample period less its fitted value at the break, ignoring the effect of DRG weights. We assume that hospitals with large increases in their charge rates and their ratio of outlier payments over this period are the likely gamers. To be conservative, we set a high bar to make this determination: hospitals in the top decile of \hat{d}_h on both dimensions are flagged as gamers. Hospitals below the 85th percentile on both dimensions are assumed to have likely not manipulated their charges. We consider the space between the 85th and 90th percentiles to be indeterminate and exclude hospitals in this range from the analytic sample. Appendix Figure D.1 illustrates the joint distribution of \hat{d}_h and superimposes this classification scheme. Panels (a) and (b) plot the joint distributions of log growth in percentiles and absolute values, respectively. We flag 180 hospitals as gamers, 2,530 as non-gamers, and 533 as indeterminate.

As with the approach used by CMS, we cannot say with certainty that every hospital designated as a gamer using this approach manipulated charges to reap excess Medicare outlier payments. Here, we find it reassuring that the set of hospitals designated as gamers overlaps closely with those accused by the DOJ based on whistleblower witness testimony. Note that the DOJ only brought lawsuits against a select set of hospitals. This set does not represent all hospitals that engaged in gaming. Of the 33 accused hospitals we could find using court documents and press releases, 26 (79%) were also flagged under this algorithm, 1 was designated a non-gamer, and the remainder were in the indeterminate range.⁹ From hereon, for brevity, we refer to the hospitals tagged by our algorithm as gamers and the remaining hospitals retained in the sample as non-gamers.

5.2 Characteristics of gamer hospitals

Which hospital characteristics are associated with turbocharging? To shed light on this, we examined the association between turbocharging behavior and various hospital attributes measured in 1997. Figure 3 presents mean values of select hospital attributes (e.g., % owned by a system) by decile of charge growth over 1998–2003, the period of interest. Panel A shows that hospitals in the top decile of charge growth were disproportionately likely to be for-profit owned. While for-profit hospitals comprise about 15% of all hospitals, they are nearly 40% of hospitals in the top decile. Nonprofit hospitals are represented across all deciles of charge growth in a relatively stable fashion. In contrast, government-owned hospitals are disproportionately likely to be in the bottom two deciles of charge growth. These patterns are consistent with the theoretical predictions discussed in Section 3 about hospital ownership

⁹This omits Tenet hospitals because the Tenet lawsuit was against the entire corporation rather than a specific facility. However, of the 94 hospitals affiliated with Tenet between 1998–2001, we classify 60 (64%) as gamers.

and the incentive of managers to maximize revenue. Panel B shows that hospitals in the top decile of charge growth are also disproportionately system-owned. Panels C and D examine the attributes that determined the size of the BBA97 payment cuts. The plots show that hospitals facing greater Medicare cuts, such as those located in markets with a higher wage index, were also disproportionately more likely to increase their charges.

To study these patterns formally, Appendix Table D.1 presents regressions predicting whether a hospital is in the top decile of charge growth or is flagged by our algorithm as a gamer based on characteristics recorded in 1997. These two outcomes are highly correlated, but differ in the case of hospitals with high charge growth that did not experience high growth in their (simulated) outlier share of total Medicare payments. Since results are qualitatively similar regardless of the outcome, we focus on the latter outcome for brevity.

As seen in the bivariate regression results in Column 2, gaming hospitals are more likely to be for-profit, part of a health system, in an urban area, and have greater bed capacity. Column 4 shows that the association between gaming and for-profit ownership remains similar in magnitude even after conditioning on all the other attributes like system membership or bed capacity. Gaming hospitals also have higher mortality and readmission scores, suggesting they may serve a higher-risk patient population. The payment parameters most impacted by BBA97, which include the wage index and adjustments for safety net and teaching hospitals, are also highly predictive of gaming (discussed in more detail in the following section).

5.3 Construction of sample and matching

Given these differences in the characteristics of gaming and non-gaming hospitals, our goal is to construct a control group that minimizes the risk of bias in our estimates. We begin by restricting to the set of gamer and non-gamer hospitals open from 1994–2006. We next remove non-gamer hospitals located within 5 miles of gamer facilities. This restriction helps to address a potential Stable Unit Treatment Values Assumption (SUTVA) violation from non-gamer hospitals being influenced by their gamer peers. For instance, gamer hospitals might increase patient volume by “stealing” patients from non-gamer hospitals. Similarly, we remove hospitals ever affiliated with Tenet from the non-gamer group since the chain gamed heavily, and the excess revenue may have been diverted to these facilities. Finally, because exceptionally few government-run hospitals gamed payments, we drop all of these facilities from the sample. These restrictions reduce the sample to 145 gamer and 1,655 non-gamer hospitals.

An additional concern is the potential endogeneity of gaming. Hospitals may have gamed due to geographic coincidence, like locating near a consulting firm that advocated

this strategy, and geographic clustering is apparent when we map flagged facilities (Appendix Figure D.2). This behavior might also reflect an effort to counteract payment reductions from BBA97. This driver of gaming presents a threat to our differences-in-differences research design because the shocks from BBA97 disproportionately affected certain hospitals, such as safety net and teaching facilities, and had their own effects on hospital behavior (Kaestner and Guardado, 2008; Azoulay, Heggeness and Kao, 2020).

A standard approach to address this endogeneity is to match gaming hospitals to non-gaming hospitals based on hospital characteristics before the gaming occurred. We match on the payment parameters BBA97 affected: the add-on payment for safety net facilities, the add-on payment for teaching facilities, and the wage index.¹⁰ We use these parameters at their 1997 values, which were set before BBA97. In addition, we match on the hospital’s Medicare share of inpatients in terciles, since the Medicare share determines the hospital’s overall shock from Medicare policies. Because we combine matching with differences-in-differences, our approach assumes that the matched comparison group provides a valid counterfactual trajectory for the gamer group.

Our baseline approach uses coarsened exact matching (CEM), although we demonstrate the robustness of our key results to a number of alternative methods. CEM coarsens the matching covariates into bins and then matches “treated” units (gamers) to “untreated” units (non-gamers) exactly on those coarsened covariates (Iacus, King and Porro, 2012; King and Nielsen, 2019). We generate weights to target the effect of gaming on the hospitals that gamed, i.e., the treatment on the treated (TOT) estimand. We call the reweighted non-gamer hospitals matched comparators.

After matching, our sample includes 120 gamer hospitals and 1,396 non-gamer hospitals. Table 1 provides summary statistics on the gaming hospitals and matched comparators. Panel A includes the payment parameters we matched on and Panel B includes other key characteristics. As expected, the averages are similar between the groups on the matched variables. Appendix Table D.2 shows the characteristics of the samples step-by-step as we move from the full set of hospitals to the set analyzed in the regressions. This table shows that the matching approach makes the groups much more observably similar on the covariates that both were and were not directly matched upon. Appendix Table D.3 presents descriptive statistics for hospitals in the final analysis sample by type of ownership.

¹⁰While BBA97 did not change the wage index, it did limit annual payment updates. This policy essentially reduced payments to all hospitals by a common percent amount. We match on the wage index because these reductions impacted high-wage areas more in absolute terms.

5.4 Empirical strategy

Having assembled the gamer and matched comparator hospitals, we implement a difference-in-differences (D-D) research design to estimate the causal effect of manipulating the outlier payment program on income, use of funds, and other operational outcomes. The trends for the gaming hospitals over 1994–2006 are compared against those for the matched comparator hospitals. The period 1994–1997 represents the years before hospitals engaged in turbocharging. We set 1997 as the last year before gaming because of the important role of BBA97 in triggering this response by hospitals.

The period 1998–2006 has three distinct phases. The early phase, 1998–2000, is the period when hospitals began to game outlier payments, while the late phase, 2001–2003, represents the height of gaming. The after phase, 2004–2006, immediately follows CMS closing the payment loophole. We estimate separate D-D coefficients corresponding to each of these phases using the following model.

$$y_{ht} = \alpha_h + \alpha_t + \beta_1 \cdot D_h \cdot \text{early}_t + \beta_2 \cdot D_h \cdot \text{late}_t + \beta_3 \cdot D_h \cdot \text{after}_t + X_{ht}\Theta + \epsilon_{ht}, \quad (2)$$

where y_{ht} is the outcome of interest for hospital h in year t . D_h is a flag for hospitals tagged as gamers by our algorithm, as described in the previous section. β_1 captures the average difference in outcomes between gamers and non-gamers over the period 1998–2000, relative to the average over the years 1994–1997. Similarly, β_2 captures the average difference in outcomes in the late gaming period, relative to the pre-gaming period. We primarily focus on these coefficients.¹¹ X_{ht} is a time-varying control for Medicare Advantage penetration in the hospital’s market.¹² ϵ_{ht} represents idiosyncratic unobserved factors that may also determine the outcome. We cluster standard errors by hospital, which is the level of treatment in this setting.

To interpret the coefficients β_1 and β_2 as the causal effects of exploiting the loophole, the analysis assumes that outcomes for gamers and comparators would have progressed on similar trends as in the 1994–1997 period, absent the gaming behavior observed over 1998–2003. This “parallel trends” assumption is standard in D-D research designs and is untestable. However, an event study can provide suggestive evidence on the assumption by showing whether the groups were on differential trends prior to the gaming episode. It also helps to study effect dynamics. We therefore estimate the following model:

¹¹Appendix Tables D.5 and D.6 report β_3 , the effect during the post-gaming period.

¹²We define markets as Health Service Areas (HSAs), which are collections of counties in which hospital use is relatively self-contained (Pickle et al., 1996).

$$y_{ht} = \alpha_h + \alpha_t + \sum_{s \neq 1997} \gamma_s \cdot D_h \cdot 1[t = s] + X_{ht}\Theta + \epsilon_{ht}, \quad (3)$$

A hospital’s decision to exploit the loophole is non-random and, as shown in Table D.1, varies based on hospital characteristics. While selection into gaming is an inherent feature of this setting, we mitigate concerns that hospital selection drives our results in the following ways. First, the matching design enables us to identify comparison hospitals that were similarly impacted by BBA97’s changes to Medicare payments. As discussed in Section 2, this gaming episode appears to be prompted in large part due to the payment cuts instituted by BBA97. By comparing gaming hospitals to facilities that also faced observably similar payment cuts, we plausibly isolate a valid counterfactual. Second, consistent with our identifying assumption, we reassuringly find little evidence of trend deviations before 1998. Third, we observe that Medicare revenues at gaming and comparator hospitals re-converge after CMS closes the loophole. While the post-gaming period is complicated by legal uncertainty and settlements, this convergence further suggests the groups would have been on similar trends absent the gaming.

6 Results

This section presents our main results on the excess revenue hospitals generated by exploiting the loophole and how they allocated this revenue. Figures 4 and 5 present event studies using 1997 as the reference year and demarcate the gaming period (1998–2003) with vertical dashed lines. Table 2 presents the corresponding D-D estimates distinguishing between the early (1998–2000) and late (2001–2003) periods.

6.1 Excess revenue

We begin by confirming that hospital charges increase differentially at hospitals identified as gamers by our algorithm. Appendix Figure D.3 Panel (a) shows the divergence in mean charge per inpatient stay between gamers and the matched comparators. Panel (b) presents the corresponding event study plot. Table 2 presents the corresponding estimated effects on log charge per patient stay. We find that gamers increase their charges by 96% at the height of gaming relative to the comparators.

We then quantify the excess outlier payment revenue gained by the gamers due to turbocharging. Figure 4 Panel (a) presents the event study for total outlier payments in millions of dollars. Gamers and non-gamers have similar trends until 1998 when revenue increases differentially for gamers. Excess outlier revenue peaks for gamers in 2002. As

expected, there was a sharp drop in 2004, the first full year in which the loophole was closed. Payments return to baseline and stay there through 2006. Table 2 presents the corresponding coefficients of interest from Equation 2 and shows that the hospitals gain \$1.3M in outlier payments per year in the early period and \$4.4M per year in the late period. Relative to the pre-gaming average of \$1.7M per year, gaming hospitals more than double their outlier payments at the height of turbocharging. Summing over the six years, the average gamer obtains over \$17M in excess outlier payment revenue. We therefore can estimate that gamers obtained over \$3 billion in excess outlier payments by multiplying 180 (the full set of gamers) by \$17M.

Figure 4 Panel (b) plots the event study for Medicare inpatient revenue, a broader measure of income that includes DRG payments. It shows a strikingly similar pattern to that seen for outlier payments. The corresponding coefficients in Table 2 are very similar in magnitude to those estimated for outlier payments. A comparable increase in total Medicare inpatient revenue and outlier payments is expected, since increasing charges should not affect DRG payments. This pattern also implies that significant changes on other margins, such as increasing the volume of Medicare patients, are unlikely. To quantify the effective increase in Medicare payment rates hospitals receive from this aggregate payment change, we also consider the effects on payments per patient. Using the Poisson analog of equation 2, we find that gaming raises rates by 7.6% in the early period and 21.8% in the late gaming period (Table 2).

We next broaden the income measure to include revenue from all payers. We do so because turbocharging may have spillover effects on payments made by other insurers. Such spillovers could manifest if an insurer’s pricing is set as a proportion of the hospital’s list price, a practice that remains common today (Cooper et al., 2019). Another potential channel would be if other insurers mimic Medicare’s payment systems and also make outlier payments.¹³

Figure 4 Panel (c) presents the event study plot for all-payer revenue and finds a trajectory similar to Medicare payments, with a peak in 2002; excess revenue subsequently falls and becomes statistically insignificant by 2004. Table 2 shows that the increase in total revenue is about triple the increase in Medicare inpatient revenue, just as baseline total revenue is about triple baseline Medicare inpatient revenue, suggesting similar Medicare and non-Medicare effects. The \$11.2M per year effect aggregates to \$67.3M over the whole period. Unlike the patterns in outlier payments and Medicare revenue, we find that some

¹³For instance, California’s Workers’ Compensation program used essentially the same system as Medicare and was also affected by gaming (DeMoro, 2003; Wynn, 2003). Some contracts with private insurers had a similar structure, with hospitals eligible to receive insurance-like “stop-loss” payments that depended on charges. Filings from Tenet indicate that these payments became a significant source of revenue for the firm during the gaming period, then decline precipitously (Tenet Healthcare Corporation, 2003, 2004).

increase in all-payer revenue persists beyond 2003. This might reflect the persistent increase in charges discussed above since hospital chargemaster rates are frequently used to set commercial insurance prices. Our results, therefore, imply large and persistent spillover effects of turbocharging to private insurers and, consequently, to employers and employees that fund private health insurance plans.

6.2 Use of excess revenue

How do gaming hospitals allocate the funds obtained from turbocharging? Each dollar of excess revenue must either flow toward increasing operating costs or profits (often referred to as surplus in the case of nonprofits). We begin by examining the effect on operating costs. Figure 4 Panel (d) presents the corresponding event study plot. The groups follow similar pre-trends and trends through the early period, then gamers experience an uptick in the late period. The costs subsequently decline, in relative terms, after the loophole is closed. Table 2 presents the D-D coefficients. We estimate a differential increase in operating cost of \$10.8M per year during the late period. Aggregated over the whole gaming episode, operating costs increase by \$32.3M (not statistically significant) or 48 cents for every incremental dollar of all-payer revenue. The statistically insignificant effect on total costs reflects the average of increases observed among nonprofit gamers and decreases observed among for-profit gamers, which we explore in Section 6.3. By construction, the remaining half of excess revenue flows toward increasing profits.

Hospitals can use greater profits for two purposes. First, they could be used to increase a hospital's net worth, which represents a hospital's total assets net of the change in liabilities. Hospitals could increase short-term or long-term assets like cash reserves or fixed capital (e.g., purchase new equipment) or pay down short-term or long-term debt to reduce their liabilities. Second, profits can be transferred by the hospital to another entity (e.g., its parent firm), thus not affecting its assets or liabilities. We observe these transfers in the hospital cost reports submitted to CMS and refer to them as net deductions (our analysis considers deductions net of additions to the hospital's balance sheet, i.e., the net transfer off balance sheets). Appendix C provides accounting identities and further details on these categories.

Figure 4 Panel (e) presents the event study plot for changes in net worth. While the series lacks a pre-trend, it follows a sawtooth pattern during the gaming period, returning to baseline by 2004, when the loophole is closed.¹⁴ The D-D results confirm an early decline in net worth that is later partially reversed (Table 2). The overall effect is essentially zero and

¹⁴Figure D.4 presents event study plots for the change in assets and liabilities separately. They suggest an increase in liabilities over 1998–2000, which was offset by a similar-sized increase in assets later in the period. The coefficients in Table 2 also exhibit this pattern.

is statistically insignificant. The estimated confidence interval allows us to reject an increase of more than \$12.5M in net worth for the average gamer hospital during this episode, which is one-sixth of the estimated inflow in revenue. This result suggests that excess revenue is not used to pay down liabilities or increase assets.

The lack of a meaningful change in net worth for gamer hospitals leaves only one possible avenue for the remaining excess profits: net deductions. Table 2 shows that net deductions increase by \$6.6M per year or nearly 60 cents for every incremental dollar of revenue. In Section 6.3, we show that this increase in net deductions is predominantly driven by for-profit hospitals.

Figure 4 Panel (f) presents the associated event study plot, which confirms similar trends before 1998 and a sharp increase in deductions that closely tracks the increase in revenue. This result implies that over half of the revenue obtained by turbocharging is transferred off hospital balance sheets. These transfers can reflect funds sent to the hospital’s parent organization, which could be disbursed to executives or shareholders for publicly traded firms or to other hospital affiliates.¹⁵ While the cost report data alone does not permit us to examine the ultimate uses of these deductions, Section 6.3 explores whether the revenue is transferred to executives and shareholders at for-profit hospitals.

Taken together, we find that during the 6-year gaming period, the average turbocharging hospital increases operating costs by \$32.3M, increases net balance deductions by \$39.5M, and decreases net worth by \$3.8M. These changes roughly sum up to the total of 67.3M increase in all-payer revenue.¹⁶ These results are consistent with the mental accounting hypotheses discussed in Section 3 since hospitals fail to invest the revenue in new capital or in growing net worth and instead direct most funds towards operating costs or send them off the hospital balance sheet.

6.2.1 *Inputs to care*

The results in the previous section imply that about 60% of the funds obtained by turbocharging were transferred outside the hospital. We also find some signs that funds were directed to operating costs, though the results are imprecise. We now directly explore the effect on measures of care inputs to assess whether patients or hospital staff may have

¹⁵For example, in California cost reports, the list of additions and deductions includes a line for “intercompany transfers”. Unfortunately, older Medicare cost report data does not provide the lines that add to net deductions.

¹⁶The two sides are not exactly equal due to variable-specific data cleaning like winsorizing; the use of slightly different samples for net balance deductions and change in net worth, since we do not observe these values for 1994; and our use of all-payer revenue rather than total income, which also includes investment income but yields essentially identical results.

benefited from the revenue windfall.

We first examine changes in three measures of care inputs. Figure 5 Panels (a), (b), and (c) present the event study plots for total inpatient volume, hospital FTE, and total spending on salaries, respectively. Reassuringly, each has flat pre-trends. Gamer hospitals also do not appear to differentially serve more patients, employ more staff, or increase spending on personnel during 1998–2003. In fact, the FTE series implies a slight decline in staff during this period and a larger decline after the outlier payment loophole is closed.

Table 3 Panel A presents the corresponding coefficients on patient volume and hospital FTE. The point estimate on patient volume is close to zero and is statistically insignificant. The confidence intervals allow us to reject an increase of more than 3.4%. Similarly, the coefficients on staff FTE imply, if anything, a decline in staffing during the gaming period. Averaging over the entire episode, we can reject an increase of more than 0.8%.

Since the spending on salaries is a component of total operating cost, we prefer to report the coefficient on salaries in Table 2 Panel B. By this measure, the average effect over the entire period is small and statistically insignificant and implies an increase of \$4.2M. This is disproportionately small relative to the estimated increase in operating cost (\$32M) given that salaries account for more than 40% of total costs. Taking the results on FTE and salaries together, however, we conclude there is no consistent evidence of gamers deploying the excess revenue toward labor inputs. This finding is consistent with the hypothesis discussed in Section 3 that hospitals would be reluctant to use these funds to enter into longer-term commitments due to their transience.

6.2.2 *Quality of care*

Finally, we directly investigate whether patient health outcomes improve at gamer hospitals. As discussed in Section 4, we examine changes in standard measures of quality used by Medicare and other payers in performance pay incentive programs to improve hospital quality. These analyses focus on patients hospitalized through the emergency department for any of 29 non-deferrable conditions (Doyle et al., 2015). We observe patients’ 30-day mortality and readmission as well as key covariates that might affect their risk of experiencing these outcomes: their demographics, their illness histories (derived from previous hospitalizations), and their principal diagnosis category.

We begin by looking for signs of patient selection. To do so, we model the risk of mortality and/or readmission among the non-deferrable patients as a function of their key

covariates.¹⁷ Then, we calculate the average observable mortality and readmission risk of non-deferrable patients in each hospital in each year and study it as an outcome. Table 3 Panel B presents the estimated effects. The results show an (insignificant) decline in predicted mortality risk matched by a small but significant increase in predicted readmission risk; we detect no change in the composite risk of mortality *or* readmission.

Then, we test whether patient outcomes improved. We assemble yearly cohorts of the non-deferrable patients and run the following first-step regression:

$$mr_{iht} = \gamma_{ht} + Z_{iht}\Phi + \eta_{iht} \quad t \in 1994, \dots, 2006 \quad (4)$$

Where i indexes patients and mr_{iht} is an indicator for patient endpoint (mortality, readmission, or a composite of both). The γ_{ht} are hospital-year fixed effects, and the Z_{iht} are patient covariates. We extract the fixed effects, which can be interpreted as the hospital’s risk-adjusted mortality rate (Chandra et al., 2016). These fixed effects become the outcome variables in the hospital-level event study or D-D model.

Table 3 Panel C presents the coefficients on these three patient health endpoints. There are no detected improvements. We find a small and statistically insignificant decline in mortality. We detect an increase in readmissions of 0.3 percentage points, about 3% of the baseline mean.¹⁸ When we consider the composite outcome of mortality or readmission, we cannot detect an effect. Event studies reaffirm these findings, with no clear pre-trends and no clear signs of improvement during or after the gaming period (Figure 5 Panels d–f).

Overall, there is an insufficient signal here to conclude that the quality of care changes at gamer hospitals during this episode. The coefficients are estimated precisely enough to allow us to rule out an average decline in mortality of more than 0.55 percentage points (4% relative to the baseline mean), and we can nearly rule out any decline in readmissions. Thus, in addition to detecting no statistically significant gains in patient outcomes, we can also statistically reject moderate improvements in quality.

¹⁷Specifically, we regress an indicator for mortality, readmission, or a composite of both on patient demographics, illness histories, and principal diagnosis categories. This regression is run only for patients at the comparator hospitals. Then, using the coefficients from the regression, we predict the probability of mortality, readmission, or the composite for all non-deferrable patients.

¹⁸Medicare did not penalize high readmission rates during this period, and they were not a topic of policy debate. It is also worth noting that reducing mortality opens the potential for readmission.

6.3 Heterogeneity by hospital ownership

We now test whether hospitals under for-profit and nonprofit ownership make different choices about how to allocate revenue from gaming, as predicted by economic theory.¹⁹ Our findings are consistent with theories of altruism and non-contractible quality that predict different behavioral responses from nonprofit compared to for-profit firms.

As seen in Table 4, for-profit and nonprofit gamer hospitals experience comparable increases in outlier payments and Medicare inpatient payments. Both sets of gamers also obtain a similar increase in all-payer revenue relative to the baseline of about 10%. This suggests spillovers to other payers in both types of hospitals. The key difference between the two groups appears in the use of incremental revenue. Nonprofit hospitals primarily allocate excess revenue to operating costs: the average nonprofit increases operating costs by \$56.7M over the 6-year gaming period, approximately 75% of the incremental all-payer revenue. The remainder of the revenue is mostly transferred off their balance sheet with little impact on net worth.

In contrast, for-profit hospitals mainly transfer funds off the balance sheet, presumably to their parent company: net deductions increase by \$78.4M over the 6-year gaming period. This estimate appears puzzling at first since it represents 145% of the estimated increase in their all-payer revenue. This is made possible by reducing operating costs and net worth and using these proceeds to increase net deductions. Figure 6 provides the accompanying event studies for these subgroup analyses. We can reject the null hypotheses that the effects on change in net worth and net deductions are the same at the 5% level, and we reject that null for operating costs at the 10% level. Hence, nonprofits and for-profits allocate the excess revenue differently in an economically meaningful and statistically significant way.

We examine the effects on operating costs for nonprofit gamers in more detail to determine where they allocated the excess funds. Appendix Table D.4 presents the associated results. We continue to find no significant increase in salaries even among nonprofit gamers. The increase in costs is mainly driven by “other direct” costs, which account for approximately half of the total cost base. We estimate a statistically significant increase of about \$6.5M per year during the gaming period in other direct costs, more than two-thirds of the total increase in costs and disproportionately larger than its share of the cost base.

This category of other direct costs includes general, inpatient, and ancillary services. However, we have less statistical power to detect the effects on these smaller spending items. We detect a statistically significant increase only in non-salary hospital inpatient services of

¹⁹We do so by matching for-profit gamers to the pool of non-gamers via CEM with the same coarsening as in the main analyses. Then, we estimate equations 3 and 2 using this sample. Next, we repeat the method for nonprofit gamers.

about \$0.6M per year, a disproportionately large increase of about 25% relative to baseline. The coefficients also suggest an increase in spending on non-salary general services, though it is not statistically significant. Taken together, these results suggest that nonprofits invest at least some of the excess funds into clinical inputs, yielding higher spending even as patient volume is flat or falling. These results are consistent with the flypaper effect discussed in Section 3 since we find that the funds are used disproportionately for inpatient care, which is service the funds pay for in the first place.

Table 4 Panels D and E present the effects on patient risk and health outcomes. The coefficients in Panel D show that nonprofit gamers treated a higher-risk patient population during the gaming period, with the predicted mortality rate increasing by 0.29 percentage points, about 2% of the baseline risk. In contrast, for-profit gamers treated a much lower-risk patient population. The predicted mortality dropped by 0.86 percentage points or 6% of baseline risk. These results suggest the possibility of some reallocation of patients across hospitals due to this episode.

The additional spending on patient care by nonprofit gamers may have helped improve their quality of care because patient mortality decreased by 0.4 percentage points, about 3% of the baseline mean. Assuming that the decrease in mortality at nonprofit gamers is a causal effect of incremental spending, our estimates imply that mortality among Medicare patients decreases by 3% for an 8% increase in Medicare spending. To interpret the magnitude of this effect, it is instructive to compare it to equivalent estimates of mortality returns to hospital spending reported by recent studies. For example, [Doyle et al. \(2015\)](#) find that hospitals reduce mortality among Medicare patients by about 5% for a 10% increase in spending. Similarly, [Silver \(2021\)](#) reports a 5.5% reduction in mortality among high-risk patients in the emergency department for a 10% increase in resource use. Hence, the mortality improvement delivered by nonprofit hospitals using incremental funds from gaming is lower than what could be obtained by reallocating patients to higher-spending hospitals. This is not surprising since only 75% of the revenue is used directly for patient care. If we account for this diversion, the mortality improvement relative to spending is perfectly in line with previous estimates. We also detect a modest increase in readmission rates at nonprofit gamers of 0.6 percentage points.

For-profit hospital outcomes reveal a different pattern. There are statistically significant reductions in hospital FTE and total spending on salaries among for-profit gamers. Accordingly, operating costs decline, though this decline is not statistically significant. Since little of the income is invested into the hospital and the majority is sent off the balance sheet, it is perhaps unsurprising that there are no changes in quality outcomes among for-profit gamers.

6.3.1 *Executive compensation and shareholder payouts*

We now investigate whether hospitals used some of the excess revenue to increase compensation for key executives, like CEOs and other top-level managers. Executives are employed at both the system (i.e., the parent organization) and hospital levels. Compensation to system-level executives represents a potential use of funds deducted from hospital balance sheets since the compensation costs for these employees may not be allocated to individual hospitals. In contrast, compensation to hospital-level executives represents a part of hospital operating costs, though the cost report data does not disaggregate executives from non-executive salaries.

Unfortunately, data on executive compensation is not systematically collected or made available for research, as discussed in Section 4. Because of how the data is organized, we present this analysis separately for system-level executives at publicly traded for-profit firms, whose compensation we observe through SEC filings, and hospital-level executives at nonprofit firms, whose compensation we observe through tax filings. Since few health systems are publicly traded during our sample period, we can only study compensation at a single for-profit firm that gamed – Tenet Corporation.²⁰ Given that there is only one “treated” firm for this analysis, we present time series analyses of executive compensation at Tenet compared to an average of the four other publicly traded for-profit health systems consistently observed in the data.

We find that Tenet’s executive compensation follows a similar pattern to that of outlier payments. Figure 7 Panel (a) shows total executive salary and bonus at Tenet reaching a peak of \$13.4M in 2001 before falling in the year the Tenet scandal broke. This is about double the compensation level of \$6M observed in 1998. The pattern is even more striking in Panel (b), which expands the measure to include stock options exercised. By this metric, Tenet executives received \$92.5M in 2001. No such patterns are observed among the non-Tenet systems. Moreover, we are likely underestimating the true amount distributed to executives since only compensation for the five highest-paid executives is reported.

Publicly traded firms can also disburse profits to shareholders. As seen in Figure 7 Panel (c), Tenet shareholder payouts also coincide with the gaming period, with shareholders receiving \$923M between 2000 and 2004. While non-Tenet systems also sporadically disbursed profits to shareholders, Tenet only did so during the gaming period. Through a back-of-the-envelope calculation, we estimate that roughly 40% of Tenet’s excess total

²⁰There are also a few gamer hospitals owned by other publicly traded firms, but they account for negligible fractions of bed capacity or patient volume of those firms, so we do not tag these firms as gamers.

revenue was disbursed to the five highest-paid executives and shareholders.²¹ Tenet could have also used the excess revenue to engage in “empire building” by acquiring other hospitals. However, we do not observe unusual acquisition activity by Tenet relative to other hospital chains during the gaming period.

Among nonprofit hospitals, we observe trends in compensation for key hospital-level executives for a large number of both gamer and comparator firms and, therefore, analyze this outcome using the baseline model. Table 4 Panel (b) reports the D-D estimates, and Figure 7 Panel (d) presents the corresponding event study plot. In complete contrast to the patterns observed for Tenet, we do not observe any increase in compensation during 1998–2003. These results strongly suggest divergence with regard to the use of funds for executive pay between for-profit and nonprofit firms. These results support the organization theories discussed in Section 3 that managers at nonprofit and for-profit firms may use surplus funds differently.

6.4 Robustness checks

This section describes results from robustness checks testing the sensitivity of our key results to changing important assumptions or methods. The estimates obtained from these robustness checks are presented in Appendix Figure D.5, which focuses on the six key outcomes representing the flow of funds for hospitals (upper plot), two measures of hospital inputs, patient selection, and patient outcomes (lower plot). We present alternate estimates for each of these outcomes using seven different robustness checks and compare them to the baseline estimate from the preferred model. To simplify presentation, we focus on average effects across the gaming period.

Our baseline approach uses Coarsened Exact Matching (CEM) to reweight the comparator set of hospitals. An alternative but analogous approach is to use fixed effects to effectively match gaming hospitals to observably similar comparator hospitals. To do so, we leverage the strata emitted by CEM. Each stratum is a set of hospitals with identical coarsened matching covariates (i.e., payment parameters and Medicare share). We, therefore, augment our main specification with strata-year fixed effects and drop the CEM weights, an approach similar to running difference-in-differences stratum-by-stratum and averaging the results. As expected, this approach yields similar estimates to the baseline method.

Next, to assess sensitivity to alternative matching strategies, we replicate our estimates

²¹We tag 60 Tenet hospitals as gamers and the average Tenet hospital received 7.9 million in all-payer revenue per year (Table 4 reports the result for all for-profits, which is similar). Therefore, Tenet’s total estimated windfall is \$2.9 billion and the \$1.1 billion distributed to executives and shareholders represents about 40% of this amount. However, this is likely an underestimate of the reward for these groups. As a for-profit corporation, Tenet’s incremental profits would be subject to state and federal taxes, which collectively were about 40% during this period. Taking this into account, executives and shareholders received more than 50% of the windfall after tax.

using the Mahalanobis-distance based matching approach, which picks for each treated unit the comparison unit that is closest in Mahalanobis distance along the matching covariates. We also consider Propensity Score Matching (PSM). We estimate a propensity score as a function of the matching covariates we used in CEM, then reweight the comparators to again target the TOT estimand. Figure D.5 shows that the estimates are quite similar to baseline even after these modifications, though under PSM, effects on all-payer revenue and operating costs are attenuated.

Having assessed robustness to the matching strategy, we next turn to the D-D model. This model assumes that absent gaming, the gamers and matched comparators would have evolved on parallel trends. We relax this assumption and allow the two groups to evolve on differential trends in a linear fashion. We include an additional term in the model which interacts an indicator for gamer hospitals with a linear time trend. The estimates are similar with this modification, though in some cases more imprecise.

Finally, we consider three modifications to our strategy for identifying gamers. First, we modify the threshold of growth in charges and simulated outlier payments above which we tag a hospital as a likely gamer. In the baseline model, this threshold was the 90th percentile. In robustness, we lower it to the 85th percentile, which yields essentially identical results. Second, we modify the algorithm to use realized outlier payments rather than simulated outlier payments. This approach also does not change our findings. Third, we use only charge growth to identify gamers rather than additionally using growth in the ratio of outlier payments to DRG payments. In this approach, gamers are those in the top decile of charge growth, and non-gamers are those under the 85th percentile of charge growth. The results are similar using this method, though the scale of revenue is, as expected, smaller than in the baseline approach.

7 Discussion and Conclusion

In this paper, we use a design flaw in Medicare’s outlier payments program to study how hospitals allocate revenue obtained by exploiting loopholes or gaming. CMS was first warned of the potential for outlier payments gaming in 1988, suggesting these vulnerabilities could have been anticipated by policymakers (see HCFA 1988; the warning is reproduced in Appendix A.1). Our work estimates that the agency’s failure to close the loophole in a timely fashion cost Medicare at least \$3 billion, with large spillover effects for other payers. When pooling together all hospitals identified as gamers, we find uneven evidence that revenue obtained from gaming is used in ways that might benefit patients. About half the excess revenue flows toward operating costs while the rest is transferred off the hospital balance

sheets, likely to their parent organizations.

However, we find economically and statistically significant heterogeneity in outcomes by hospital owner type. For-profit hospitals drive the observed transfer of funds off balance sheets. For-profits also reduce spending on hospital and staff FTE, contributing to a decline in operating costs. In contrast, nonprofit hospitals mainly allocate excess revenue to increasing operating costs, particularly non-salary costs on general services and inpatient care. Nonprofit hospitals also produce a modest improvement in mortality rates. However, they deliver a lower mortality improvement for the incremental revenue than could have been obtained by reallocating patients to higher-spending hospitals. Consistent with the argument that greater spending on patient care decreases mortality, there are no quality improvements among for-profit hospitals since little of the excess revenue is invested in the hospital. Overall, these results suggest hospitals engineered a windfall with significant fiscal costs, while the benefits vary by ownership type.

Our results provide several insights into hospital behavior. Previous studies have found evidence that for-profit and nonprofit hospitals often behave similarly (Dranove and Ludwick, 1999; Duggan, 2000; Capps, Carlton and David, 2020). We instead find differences between for-profits and nonprofits in their propensity to game payments and how they use the revenue, consistent with the theoretical literature on distinct responses based on firm ownership. An additional reason for this different behavior may be the source of funds. Since managers may perceive revenue from this loophole as less legitimate and less permanent, they may spend it differently than other income. While we find that both nonprofits and for-profits immediately spend rather than save or invest the windfall, nonprofit hospitals spend the money on patient care needs. Such spending is consistent with the flypaper effect because it is aligned with the purpose of the outlier payments. Therefore, these findings provide insights into how the source of funds may influence hospital spending.

The loophole in the outlier payments program also serves as a warning of the long-term costs of contract design flaws. Despite the time-limited nature of the gaming episode, hospitals appear to have learned that by rapidly growing charges, they could extract higher payments from other payers. Indeed, we find evidence of persistently high charges even after the loophole closed. Private insurers are likely to pass on these costs to enrollees in the form of higher premiums (Arnold and Whaley, 2020). These spillovers highlight the interplay between Medicare’s payment design and the cost and efficiency of other insurers.

Overall, we provide new evidence on how firms in healthcare deploy windfalls engineered by exploiting payment loopholes. However, the issue of intermediaries exploiting loopholes to increase their revenue at taxpayer expense is not limited to healthcare. Federal, state, and local governments are increasingly spending their budgets on social programs

that span multiple sectors of the economy and are typically delivered through private firms. These include, among others, food vouchers redeemed in grocery stores and K-12 education delivered by charter schools. Our results highlight the potential social value of investing in strong contract design and close oversight of privately delivered public programs. More research is needed across sectors to assess the opportunities for and consequences of contract gaming in tax-funded programs.

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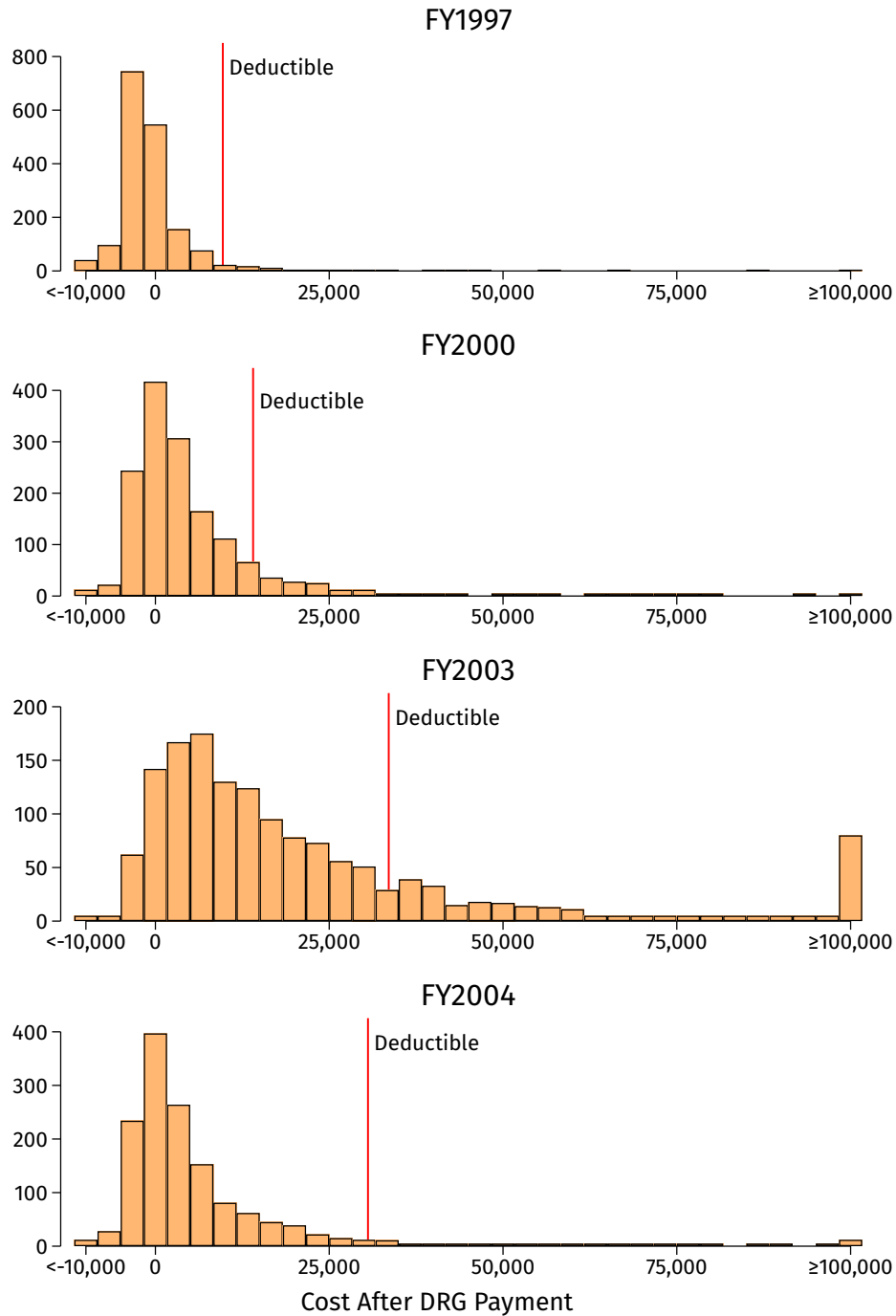


Figure 1: Evolution of excess “cost” distributions at an extreme gamer hospital

Notes: This figure shows histograms of the excess “cost” distributions of patients at the most extreme gamer hospital in our data. Each panel depicts a different fiscal year. Excess “costs” were defined as the hospital’s submitted charges deflated by the cost-to-charge ratio used by the payment contractor, less the DRG payment (i.e. $BILLCOST_i - DRGPAY_i$ as defined in Appendix B). Bars indicating patient counts between 1 and 10 set to 5.5 to follow CMS cell suppression rules. The vertical red line indicates the national deductible for outlier payments (\overline{THRESH}_t in Appendix B). Hospitals received payments equal to 80% of “costs” beyond this threshold.

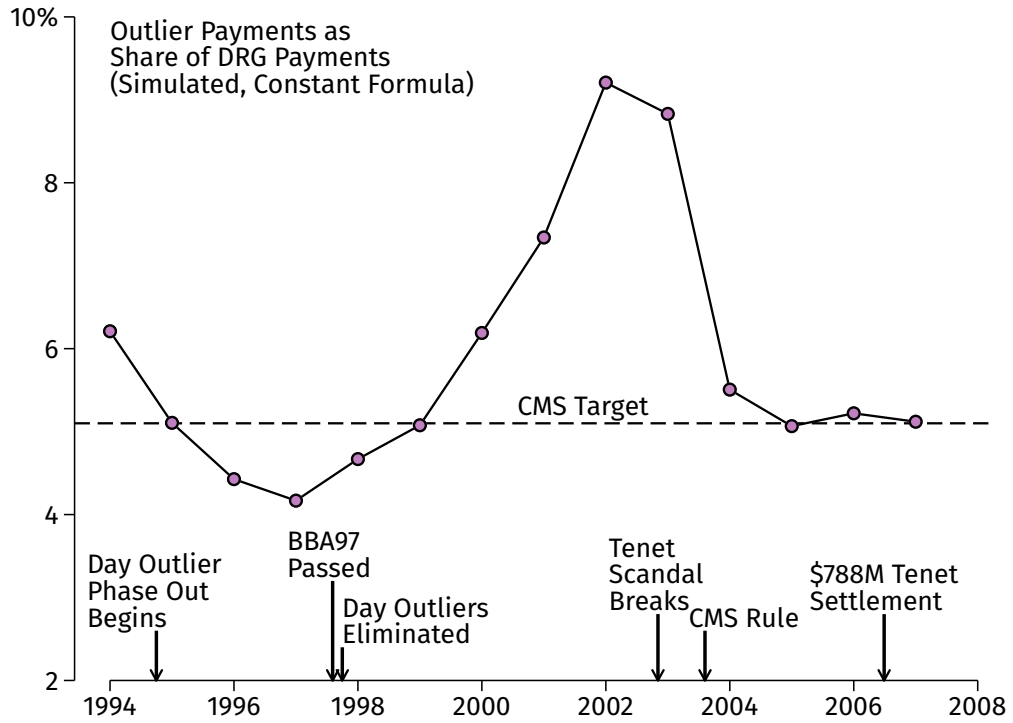


Figure 2: Trend in Medicare outlier payments

Notes: The figure presents aggregate outlier payments as a share of aggregate DRG (non-outlier) Medicare inpatient payments, using our simulation approach holding fixed payment formulas. We also note key events associated with the episode over this period. Appendix Figure D.6 shows the same time series using actual payment data.

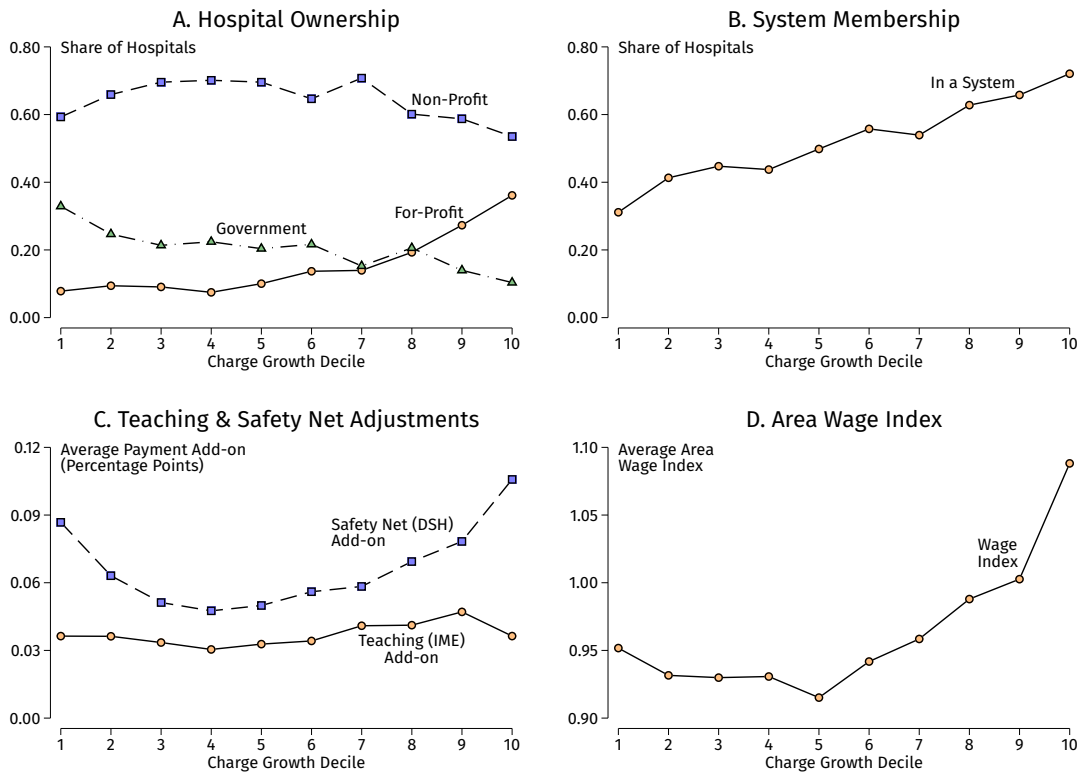
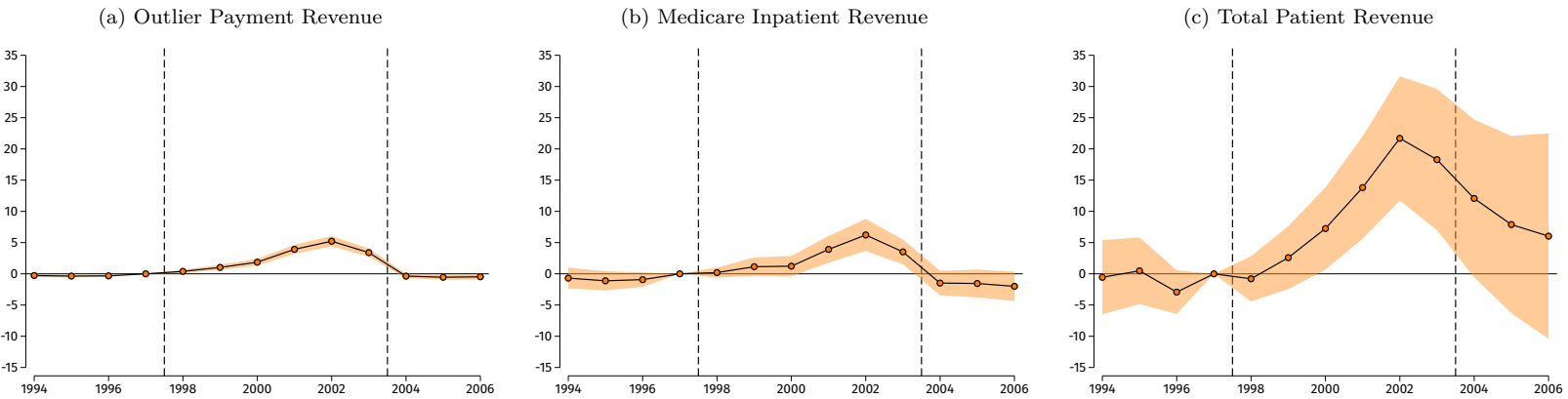


Figure 3: Characteristics of Hospitals by Charge Growth Decile

Notes: Each panel of this figure shows the association between charge growth during 1998–2003 and a hospital characteristic or set of characteristics. Hospitals are binned according to their decile of charge growth, displayed along the x-axis. Each point is the average characteristic of hospitals in the given decile. Panel A shows hospital ownership, Panel B shows the share of hospitals in a system, Panel C shows average payment add-ons for teaching and safety-net hospitals, and Panel D shows the average area wage index. Characteristic values are taken at their 1997 values.

Inflows (\$Mn) in Increasing Broadness



Outflows (\$Mn) in Mutually Exclusive and Exhaustive Categories

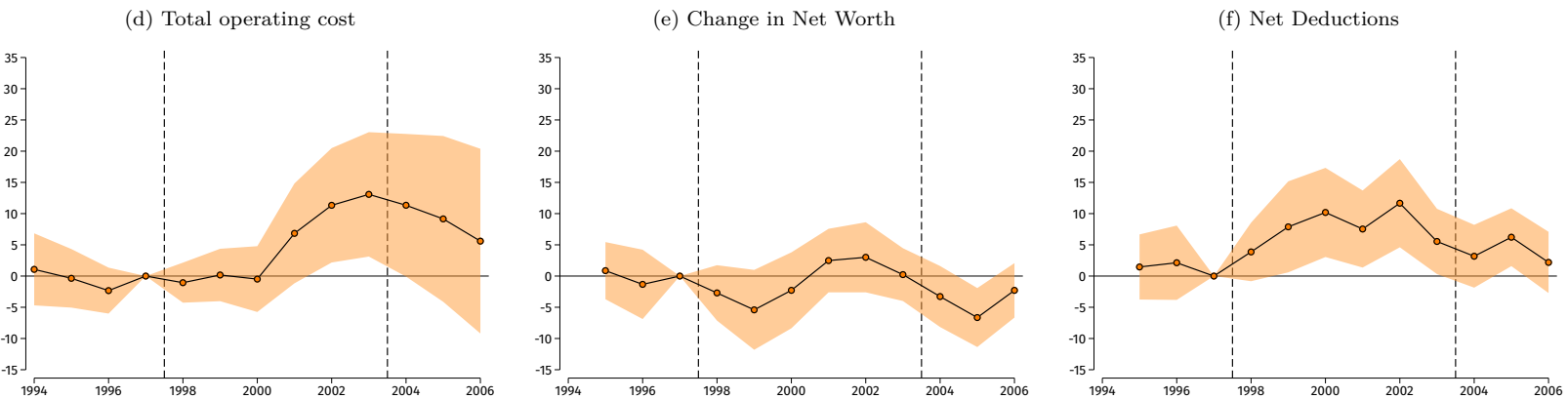


Figure 4: Flow of funds

Notes: The figure presents event study plots obtained by estimating the dynamic effects model in Equation 3 on our main analysis sample. The outcomes here are various measures of income (outlier revenue, Medicare inpatient revenue, and total patient revenue), costs (operating costs), and changes in balance sheet items (change in net worth, net deductions), as reported in the Medicare cost reports for the corresponding years. All values are expressed in millions of real year 2000 dollars. All coefficients are estimated relative to 1997 as the reference year. The shaded area represents 95% confidence intervals. Standard errors are clustered by hospital.

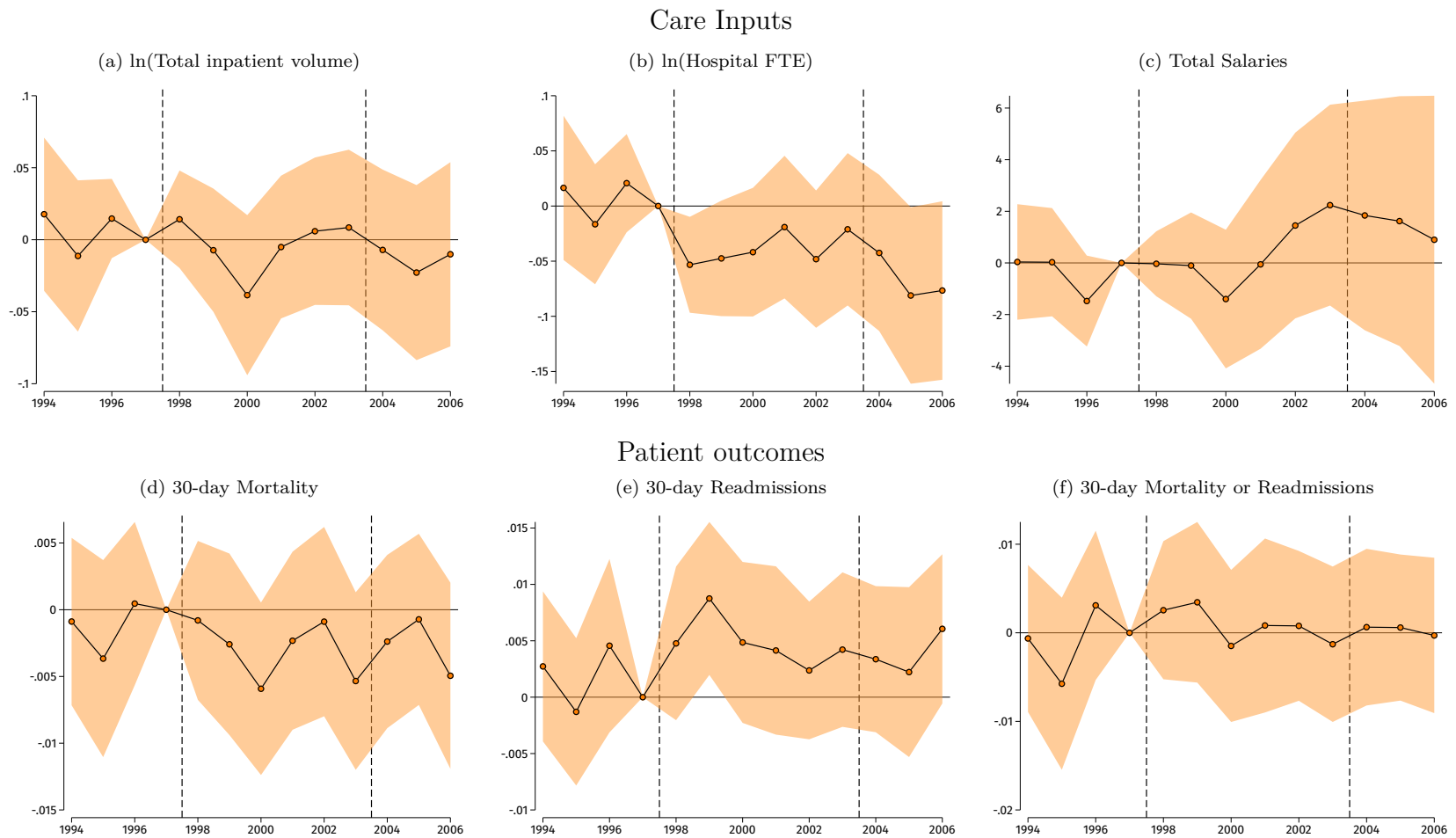
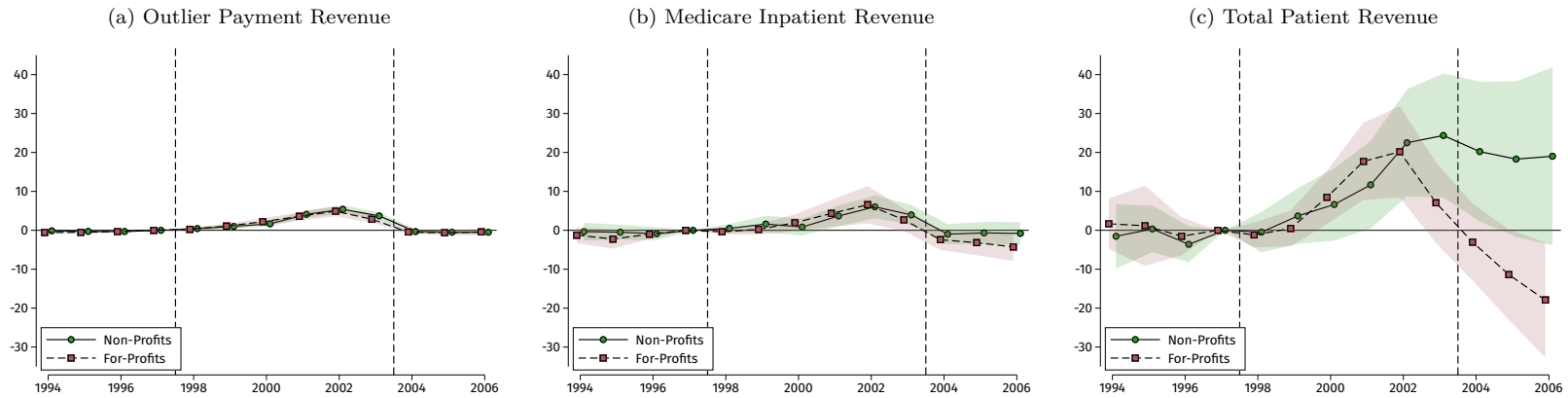


Figure 5: Inputs and Patient Outcomes

Notes: The figure presents event study plots obtained by estimating the dynamic effects model in Equation 3 on our main analysis sample. The outcomes here are measures of care inputs (total number of inpatients, full-time equivalent employment, and total salaries) and measures of health outcomes for the cohort of patients admitted with non-deferrable conditions (30-day mortality and readmission rates). Event studies for inpatient volume and full-time equivalent employment are estimated with Poisson models. Data on inputs is sourced from the Medicare cost reports, while health outcomes are observed for Medicare fee-for-service patients admitted with non-deferrable conditions. All coefficients are estimated relative to 1997 as the reference year. The shaded area represents 95% confidence intervals. Standard errors are clustered by hospital.

Inflows (\$Mn) in Increasing Broadness



Outflows (\$Mn) in Mutually Exclusive and Exhaustive Categories

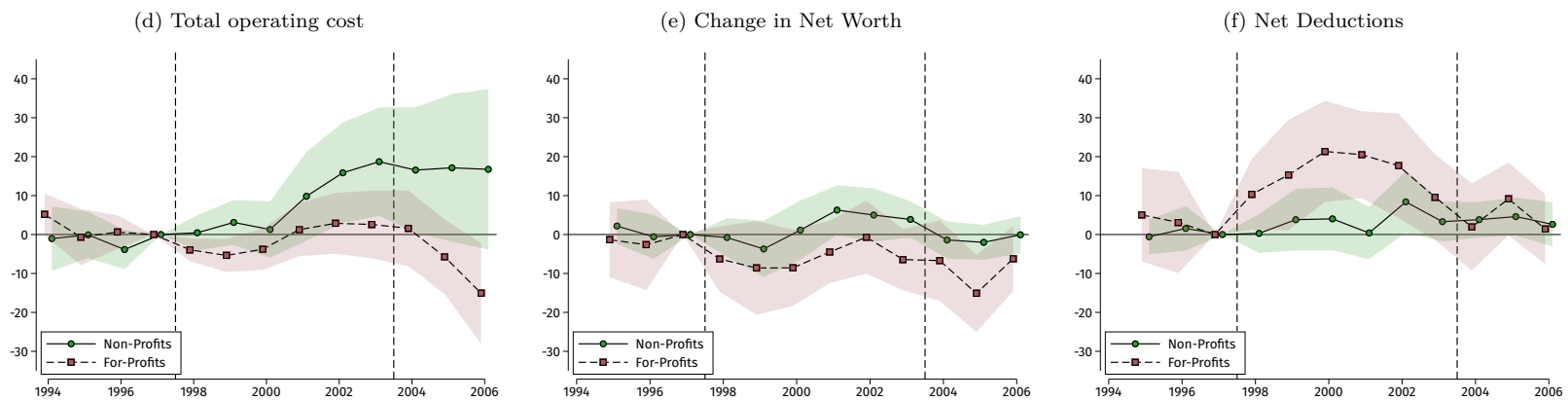


Figure 6: Flow of funds for nonprofits and for-profits

Notes: The figure presents event study plots obtained by estimating the dynamic effects model in Equation 3 separately for nonprofits and for-profits. The outcomes here are various measures of income (outlier revenue, Medicare inpatient revenue, and total patient revenue), costs (operating costs), and changes in balance sheet items (change in net worth, net deductions), as reported in the Medicare cost reports for the corresponding years. All values are expressed in millions of real year 2000 dollars. All coefficients are estimated relative to 1997 as the reference year. The shaded area represents 95% confidence intervals. Standard errors are clustered by hospital.



Figure 7: Compensation of Executives and Shareholders

Notes: Figure (a) presents the average total salary and bonus for the 5 highest-paid executives in for-profit systems for Tenet compared to the following non-Tenet systems with data available from 1995-2006: Health Management Associates, Health Corporation of America, Sunlink, and Universal Health Systems. Data is not consistently available for all of these systems before 1995. Figure (b) is an extension of Figure (a) but instead shows a broader measure of executive compensation available in Compustat that captures the total compensation realized by an executive in a given year. Figure (c) presents the total shareholder payouts representing the sum of dividends and the purchase of common and preferred stock. Figure (d) presents event study plots obtained by estimating the dynamic effects model in Equation 3 for the compensation of key individuals measured in the Form 990 data. Total compensation represents all salary and bonus payments made to a nonprofit hospital's officers, directors, trustees, and other key employees.

Table 1: Summary Statistics

	(1)	(2)
	Gamers	Matched Comparators
A. Payment Inputs Used for Matching		
Wage Index	1.099	1.086
Safety Net (DSH) Adjustment	0.0898	0.0789
Teaching (IME) Adjustment	0.0301	0.0275
Medicare Inpatient Share	0.360	0.361
B. Additional Hospital Characteristics		
Beds	275.3	226.1
In System	0.730	0.523
Medicare Inpatient Payments	34.34	27.62
All-Payer Revenue	114.9	101.2
Ownership		
Non-Profit	0.650	0.866
For-Profit	0.350	0.134
Location		
Rural	0.0417	0.106
Urban	0.958	0.894
C. Risk Scores (Non-Deferrable Patients)		
Mortality	0.138	0.134
Readmission	0.135	0.136
D. Risk-Adjusted Outcomes (Non-Deferrable Patients)		
Mortality	0.140	0.139
Readmission	0.139	0.137
Hospitals	120	1,396

Notes: The table presents descriptive statistics on the hospitals in our analysis sample. Column 1 presents the mean values for the turbocharging hospitals we designate as gamers, while column 2 presents the corresponding values for the matched comparator hospitals. Panel A presents values for the variables used to match gamers to non-gamers. Panel B presents values for other relevant attributes or outcomes of interest. Panel C reports the estimated risk of mortality and readmission among non-deferrable Medicare fee-for-service patients. Panel D reports realized mortality and readmission rates among these patients after adjusting for observable risk. All values are computed using data from 1997 except for the Medicare inpatient share, which is the 1994-1997 average. Revenue values are expressed in millions of real year 2000 dollars.

Table 2: Flow of Funds

	(1)	(2)	(3)	(4)	(5)
	DV Mean	1998–2000	2001–2003	1998–2003	Observations
ln(Medicare Charges/Patient)	20,430.4	0.254*** (0.0198)	0.671*** (0.0241)	0.463*** (0.0185)	19,706
Panel A. Income in Increasing Breadth					
Medicare Outlier Payments	1.715	1.331*** (0.235)	4.419*** (0.347)	2.875*** (0.257)	19,699
Medicare Inpatient Payments	32.94	1.537+ (0.855)	5.232*** (1.249)	3.384*** (0.993)	19,699
ln(Medicare Payments/Patient)	9,150.2	0.0732*** (0.0114)	0.197*** (0.0185)	0.135*** (0.0133)	19,706
All-Payer Revenue	111.0	3.776 (3.021)	18.66*** (5.528)	11.22** (4.089)	19,515
Panel B. Outflows in Mutually Exclusive Categories					
Operating Costs	111.9	-0.0489 (2.755)	10.82* (5.056)	5.387 (3.745)	19,580
Total Salaries	46.85	-0.158 (1.302)	1.565 (1.998)	0.703 (1.584)	19,699
ΔNet Worth	5.199	-3.317+ (1.768)	2.058 (1.450)	-0.630 (1.383)	17,949
ΔTotal Assets	4.156	0.979 (1.979)	4.329* (2.130)	2.654 (1.736)	18,040
ΔFixed Assets	0.707	-0.173 (0.884)	0.410 (0.891)	0.118 (0.769)	17,943
ΔLiabilities (subtracted)	-0.662	3.489* (1.694)	1.989 (1.534)	2.739* (1.265)	18,009
Net Deductions	1.703	6.112** (2.187)	7.048** (2.258)	6.580*** (1.960)	17,949

Notes: The table presents the coefficients estimated using Equation 2. Each row presents coefficients from a separate regression on a different dependent variable, typically estimated on a slightly different sample. Column 1 presents the sample mean value of the dependent variable for gamers during 1994-1997. Columns 2 and 3 present the coefficients pertaining to the 1998–2000 and 2001–03 periods, respectively. Column 4 presents the average coefficient for 1998–2003. Column 5 presents the number of observations used for each regression. All dollar values are expressed in millions of real year 2000 dollars. Effects on Medicare charges per patient and payments per patient are estimated using Poisson regression; these coefficients have a log-point interpretation. All-payer revenue includes both inpatient and outpatient components. The change in net worth is equal to the change in assets minus the change in liabilities. Net deductions refers to the funds transferred off the hospital’s balance sheet, typically to its corporate parent. Standard errors are in parentheses and are clustered by hospital.
⁺ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Care Inputs, Patient Risk, and Outcomes

	(1)	(2)	(3)	(4)	(5)
	DV Mean	1998–2000	2001–2003	1998–2003	Observations
Panel A. Care Inputs					
ln(Total Inpatient Volume)	10,812.4	-0.0160 (0.0209)	-0.00192 (0.0256)	-0.00895 (0.0218)	19,519
ln(Hospital FTE)	1,076.8	-0.0526* (0.0243)	-0.0345 (0.0312)	-0.0436+ (0.0262)	19,505
Panel B. Patient Risk (Non-Deferrable Conditions)					
Mortality	0.134	-0.000917 (0.00109)	-0.00157 (0.00139)	-0.00125 (0.00113)	19,064
Readmission	0.135	0.000274 (0.000259)	0.000941** (0.000345)	0.000607* (0.000274)	19,064
Mortality or Readmission	0.258	-0.000666 (0.00111)	-0.000662 (0.00143)	-0.000664 (0.00115)	19,064
Panel C. Patient Outcomes (Non-Deferrable Conditions)					
Mortality	0.139	-0.00208 (0.00193)	-0.00183 (0.00219)	-0.00196 (0.00182)	19,064
Readmission	0.134	0.00463* (0.00198)	0.00208 (0.00213)	0.00335+ (0.00183)	19,064
Mortality or Readmission	0.264	0.00232 (0.00249)	0.000926 (0.00281)	0.00162 (0.00237)	19,064

Notes: The table presents the coefficients estimated using Equation 2. Each row presents coefficients from a separate regression on a different dependent variable, typically estimated on a slightly different sample. Column 1 presents the sample mean value of the dependent variable for gamers in 1994–1997. Columns 2 and 3 present the coefficients pertaining to the 1998–2000 and 2001–03 periods, respectively. Column 4 presents the average coefficient for 1998–2003. Column 5 presents the number of observations used for each regression. The health outcomes are estimated using the two-step approach described in Section 6.2.2. All health outcomes are computed for patients admitted with non-deferrable conditions, following the algorithm used in Card, Dobkin and Maestas (2009). Mortality and readmissions are measured at 30 days following discharge from the index admission. We generate predicted risk values using one-year history of co-morbidities associated with the patient and their principal diagnosis category, but not co-morbidities recorded on the index stay itself. The analyses in Panels B and C have slightly smaller sample sizes because they are restricted to hospital-years with at least 5 non-deferrable patients. Standard errors are in parentheses and are clustered by hospital. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Results for Nonprofits and For-Profits

	(1)	(2)	(3)	(4)	(5)	(6)
	Non-Profits			For-Profits		
	1998–2000	2001–2003	1998–2003	1998–2000	2001–2003	1998–2003
Panel A. Income in Increasing Broadness						
Medicare Outlier Payments	1.225*** (0.303)	4.580*** (0.431)	2.903*** (0.310)	1.536*** (0.363)	4.128*** (0.581)	2.832*** (0.453)
Medicare Inpatient Payments	1.409 (1.192)	4.987** (1.554)	3.198* (1.299)	1.725+ (0.940)	5.642** (2.011)	3.684** (1.405)
All-Payer Revenue	4.482 (4.164)	20.70** (7.663)	12.59* (5.662)	2.289 (3.507)	14.64* (6.236)	8.466+ (4.648)
Panel B. Outflows in Mutually Exclusive Categories						
Operating Costs	2.864 (3.881)	16.04* (7.166)	9.453+ (5.288)	-5.640* (2.577)	0.954 (4.199)	-2.343 (3.225)
Total Salaries	0.776 (1.934)	3.369 (2.921)	2.073 (2.332)	-2.053* (0.881)	-2.011 (1.405)	-2.032+ (1.080)
Compensation of Key Personnel	0.0320 (0.0999)	-0.104 (0.112)	-0.0360 (0.0997)			
ΔNet Worth	-1.665 (2.036)	4.509* (1.834)	1.422 (1.569)	-6.483* (3.221)	-2.551 (2.173)	-4.517+ (2.534)
Net Deductions	2.392 (2.252)	3.718 (2.399)	3.055+ (1.821)	12.94** (4.375)	13.21** (4.440)	13.07** (4.216)
Panel C. Care Inputs						
ln(Total Inpatient Volume)	-0.0285 (0.0241)	-0.0204 (0.0300)	-0.0245 (0.0252)	0.0262 (0.0381)	0.0561 (0.0428)	0.0412 (0.0393)
ln(Hospital FTE)	-0.0321 (0.0288)	-0.0123 (0.0367)	-0.0222 (0.0309)	-0.119** (0.0388)	-0.103* (0.0498)	-0.111** (0.0425)
Panel D. Patient Risk (Non-Deferrable Conditions)						
Mortality	0.00258* (0.00118)	0.00330* (0.00143)	0.00294** (0.00112)	-0.00710*** (0.00172)	-0.0101*** (0.00202)	-0.00862*** (0.00174)
Readmission	0.000664* (0.000310)	0.00140*** (0.000408)	0.00103** (0.000326)	-0.000460 (0.000427)	0.0000764 (0.000577)	-0.000192 (0.000456)
Panel E. Patient Outcomes (Non-Deferrable Conditions)						
Mortality	-0.00492* (0.00200)	-0.00339 (0.00252)	-0.00415* (0.00197)	0.00320 (0.00367)	0.00109 (0.00380)	0.00215 (0.00333)
Readmission	0.00656** (0.00243)	0.00480+ (0.00269)	0.00568* (0.00232)	0.00112 (0.00296)	-0.00276 (0.00301)	-0.000820 (0.00251)

Notes: The table presents key outcomes from Tables 2 and 3 separately for nonprofit and for-profit gamers. Each row presents coefficients from a separate regression on a different dependent variable, typically estimated on a slightly different sample. Columns 1–3 consider effects for nonprofit hospitals while columns 4–6 consider for-profit hospitals. See notes to tables 2 and 3 for more details on the outcome measures. Standard errors are in parentheses and are clustered by hospital. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$