

# Can Whistleblowers Root Out Public Expenditure Fraud? Evidence from Medicare

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## Abstract

This paper analyzes private anti-fraud enforcement under the False Claims Act, which compensates whistleblowers for litigating against healthcare providers who overbill the US government. I conduct several case studies of successful whistleblower lawsuits concerning Medicare fraud, pairing new legal data with large samples of Medicare claims. I estimate that deterrence from \$1.9 billion in whistleblower settlements generated Medicare cost savings of nearly \$19 billion, while imposing low costs on the government. These results suggest private enforcement is a cost-effective way to combat public expenditure fraud.

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# 1 Introduction

Waste, fraud and abuse are serious concerns in the governmental provision of goods and services. Governments often rely on private firms to execute their spending, such as the procurement of goods or in contracting to provide services, and these firms face strong incentives to divert government funds for their private interest. The government's efforts to combat public expenditure fraud face challenges: increased oversight can be costly or distortive, and bureaucrats themselves face weak incentives to combat waste and fraud as they face limited accountability mechanisms and are not personally responsible for the government's financial mismanagement.

Privatization is a potentially effective way to both elicit private information useful for the detection of fraud and also to provide incentives to catch fraudsters. The False Claims Act (FCA) is a US federal law that allows whistleblowers to recover over-billed money for the government and receive a share of the recoveries. Uniquely, FCA whistleblowers conduct their own litigation on behalf of the government in federal civil court, combining the private information of whistleblowers with the private enforcement of law. This process has generated thousands of whistleblowing lawsuits and recovered tens of billions of dollars since the 1986 enactment of the law. In fiscal year 2018 alone, whistleblowers recovered \$2.1 billion for the US government from FCA lawsuits, for which whistleblowers were awarded \$301 million (US Department of Justice, 2018). Despite the volume of lawsuits and recovered funds, there has been very little empirical evidence on the False Claims Act's effectiveness at both catching and deterring public expenditure fraud.

The issues of fraud in public expenditure are compounded in the provision of federal health insurance. The US federal government relies heavily on private firms to provide healthcare and reimburses these providers based on self-reported activity. Furthermore, much of healthcare is a credence good, meaning that neither patients nor non-specialist bureaucrats are able to effectively monitor doctors (Dulleck and Kerschbamer, 2006). This information asymmetry provides opportunities and incentives for healthcare firms to increase their profits through misreporting. In contrast,

the federal insurer has a limited capacity for monitoring and enforcement. With the US government spending more than a trillion dollars per year on healthcare, even small shares of impropriety can be expensive, prompting concerns about the magnitude of healthcare fraud and generating interest in the ways to combat it. Correspondingly, 55% of False Claims Act whistleblower lawsuits are related to the federal healthcare programs.

In this paper, I examine the economics of whistleblowing under the False Claims Act and empirically measure the costs and benefits of private enforcement, with evidence from Medicare, the American health insurance program for adults over 65 and the disabled. Medicare provides an excellent setting to understand the effects of private enforcement on fraud more generally, as we can observe all relevant expenditures and many of the important social consequences of these policies. First, I model the decision of a whistleblower to litigate, as compared to socially optimal behavior, and discuss the key magnitudes needed to understand whether privatization is efficient. For my empirical analyses, I pair a novel dataset on whistleblower filings and their allegations with a large sample of Medicare claims data from 1999 to 2016 to measure the benefits and costs of whistleblowing. I estimate the deterrence effects of a set of the largest successful whistleblower cases, as well as the public costs of whistleblowing and its effects on patient health outcomes. Overall, I find large deterrence effects, small public costs, and no evidence of negative health effects on patients, indicating that private enforcement is an effective anti-fraud policy.

Private antifraud enforcement involves social benefits, private costs, and public costs, none of which are fully internalized by the whistleblower. In a simple model of whistleblowing litigation, I show how the decision of the whistleblower to litigate differs from the publicly efficient choice. By paying whistleblowers a share of the money recovered, the False Claims Act creates incentives for whistleblowers to conduct enforcement when they expect cases to be profitable, which is proportional to the public cost of the fraud already committed. Yet whistleblowing can also have deterrence effects for which the whistleblower is uncompensated. Whistleblowing can change spending on the types of fraud the whistleblower identifies, called specific deterrence, and can also

cause spillovers to inhibit fraudulent billing throughout the medical industry, known as general deterrence.<sup>1</sup> Private enforcement can also risk over-enforcement because whistleblowers do not bear the full costs of their litigation. Lawsuits have both public and private costs, including to the Department of Justice, the court system, and the attorneys of the plaintiffs and the defendants. Whistleblowing can also affect care decisions by providers, with either positive or negative consequences for patient health that are not internalized in the whistleblower's enforcement decision.

To measure these deterrence effects, I analyze the effects of whistleblowing on public spending in four case studies of enforcement related to the Medicare program. These four case studies reflect dozens of lawsuits against hundreds of defendants, grouped by similar allegations of fraudulent conduct. I use a novel synthetic control methodology, which I call "staggered synthetic controls," to estimate counterfactual spending in the absence of whistleblowing. In each case study, the treated group is spending of the type identified by the whistleblower as fraudulent, for the broadest possible sample of potentially affected providers. I compare this treated group against a synthetic control group constructed of similar types of care not affected by the lawsuit. The staggered synthetic controls method allows estimation in a case study design where treated units are on trajectories that are uncommon among potential control units. My method extends existing synthetic control methods by using donor control units that occur asynchronously and estimating a time shift for these units to align them with the treated unit. This extension allows the comparison between similar trends in spending that occur at different points in time, which improves the pre-period fit of the synthetic control group. In effect, this method extends the staggered difference-in-difference approach to synthetic controls. The difference between the treatment and control series measures the specific deterrence effect of the whistleblower lawsuits. Importantly, my analysis does not estimate the counterfactual of whistleblowing versus having no such regime, but rather measures the benefits of these specific cases, taking the enforcement setup as given.

My results show that whistleblowing achieves a high level of specific deterrence, as measured

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<sup>1</sup>The distinction between "specific" and "general" enforcement and deterrence comes from Shavell (1991).

by the change in spending on the procedures identified as fraudulent by the whistleblowers, netting out increases in spending on substitute procedures. I estimate that total specific deterrence effect of these four case studies is \$18.9 billion in the first five years after the suits were filed, compared to a settlement total of \$1.9 Billion. On average, specific deterrence is 6.8 times the case's settlement value, but with wide variation in this ratio across case studies. Importantly, these specific deterrence effects do not count the general deterrence value of these cases in deterring other types of fraud not identified by the whistleblower. Therefore, this estimate constitutes a conservative measure of the total deterrence caused by these suits. A variety of robustness checks support the high deterrence value found via the synthetic control method.

The public costs of whistleblowing are modest and are a small fraction of the estimated benefits. These costs include expenditures by the federal agencies that oversee and contribute to the litigation, including the courts, the Department of Health and Human Services, and the Department of Justice. Using data from federal budget reports, I estimate that total federal expenditures were less than \$108.5 million in 2018. This indicates that whistleblowing has an extremely high return on investment for federal resources, and that privatization is a promising mechanism for antifraud enforcement. In further analysis presented as supplementary material, I discuss the effects of whistleblowing on provider care decisions and patient health outcomes with a case study on Kyphoplasty. This analysis finds no evidence that whistleblowing harmed patients.

While there has been substantial disagreement in the public sphere over the value of the False Claims Act, there has been little empirical evidence on the effects of this law. Engstrom (2012; 2013) presents descriptive statistics on FCA cases and settlements using similar legal data but does not measure the law's effects on providers and spending. In the accounting literature, Heese (2018) shows that hospitals prosecuted under the FCA are less likely to participate in broad measures of overbilling. In the health literature, Howard and Desai (2020) show that FCA investigations lower angioplasty volume in investigated hospitals, and Howard and McCarthy (2021) show that False Claims Act enforcement deters the overuse of implantable cardiac devices. No paper has quantified

the financial deterrence effects of whistleblowing across a generalizable sample of different cases.

This paper also relates to a broader literature on private enforcement and deterrence. Becker and Stigler (1974) suggest the privatization and marketization of enforcement as a way to align the incentives of enforcers with those who benefit from the enforcement. Landes and Posner (1975) formalize the theory of private enforcement, and Polinsky (1980) compares public and private enforcement for the imposition of fines. Shavell (1991) formulates the differences between specific and general enforcement of law used here. While the legal literature on private enforcement theory is robust, there has been limited empirical evidence of private enforcement in practice due to data limitations and the relative rarity of private enforcement mechanisms. Notably, private enforcement is widely used to combat self-dealing in securities law; Djankov et al. (2008) and Jackson and Roe (2009) discuss the efficacy of this form of private enforcement, with mixed results.

The main contribution of this paper is on the economics on healthcare fraud, where extant literature has largely not discussed whistleblowing. Silverman and Skinner (2004) and Dafny (2005) describe the financial incentives for misreporting (particularly upcoding) among hospitals. The types of fraud described in those papers were ultimately litigated by whistleblowers under the False Claims Act; this paper fills a gap in the existing literature by evaluating the whistleblowing program that seeks to catch and inhibit the fraud described in those studies. Becker et al. (2005) show that increased state-level Medicaid anti-fraud enforcement by government investigators lead to declines in fraudulent treatment, with no negative patient health outcomes. In recent work, Fang and Gong (2017) use a measure of the time spent on procedures to detect providers who bill Medicare for too many hours.

Finally, the question of the health consequences of whistleblowing reflects a broader concern about access and welfare effects when government services undertake reforms. This is similar in spirit to the analysis of malpractice litigation reforms in Kessler and McClellan (1996), who find no observable harm to patients. In recent work, Eliason et al. (2021) show that anti-fraud regulations in the dialysis ambulance industry do not harm patient health. In contrast, Meckel (2020) shows

that reforms intended to limit fraudulent price discrimination in a nutrition-assistance program reduces social welfare by causing providers to drop out.

This paper is organized as follows. Section 2 describes the institutional details of the False Claims Act, and Section 3 models the economics of private enforcement. Section 4 describes the data and provides stylized facts about FCA lawsuits and recoveries. Section 5 measures specific deterrence on a set of case studies using the staggered synthetic control methodology. Section 6 addresses the costs of private enforcement. Section 7 concludes.

## 2 Background

Medical care has a fundamental information asymmetry among providers, insurers, and patients (Arrow, 1963), which creates opportunities for misreporting. Patients are less informed than doctors about the care they need, making healthcare a credence good: patients are not sufficiently able to monitor doctors for bad behavior (Dulleck and Kerschbamer, 2006). Conversely, insurers have limited means of directly observing medical conditions or treatments, and rely on information from providers' claims for payment. This information asymmetry provides opportunities for misreporting by providers, whose billing practices tie directly to their profits. It is difficult to uncover misreporting using top-down enforcement, as insurers often lack other sources of information besides the provider's claim and supporting documentation, which can be manipulated.

When the insurer is the federal government, as is the case with Medicare and Medicaid patients, these problems are exacerbated. Medicare and Medicaid are massive programs, spending respectively around \$700 and \$400 billion per year (Congressional Budget Office, 2019), creating bureaucratic issues due to the sheer volume of claims. Indeed, the Government Accountability Office (GAO) estimates that \$48 billion (8%) of Fee-for-Service Medicare expenditures in 2017 were "improper," that is, they lack necessary documentation to ensure the correct amount was paid to the right person for a valid claim (United States Government Accountability Office, 2019). Not



all improper payments are fraudulent, and not all fraud is captured by improper payment measures, but this figure underscores the opportunism that may arise from expensive and overwhelmed federal programs.

With these issues in mind, in 1986 Congress amended the False Claims Act to enable whistleblowers to directly conduct lawsuits against those who overbill the government (United States Department of Justice, 2012). The False Claims Act applies to all claims for payment made to the federal government, but has largely been used against healthcare fraud, overbilling, and misreporting. Under the False Claims Act, individuals who uncover misreporting against the US government, themselves often healthcare workers (e.g., a hospital employee), hire their own attorneys and sue those filing false claims in federal civil court. The whistleblower sues *qui tam*, i.e., on behalf of the US government. These civil court cases have 3 parties: the whistleblower, the defendant, and the US government. The US government has the option to support a case by “intervening” – that is, by assigning its own attorneys to help litigate the case.

False Claims Act lawsuits can be high stakes for all parties involved. These cases are conducted in civil court, and the burden of proof is the preponderance of the evidence, i.e. “more likely than not.” Because litigation is expensive, few cases go to trial; unsuccessful cases are often voluntarily dismissed by the whistleblower, and clear-cut cases are settled. In successful cases, the federal government can recover up to 3 times the amount of the proven false claims from the defendants, plus potentially large criminal fines. Upon settlement, the whistleblower is entitled to 15–25% of the recovery amount if the government intervened, and 25–30% if the government did not intervene. Section 4.1 provides summary statistics on FCA lawsuit outcomes.

The ability for the whistleblower to conduct the lawsuit in lieu of the government creates a profit motive for rooting out impropriety that may be otherwise lacking in the federally administered programs. This profit motive is in contrast to the usual incentives of federal bureaucrats, and thus can alleviate principal-agent problems within the government that can cause inefficient investment in monitoring and enforcement. Prosecution initiated by the government also has capacity

constraints due to the limited resources of the Department of Justice, while privatized enforcement creates a market for whistleblowing information and generates substantially more litigation than the federal government conducts alone.

Appendix A presents additional institutional details about the False Claims Act.

### 3 Theory of Private Antifraud Enforcement by Whistleblowers

#### 3.1 Model

Consider the following simplified model of private enforcement against Medicare fraud under the False Claims Act. This model is motivated by other general models of private litigation not specific to the FCA, including Shavell (1982) and Spier (2007). This model explores the divergence between a whistleblower's private incentives to litigate and the decision a social planner would make.

A whistleblower receives a private signal about fraud occurring against the government, in the form of the probability  $\pi$  that they can win a False Claims Act lawsuit, and the amount of fraud being committed as measured by the expected federal recovery amount  $R$  (including fines). Whistleblowers are not permitted to represent themselves (United States District Court, D.C., 2003), and the whistleblower makes a joint decision with their attorney of whether to file suit; both parties must agree. The whistleblower and their attorney observe private costs  $C_w$  associated with conducting litigation. Attorneys working on contingency expend resources pursuing litigation, most notably their time, which carries a high opportunity cost. A whistleblower attorney may be able to recover some of the costs of litigation from the defense in the case of a successful suit, although this fee-shifting is not always practiced. If the case is successfully pursued by the whistleblower-attorney pair, they expect to receive a share  $s$  of the recovery. Then, a risk neutral whistleblower-

attorney pair would choose to litigate if:

$$\pi sR > C_w \quad (1)$$

The expected whistleblower compensation  $\pi sR$  creates incentives for the whistleblower to come forward with their private information about fraud or misconduct, and can alleviate personal and professional costs arising from whistleblowing on one's employer, as well as the realized costs of litigation, all captured in  $C_w$ .

The whistleblower and attorney's decision reflects the fact the decision to litigate is increasing in the probability of settlement as well as the magnitude of the recovery, and decreasing in the expected litigation costs. This indicates that, all else equal, whistleblowers and their attorneys are more likely to litigate against large frauds, as well as frauds for which they have the greatest evidence, as evidence can both increase the likelihood of a successful suit  $\pi$  and also decrease investigatory litigation costs.

Consider instead the decision of a social planner of whether a particular fraud should be litigated against. Whistleblowers fail to internalize the costs of litigation that they do not bear. The defendant must spend  $C_d$  to defend against the lawsuit, and the lawsuit also has public cost  $C_p$ , reflecting the resources expended by the federal government in oversight and trial of the case.

Litigation by the whistleblower can also produce benefits that whistleblowers fail to internalize. Whistleblowing produces specific deterrence effects  $D_s$ , measured in cost savings by the government for the type of fraud the whistleblower deters. Figure 1 shows the relationship between spending, damages, and specific deterrence. I define specific deterrence as the difference between spending with and without whistleblowing, integrated after the time of the lawsuit:

$$D_s := \int_{t_s} (S_f - S_w) \delta^{t-t_s} dt \quad (2)$$

where  $t_s$  denotes the time the lawsuit initiates,  $S_w$  is spending with whistleblowing,  $S_f$  is spending

with unaddressed fraud, and  $\delta$  is a discount factor. In a circumstance where whistleblowers cause a decrease in one specific type of spending but an increase in a substitute procedure,  $S_f - S_w$  reflects the net changes in spending.

In contrast, the recovery  $R$  is proportional to the damages the government faces. As shown in Figure 1, damages are the integral of fraudulent minus non-fraudulent spending up to the lawsuit:

$$R \propto \text{Damages} = \int^{t_s} (S_f - S_n) \delta^t dt \quad (3)$$

where  $S_f$  is fraudulent spending without whistleblowing and  $S_n$  is spending without fraud. Spending with whistleblowing  $S_w$  and spending without fraud  $S_n$  may be the same if whistleblowing completely deters fraud and returns spending to a non-fraudulent level. As shown in Figure 1, the relationship between the magnitude of damages and of specific deterrence are governed by the amount of fraudulent spending as well as the extent to which whistleblowing curbs fraudulent behavior.

In addition to specific deterrence, whistleblowing can cause general deterrence  $D_g$ , not shown in Figure 1. Whistleblowing against a particular fraud may cause providers committing unrelated frauds to stop doing so because they fear being caught. Moreover, the existence of whistleblower lawsuits may deter providers from committing other frauds in the first place. The magnitude of general deterrence is difficult to measure empirically, as it concerns behavior not identified by the whistleblower. However, general deterrence effects must decrease spending on other fraudulent or misreported procedures, because providers are less likely to commit fraud given increased scrutiny. Therefore, I assume  $D_g > 0$ .

In addition to the financial costs and benefits discussed above, whistleblowing cases may also have impacts on provider decisions over patient care. False Claims Act cases may inform providers' care decisions as they seek to comply with the shifting landscape of regulation and litigation risk. These changes in provider behavior can be consequential to patient health outcomes.

These changes to patient health outcomes may pose an additional cost  $H_c$  if whistleblowing distorts care away from the social optimum, or may provide additional benefits  $H_b$  if whistleblowing corrects fraudulent behavior that jeopardizes patient health. This relates to similar research on malpractice liability, in particular Kessler and McClellan (2002), whose model predicts that malpractice liability can cause either inefficiently high or low levels of care. I expect that the health effects of whistleblowing may differ between lawsuits, with some providing positive changes, and others causing negative changes.

From a social welfare perspective, private enforcement by the whistleblower is efficient if the total expected benefits exceed the total costs of the lawsuit:

$$\beta[\pi(1-s)R + \pi D_s + D_g] + H_b > C_w + C_d + C_p + H_c \quad (4)$$

The probability of settlement  $\pi$  gives the probability that the government gains the recovery  $(1-s)R$ , and also governs the probability that specific deterrence effects  $D_s$  are produced. I define specific deterrence as the effect of a successful whistleblower lawsuit. General deterrence effects  $D_g$ , measured in spillovers of this case onto other fraud decisions, can be produced even if the whistleblower's case is not successful; however, the magnitude of general deterrence may vary with factors that correlate to the probability the case is successful, such as the quality of evidence or the magnitude of alleged fraud. Costs, as well as changes to healthcare outcomes associated with litigation, are borne regardless of the outcome of the suit. The whistleblower's share  $sR$  is a transfer from the defendant to the whistleblower and does not factor into social welfare. The coefficient  $\beta$  governs how the social planner values the financial recoveries and deterrence effects, which they may value at more than one dollar per dollar recovered. For a discussion of exact values of  $\beta$  and for more details and insights from the model, see Appendix [B](#).

## 3.2 Discussion

The difference between the whistleblower's decision as captured in Equation 1 and the social planner's choice in Equation 4 highlight some of the key issues facing private antifraud enforcement.

Whistleblower cases have the potential for valuable specific deterrence effects  $D_s$ , which contribute to the public good but not to the whistleblower's decision. Following a lawsuit, both the defendants and other providers of the same care face incentives to change their behavior to avoid further litigation or to comply with the terms of their settlement agreements. Defendants face potential exclusion from the Medicare and Medicaid programs for noncompliance with their settlements. Because the defendants may be only a small share of those committing litigable behavior, these specific deterrence effects have the potential to affect providers far exceeding the scope of the settlement.

This model gives rise to a set of cases where the private and public interests diverge. If damages prior to the whistleblower's signal are small, the expected recovery  $R$  may be too small to be worth pursuing by the whistleblower, and the inequality in Equation 1 fails to hold. Yet from a social welfare perspective, these cases might be valuable to litigate if the deterrence value would be large. For example, a small trickle of fraud in perpetuity could have a low recovery but a high deterrence effect if enforced against. In contrast, there are potential circumstances in which the specific deterrence values are small. Specific deterrence is the difference between spending with and without whistleblowing, and when these values are similar then specific deterrence is small. This could occur when the increase in spending due to fraud all occurs before the whistleblower files, and future spending would look the same with or without whistleblowing. In this circumstance, the settlement serves as a transfer from the defendant to the government and whistleblower for past bad actions, but there is no specific deterrence. However, there may be general deterrence effects, if observing this transfer changes others' beliefs about their own enforcement probability or about the profitability of fraud. Another circumstance with little specific deterrence effect is one in which whistleblowing is not meaningful; for example, if fraud continues to be profitable

even following a settlement, whistleblowing may not deter future bad behavior of the same sort, and  $S_f - S_w$  is small. In these circumstances, whistleblowing is potentially inefficient because the settlement only serves to correct retrospective damages, and the lawsuit incurs its full costs without providing social value into the future.

The value of the deterrence effects  $D_s + D_g$  is policy-relevant in evaluating the compensation of whistleblowers. Whistleblowers are paid a portion of the settlement recovery, which is itself proportional to the amount of damages due to pre-settlement overbilling. Therefore, whistleblowing compensation is purely *retrospective*. However, the value of whistleblowing depends on both the settlement and the deterrence effects, the latter of which does not factor into whistleblower compensation. This disconnect between whistleblower compensation and whistleblower value-added may indicate that whistleblowers are inefficiently compensated, as they do not internalize the public good element of the deterrence they provide. As an alternative policy, whistleblowers could be compensated based on both settlement and their ex-post deterrence effects, for example through a contract that pays the whistleblower for a proportion of the deterrence realized after their suit. This discussion ties directly to the literature on incentives for private enforcers, as discussed by Polinsky (1980).

The value of the private enforcement regime relies on the extent to which the benefits of whistleblowing outweigh its costs. This motivates an analysis of both the deterrence effects and health consequences of False Claims Act lawsuits. Section 5 undertakes an exercise to measure the deterrence effects of the largest whistleblower cases, and Appendix G undertakes a case study of the health effects of a set of whistleblower lawsuits against a spine surgery procedure.

## 4 Data and Descriptive Statistics

The data for this project come from a variety of complementary sources which aggregate information on whistleblower cases and their downstream impacts on medical care provision and patient

health outcomes.

Data on whistleblowing at the lawsuit level comes from a Freedom of Information Act (FOIA) request I conducted on the Department of Justice in 2018 for data on all completed (settled or dismissed) whistleblower-filed FCA suits (Department of Justice, Civil Division, 2018). These data describe almost 6,000 whistleblowing cases and include information on the defendant, whistleblower, filing date, federal agency to which the case relates, federal court district of filing, government intervention election status and date, settlement amount, and whistleblower share. These data start with the introduction of the law in 1987, and the coverage declines after 2012, as many newer cases are still under seal. These data are used for descriptive statistics and stylized facts in section 4.1, as well as for providing supplementary information on whistleblower lawsuits for each case study in Section 5. Appendix C describes the data cleaning process.

The FOIA data from the Department of Justice do not contain allegations of conduct by the defendants, which is necessary to trace the effects of lawsuits in the Medicare claims data. To find such allegations of fraud, I scraped the Department of Justice “Justice News” archive website for all press releases related to Medicare and whistleblowing. For the cases analyzed in this paper, I also collected whistleblowers’ original court filing documents (complaints), settlement agreements, and other court documents from a variety of sources. These documents detail exact filing dates, settlement timing, allegations of fraud, and the conduct covered by the settlement agreements. Sources for these documents include the federal court record system (PACER), the Department of Justice digital archives, SEC filings of publicly traded companies, and the legal database of Taxpayers Against Fraud, a not-for-profit supporting whistleblowers’ attorneys. Combined with the press release and FOIA data, the court filings give a complete picture of the allegations and outcomes for a subset of the whistleblower lawsuits for which I conduct case studies. Section 5 describes this process and presents its results.

Data on Medicare claims and payment are necessary for the analysis of the medical and fiscal impacts of whistleblowing cases. My available data include 100% samples of Fee-for-Service



Medicare, i.e. Parts A and B, from 1999–2016, for inpatient, outpatient, hospice care, durable medical equipment, home health care, and skilled nursing facilities; and 20% samples of the carrier files that reflect physician office visits (Center for Medicare and Medicaid Services, 1999-2016). These data, containing mostly 100% samples of each type of care over nearly 20 years, cover tens of billions of claims from hundreds of millions of patients. Section 5 presents the methodology by which I selected whistleblowing cases for analysis, which translates into the usage of these data. Medicare data are used only as they related to each case presented there, and for the analysis of patient health outcomes in Appendix G. As such, only a portion of the available data is used in these analyses, reflecting the “needle in a haystack” aspect of Medicare overbilling.

Information on the costs of whistleblowing comes from a different set of data. The Department of Justice does not publish data on the costs of FCA lawsuits directly. Data on public expenditures related to civil enforcement were culled from federal budget reports, particularly the 2018 Health Care Fraud and Abuse Control Program Annual Report from the Department of Health and Human Services and the Department of Justice (The Department of Health and Human Services and The Department of Justice, 2019). Other data on costs were gathered from the Department of Justice Qui Tam Fraud Statistics (US Department of Justice, 2018) and the budget of the federal judiciary (Administrative Office of the US Courts, 2017).

## **4.1 Descriptive Statistics about False Claims Act Lawsuits**

Table 1 presents descriptive statistics about False Claims Act lawsuits. I observe 5,967 lawsuits, of which 3,269 (55%) are healthcare-related. Of the healthcare cases, only 35.7% result in a recovery of funds; the rest were dismissed by the whistleblower, the judge, or the Department of Justice. This points to a high level of cases for which the federal government receives no compensation, underscoring questions about the value of the False Claims Act.

Both the settlement amounts and the whistleblower shares have high variance reflecting very long right tails. The median settlement amount for healthcare-related whistleblower lawsuits is

\$1.5 million, but the mean is \$22.7 million and the standard deviation is \$87 million. Total settlements amount to \$26.47 billion, for which whistleblowers were paid a total of \$4.23 billion, with a median of \$250,000 per case. Similarly, whistleblower cases take a highly variable amount of time. The median healthcare whistleblower lawsuit length, defined as the time from filing to case closure, is 964 days (2.6 years) with a standard deviation of 800 days (2.2 years).

Appendix Figure [A1](#) shows the trend of healthcare whistleblowing cases by year of filing and whether they end in a settlement. Settlements rose between 1990 and 1995 to around 75 cases per year, and have stayed rather constant since. Conversely, the total number of cases and the share of dismissed cases have both risen substantially since 1987, and continue to grow. Cases that are ultimately dismissed now constitute the majority share of whistleblowing. Naturally, the settling or dismissal of cases does not reveal their underlying merit – some meritorious cases are dismissed (for example, due to cost reasons) while some frivolous cases settle, (for example if the defendant is particularly risk-averse).

While the number of settled cases has remained steady since 1995, total settlement dollars have risen immensely. Total settlements were just \$80.6 million in 1995, when the number of settled cases reached its steady state of around 75 per year. However, settlement totals exceed \$4 billion in 2012, the last year of the data. The 2012 total was in a large part due to a single \$1.5 billion settlement against GlaxoSmithKline for allegedly promoting its pharmaceuticals for non-FDA-approved uses.

The Department of Justice Data also include lawsuits from outside of the medical field, and exhibit the broad use of the False Claims Act. Medical-related suits, those categorized by the DOJ as relating to the Department of Health and Human Services, the Food and Drug Administration, or the Center for Medicare and Medicaid Services, constitute 55% of cases. Suits regarding the Department of Defense account for 11% of the nearly 6,000 whistleblower lawsuits, and cases have arisen from nearly all parts of the federal government, including the Department of Education (3% of cases) and the Goods and Services Administration (2% of cases). The use of FCA whistleblow-

ing outside of the medical field is beyond the scope of this paper and presents an opportunity for future research.

## 5 Deterrence Effects: Method and Results

The deterrence effects of whistleblower lawsuits are a key component in the economic tradeoffs described in the model in Section 3. If deterrence effects are large, whistleblower lawsuits not only provide recovered funds for the government, but also save the government money in the form of fraud not committed.

As discussed in Section 3, deterrence from a whistleblowing lawsuit takes two forms: specific deterrence, from changes in spending on the type of care that the whistleblower identifies as fraudulent, and general deterrence, from reduced spending on other types of fraud due to increased litigation risk. In simpler terms, specific deterrence is the main effect of the lawsuit, and general deterrence captures the spillover onto other types of fraud. This analysis measures the dollar value of the specific deterrence of whistleblower cases.

The section proceeds as follows: first, I describe the econometric method for the analysis, which uses staggered synthetic controls to estimate the treatment effect of whistleblower lawsuits on healthcare spending. Second, I describe the lawsuits that serve as case studies, which are the largest whistleblower cases for which I have data. Finally, I apply the method to these case studies and find that whistleblowing produces large specific deterrence effects, saving the government nearly \$19 billion in deterred fraud from just \$1.9 billion of settlements. The cases I analyze account for roughly 7% of total whistleblower healthcare settlements. I conduct a series of robustness checks that support these results. Importantly, specific deterrence does not count the spillovers of these lawsuits onto other types of fraud, and therefore this estimate provides a lower bound of the total deterrence effects of the FCA.

## 5.1 Method

The measurement of deterrence requires an analysis of a counterfactual, between the real world in which enforcement happened and one in which it did not. Synthetic controls, first introduced in Abadie and Gardeazabal (2003), provide a method by which to produce such a counterfactual. Here, the treatment group is the type of spending identified by the whistleblower as fraudulent, and the treatment effect of interest is the change in spending following whistleblowing. The treatment date is the filing of the first related whistleblower lawsuit. The control groups are other types of medical care or other providers that are not treated by whistleblowing, but saw similar rises in spending. Synthetic controls use untreated control groups to construct a series that most closely matches the treated unit in the pre-treatment periods. The difference between the treated unit and the synthetic control group in the post-treatment periods estimates the treatment effects.

Traditional synthetic controls make the assumption that the counterfactual of the treated unit in the absence of treatment can be captured by using a set of controls with contemporaneous time patterns (for example, in the factor model given by Abadie et al. (2010)). However, whistleblowing often affects types of care with unusual trends: they exhibit high growth in spending and claims, potentially driven by the improper conduct of the defendants. This means that there may be few control units on similar trajectories, and a sparse donor pool can lead to a poor fit in the pre-treatment periods when the contemporaneous control groups do not have such trends. The increases among control units may have been due to unchecked fraud or other profit-centered changes in billing practice.

Rather than comparing the treated unit to contemporaneous controls, I consider control groups that saw a similar rise in spending at other points in time but were not subject to enforcement by whistleblowers within the sample period. The rise in spending on control units used here were also potentially driven by fraud; the specific control units given weight by the method are presented in the results section, and many are indeed other forms of fraud that were eventually enforced against, much later. This method makes the assumption of a similar growth trajectory at different points in

time between treated and untreated units in the absence of whistleblowing. Appendix [D.1](#) presents an econometric model consistent with this assumption that motivates the use of staggered synthetic controls, modeled after Abadie et al. (2010). Under this model, the staggered synthetic control method can estimate the counterfactual spending of the treated unit, as though it were untreated, by producing a synthetic control group constructed as a weighted combination of untreated units.

This modification of synthetic controls relies on different assumptions than standard synthetic controls. In effect, this model assumes that the “life cycle” of the fraudulent procedure dominates any common time effects. However, this raises concerns about time-varying confounders, as well as concerns about spillovers between treated units and control units due to their asynchronous timing. Section [5.5](#) presents a series of robustness checks that further address these issues, which find similar estimates of the deterrence value.

Figure [2](#) provides a simple graphical explanation of the staggered synthetic control method for two controls, one shifted forward in time and one shifted backward. The method is implemented with a two step procedure. First, I estimate a time shift for each control unit by finding the time shift with the best pre-period fit between the control group and the treated unit. Second, I construct a synthetic control group by estimating weights for the time-shifted controls. The resulting synthetic control group is used to estimate the counterfactual of the treated unit in the absence of enforcement.

For each case study, I estimate the deterrence effect by integrating the difference between the observed spending and the synthetic control in the post-lawsuit period. Appendix [D.2](#) provides the technical details of the implementation of the shifting, weighting, and deterrence integral estimation. When the type of care treated by whistleblowing has a clear substitute, e.g., inpatient and outpatient medical care, I consider the net change in spending by applying the synthetic control method to both the treated unit and its substitute.

The deterrence values presented in this paper are computed using 5 years of post-treatment effects at a 10% discount rate, which is a conservative estimate. In the absence of whistleblowing,

fraud or abuse may have continued indefinitely into the future, in which case the total deterrence effect would be a perpetuity, providing value at all later periods. Rather than assume that the deterrence effects persist indefinitely, the use of 5 years of post-treatment effects avoids excess extrapolation. Fundamentally, the specific deterrence being measured here is a lower bound of the total deterrence effect, as it also does not include the general deterrence effect, i.e. the spillover of these lawsuits onto deterring other types of fraud.

This method extends the use cases for synthetic controls. Traditional synthetic controls are only useful when there are contemporaneous control units that experience similar patterns to the treated unit in the pre-treatment period. This fails in circumstances where the treated unit is on a rarely seen trajectory. In these circumstances, the staggered synthetic control method can estimate the treatment effect on the treated unit from the pattern of the other similar, untreated units that occur asynchronously. In this sense, it extends the staggered difference-in-difference approach to synthetic controls. This method could be used for a variety of applications in circumstances where traditional synthetic controls produce a poor pre-period fit but the researcher would like to use control units from different points in time.

In order to conduct inference on my results, I employ a permutation test as per Abadie et al. (2010). Each synthetic control is substituted in for the treated unit, and the same two-step procedure detailed above is performed, fitting leads and lags and constructing weights, using all other controls. These weights give a synthetic control unit for the placebo, from which the deterrence measurement can be computed. The deterrence effects corresponding to each control unit form an empirical distribution against which the deterrence effect of the treated unit can be compared.

For further robustness, I produce estimates of deterrence that do not rely on controls, but instead take the approach of projecting the pre-enforcement trend. Section [5.5](#) describes these methods and results.

## 5.2 Case Selection

An ideal study of whistleblowing would analyze every whistleblower lawsuit to compute deterrence effects; however, such an analysis is impossible. There is no complete database that provides information on the allegations of fraud of whistleblower lawsuits, including the Department of Justice FOIA Data. Each lawsuit must be researched individually through Department of Justice press releases and publicly available federal court filings. Some whistleblower documents remain under seal, and so the whistleblower’s allegations are not available whatsoever. Even for unsealed lawsuits, finding corresponding claims in the Medicare data requires a thorough understanding of medical billing for the procedure, which has changed extensively over time.

The difficulty of mapping from lawsuits into the medical claims data motivates a case study design. The summary statistics presented in Section 4.1 show that a few large whistleblower cases dominate the settlement totals and amounts paid to whistleblowers. Therefore, I undertake a case-study based design of the largest whistleblower cases that are feasible to analyze.

Many lawsuits contain similar allegations of fraud and therefore must be treated as a single case study of enforcement. The FOIA data contain 3,269 healthcare lawsuits through 2012, of which 1,167 were successful, but there are no allegations of conduct tied to the FOIA data. To collect the allegations of fraud by whistleblowers, I scraped the universe of 325 press releases from the Department of Justice “Justice News” website that relate to Medicare and whistleblowing, from 1994 (the start of the archives) through 2014.<sup>2</sup> The 325 DOJ press releases contain details on 170 potential cases, after excluding press releases that could not theoretically be linked to the Medicare data. From these press releases, I hand-coded lawsuits that contain similar allegations of misconduct in similar types of medical care into a single case study: the 170 press releases are grouped into 54 case studies, and I focus on the four case studies with settlements over \$100 million that can be identified in the data. For example, one case study is the misuse of the outlier payment

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<sup>2</sup>2014 is chosen as it ensures that cases are filed early enough for use in the synthetic control methodology, which requires 5 years of post-filing data.

system, which contains 11 press releases from different settlements with similar allegations. Table 2 lists the four case studies with the largest total settlement amounts for which I have data, which comprise 29 press releases detailing \$1.9 billion in total settlements. While presented as four case studies grouped by fraudulent conduct, these case studies reflect lawsuits against hundreds of providers, and represent about 7% of total healthcare whistleblower settlements. For each case study, I use court documents including whistleblower complaints and settlement agreements to gather details about the alleged conduct and guide the analysis of claims.

A number of case studies were omitted from analysis, including enforcement that precedes the start of my data, or allegations related to falsification not visible in the Medicare claims. Appendix E describes the case selection process in greater detail, and Appendix Table A3 provides additional details about case studies not selected. The most important reason for not selecting cases is that the timing of the lawsuit precedes the first year of Medicare data available.

### 5.3 Case Details

The following case studies examine the effect of FCA lawsuits on the type of spending identified as fraudulent by the whistleblower, using the staggered synthetic control methodology described above. For each case study, I select controls that are appropriate based on the nature of the case. There are two general sets of potential control units for synthetic controls in this setting: spending on other types of medical care not named by the whistleblower, and spending at other non-defendant providers on the same type of medical care. Using other types of care as controls relies on the assumption that other types of medical care are on similar trajectories as the treated unit. In contrast, using non-defendant providers as controls relies on the assumption that other providers were not affected by the lawsuit, which may not hold in some cases. Therefore, for the first three case studies, where the behavior identified as fraudulent by the whistleblower shows a large change in total volume, which indicates non-defendants were affected, I use different types of medical care with similar pre-enforcement trends as controls. For the last case study, where behavior was lo-



calized to the defendants, I use spending at other non-defendant providers on the same type of medical care, focusing on controls groups geographically separated from the defendants.

As a robustness check, for each method I also present robustness estimates not using controls, estimated by carrying forward the pre-enforcement trend in fraudulent spending at defendant providers. In contrast to the other methods, this makes assumptions about extrapolation from past trends rather than assumptions about controls.

### **5.3.1 Outlier Payment Falsification**

The first case study concerns the misuse of outlier payments for inpatient hospitalization, for which over \$900 million in settlements was recovered by the government between 2004 and 2010. Medicare pays providers of inpatient medical care a fixed reimbursement amount for the diagnosis related group (DRG) under which the patient is coded. By fixing reimbursement for each diagnosis, providers have incentives to keep costs down. However, this raises concerns that providers would be unwilling to treat high-cost patients. To mitigate this adverse selection effect, the Medicare system contains a provision for outlier payments, which are additional reimbursements for very-high-cost patients. Before 2004, to qualify for outlier payments, a patient must have exceeded a cost threshold, computed with a complicated formula based on the provider's labor costs, capital costs, historic charges, and a geographic adjustment factor.<sup>3</sup> This formula provided an opportunity for misreporting: by manipulating their historic costs, hospitals were able to change their thresholds and collect more outlier payments.

On November 4, 2002, Tenet Healthcare, a large investor-owned hospital company, was sued under the False Claims Act for manipulating its cost reports in order to illicitly receive additional outlier payments. This lawsuit was settled in June, 2006, with Tenet paying \$788 million to resolve these allegations without admission of guilt. The DOJ press releases describe 10 other settlements for alleged manipulation of outlier payments. Appendix [F.1](#) contains additional details about the

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<sup>3</sup>Rawlings and Aaron (2005) provide a detailed analysis of this computation.

related lawsuits.

Tenet settled the outlier case for \$788 million, but outlier payments were around \$500 million per month at the time of the lawsuit, and declined by more than half following litigation. This indicates that outlier payment manipulation was widespread, and therefore, I use outlier payments from all hospitals as the treated unit. Then, to construct controls, I use spending on other types of medical care. I consider that outlier payments constitute their own type of spending by the Medicare system, and they are an accounting measure rather than a medical treatment *per se*. Therefore, for its controls, I consider the other broad types of payments made by Medicare that are of comparable scale, including durable medical equipment, home health care, hospice care, nursing care, and disproportionate share payments for hospitals that serve many low-income patients. Analysis is conducted at the month level for each type of spending.

### **5.3.2 Medically Unnecessary Botox**

The second case regards medically unnecessary usage of Botox. Despite popular branding as an anti-wrinkle procedure, Botox is FDA-approved for a number of important medical uses, including treatment of crossed eyes (strabismus) and neck spasms (cervical dystonia). Medicare covers medically necessary Botox injections for FDA-approved uses, but not for non-FDA-approved uses.

Between 2007 and 2009, Allergan, the sole manufacturer of Botox, was sued by a set of whistleblowers who alleged that Allergan had illegally promoted Botox for non-FDA-approved (“off-label”) uses, including headaches. In order to ensure that Medicare would pay for the injections, Allergan allegedly instructed physicians to miscode the injections, using diagnosis codes for approved uses. Additional details about the outpatient coding of Botox and the whistleblower lawsuits are presented in Appendix [F.2](#). On August 31, 2010, Allergan settled with the federal government for \$600 million, of which \$210 million was for federal civil liability (primarily Medicare overbilling), \$375 million was a criminal fine, and \$14.85 million was to recompense affected state Medicaid programs.

The False Claims Act settlement against Allergan lists a set of outpatient billing codes and diagnosis codes that were subject to fraud. I consider all spending that falls under these codes to be the treated unit, by all providers. For the synthetic control design, fraudulent Botox spending is compared to other outpatient procedure codes that saw similar pre-whistleblowing levels and trends in spending, also by all medical providers. The unit of analysis is the code-month level. Appendix [F.2](#) contains additional details about these control units.

The Botox case study is somewhat unlike the other False Claims Act lawsuits studied here, because following its settlement, Botox received FDA approval for migraines, approving the behavior that the whistleblower had indicated as fraudulent. I discuss these issues more in the results section, and show how my estimates change if the Botox case study is excluded.

### **5.3.3 Unnecessary Inpatient Kyphoplasty**

Kyphoplasty is a spine procedure to repair vertebral compression fractures that cause pain and deformity of the back, often observed among patients with osteoporosis. Kyphoplasty involves the percutaneous (through the skin) injection of bone cement into an inflatable balloon placed within the affected vertebra. Because the procedure is performed percutaneously, kyphoplasty can be safely conducted as an outpatient procedure. The kyphoplasty procedure was developed, patented, and marketed by the company Kyphon, which sold a spine surgery kit as well as other related medical devices. Hospitals using the kyphoplasty procedure on Medicare patients would purchase the equipment from Kyphon and bill Medicare for the procedures that used these kits.

In December, 2005, Kyphon was sued by FCA whistleblowers who alleged that Kyphon illegally promoted the procedure as an inpatient procedure as opposed to outpatient. By doing so, hospitals received greater reimbursement for the treatment, allowing Kyphon to charge more for its products. Hospitals kept patients for a short inpatient stay so they could receive the inpatient reimbursement level for a low amount of inpatient care. Inpatient stays under the relevant diagnosis-related groups (DRGs) were reimbursed in the \$6,000 - \$11,000 range, as opposed to

outpatient kyphoplasty which was reimbursed between \$500 and \$2,000.

In May 2008, Kyphon settled these allegations with the Department of Justice for \$75 Million, without admission of guilt. Between 2009 and 2015, the DOJ released another 9 press releases detailing settlements with 140 hospitals having performed unnecessary inpatient kyphoplasty. The sum of the settlements against Kyphon and the defendant hospitals was \$214.2 Million. Appendix [F.3](#) provides additional details for these lawsuits. For the treated units, I analyze monthly inpatient spending at all hospitals on short stays of 7 or fewer nights under the inpatient DRGs promoted by Kyphon, and monthly outpatient spending on all spine procedures at all medical providers. As controls for short-stay inpatient visits, I use inpatient spending at all hospitals for short stays of 7 or fewer nights under other DRGs that saw similar rises in spending. For controls on outpatient spine procedures, I use spending on other outpatient surgical procedures on the musculoskeletal system at all providers. Appendix [F.3](#) describes the coding of inpatient and outpatient kyphoplasty and the control units used.

#### **5.3.4 Unnecessary Inpatient Admission**

The fourth case study concerns the unnecessary admission of Medicare beneficiaries for inpatient care at hospitals, instead of receiving observational or outpatient care. Many of these patients presented at the hospital's emergency department and should have been held under observational or outpatient status, which are reimbursed much less than inpatient care. The first successful lawsuit of this type was filed in October 2004, and in total, 7 settlements were reached regarding 135 hospitals for a total of \$172.3 million in recovery between 2007 and 2014. The majority of the enforcement comes from the settlement with Community Health Systems, the nation's largest operator of acute care hospitals at the time, which settled for \$98 million in 2014 for similar conduct in 119 of their hospitals. Appendix [F.4](#) provides additional details about these lawsuits.

Inpatient admission is a broad class of medical care, with many different billing codes, and therefore an analysis which compares different types of care is unfeasible. Moreover, the few

hundred million dollars of fraud in this case is unlikely to have affected the hundreds of billions of dollars of inpatient Medicare spending nationwide. Therefore, instead of using a control strategy based on comparing different types of care, I consider a control strategy comparing different providers and their admissions patterns. The set of potential controls for the defendants are all other hospitals not litigated against for unnecessary inpatient admissions. To mitigate spillover effects into the control groups, I restrict the controls to hospitals in states that contained no defendants. These hospitals treat different patient pools than the defendants and are less likely to have doctors or administrators cross-employed with the defendant hospitals.

The outcome variable in this case study is total inpatient spending at the defendant hospitals or the control hospitals, and for the substitution effect, total outpatient spending at those hospitals, at the month level of analysis. For each of the defendants, I construct a random sample of 100 control units, where each control group contains the same number of hospitals as the defendant. For example, two defendants were chains of 6 hospitals each; I create 100 control units of 6 randomly grouped control hospitals, drawn with replacement, from the set of controls. Similarly, to measure substitution by the defendant providers to increased outpatient expenditure, I use randomly grouped outpatient providers from the unaffected states. Appendix F.4 provides further details about this process.

## 5.4 Results

Figure 3 shows the main results of the synthetic control method. In 3 of the 4 case studies, all except Botox, whistleblowing caused a large decline in spending relative to the synthetic control unit, indicating strong specific deterrence effects of whistleblowing on fraudulent provider behavior. Each case study is analyzed at the month level, and each outcome variable is total payments from Medicare. In each case study, the pre-treatment fit of the treated unit on the controls is excellent, indicating that the synthetic control method successfully replicated the trends of the treated unit. Appendix Table A2 reports the Root Mean Square Prediction Error for each synthetic control

analysis.

Table 2 also summarizes the deterrence effects for these cases and provides totals, deterrence values, and deterrence-to-settlement ratios. These 4 whistleblower case studies produced deterrence effects totaling to \$18.9 billion, compared to settlements of just \$1.9 billion. The mean deterrence effect for these cases is 6.8 times the settlement value. There is substantial heterogeneity in the deterrence ratios, from a small negative deterrence effect in the Botox case to a particularly high positive deterrence ratio for the Outlier Payments case. Notably, the deterrence metric used here is computed using a discounted difference between the treated and control units for only five years after the filing of the case, giving 0 weight to deterrence effects beyond five years, and does not include general deterrence effects, i.e. spillovers to other types of fraud. Therefore, this is intentionally conservative in measuring the total deterrence effects of whistleblowing.

The largest of these effects is in the Outlier Payments case (top left in Figure 3): the 5-year discounted deterrence measurement for the outlier payments computed is \$17.46 billion, which is roughly 19 times the total settlement value of the outlier whistleblowing lawsuits of \$923 million. Visually, the synthetic control method estimates the rise of the outlier payments system at roughly a linear trend equal to its pre-period rise in the absence of whistleblower enforcement. The magnitude of the deterrence is driven by the scale of spending on outlier payments, which exceeded \$500 million per month in its pre-whistleblowing peak, and then dropped off substantially following the lawsuits.

Notably, for the Botox case (top right in Figure 3), there is a small negative deterrence effect: Botox spending exceeds the synthetic control group post-lawsuit. The 5-year discounted deterrence effect is  $-\$41.67$  million, around 7% of the settlement value of \$600 million. One potential reason for the negative deterrence effect is that Botox gained FDA approval for migraine coverage about 2 months after settling with the Department of Justice for illegally promoting botox for headaches (Singer, 2010). Because civil litigation and settlement negotiations can stretch out for indefinite periods of time, it is possible that Allergan timed the settlement to coincide with its expected FDA

approval, although the original whistleblower complaint indicated that, at least when the off-label promotion was conducted, Allergan knew it lacked evidence to support FDA approval.

This case exhibits that deterrence effects are not necessarily positive, and that the future value of misconduct is not necessarily large when compared to the past costs and settlement amount. In this circumstance, the \$600 million settlement paid by Allergan to the US functioned as a penalty for promoting its product for a use that was not yet FDA approved. But given that FDA approval did ultimately arise, the future value of the damages and the specific deterrence effect are small. Because the Botox case study is different than the others in its context, the reader might consider how these results would differ if this case were excluded; Appendix Table [A1](#) repeats the analysis in Table [2](#), excluding the Botox case. The deterrence effects total \$18.96 billion, compared to settlements of \$1.31 Billion, and the average per-case deterrence ratio is 9.1.

For the Kyphoplasty case (bottom left) and Unnecessary Inpatient Admissions case (bottom right), Figure [3](#) shows that inpatient spending declined relative to the respective synthetic controls. The short-stay inpatient deterrence total for the Kyphoplasty case is \$538.9 million. For the Unnecessary Inpatient Admissions case, I graph results for the Community Health Systems lawsuit, the largest defendant by far. Inpatient deterrence for the defendant Community Health Systems is \$693.2 million, and the total inpatient deterrence for all defendants is \$1.124 billion. Appendix Figure [A2](#) shows the deterrence effect on other defendants. These decreases in inpatient spending must be weighed against expected increases in outpatient spending. Figure [4](#) plots the substitute outpatient spending for these cases. In the Kyphoplasty case, the increase in outpatient spending on all spine procedures totals to \$257.8 million; when compared with an inpatient spending decrease of \$538.9 million, this results in a net deterrence effect of \$281.1 million. For the Unnecessary Inpatient Admissions case, outpatient spending at the defendant CHS did not rise relative to the control providers. Appendix Figure [A3](#) displays the similar synthetic control setup for each of the other defendants' outpatient spending, and shows heterogeneity, with some defendants' outpatient spending rising post-lawsuit and others' falling. The total deterrence from decreases in outpatient

spending is \$96.9 million.

Many of the particular control units that comprise the synthetic controls in these case studies were also due to fraudulent spending, which supports the validity of these controls to estimate the spending trajectory of the treated unit. Appendix Table A4 shows the synthetic control weights and time shifts for the control units for the Outlier case. Most of the synthetic control weight is placed on disproportionate share payments, with only a 1-month time shift. Disproportionate share payments operate very similarly to outlier payments in that they are additional payments for inpatient stays, and were also subject to later whistleblower lawsuits for overuse.<sup>4</sup> Appendix Table A5 shows the weights for the Botox case study among other outpatient CPT codes. Similarly, the top 2 controls by weight, retroperitoneal ultrasound and debridement, which were given 60.2% and 22.6% respectively by the synthetic control process, were also subject to enforcement for fraudulent overbilling at much later dates. In the Kyphoplasty case, Appendix Table A6 shows that 43.1% of the synthetic control weight was placed on inpatient rehabilitation; as with the other case studies, rehabilitation was eventually the subject of anti-fraud enforcement due to overuse and improper billing.<sup>5</sup> The ultimate enforcement against the most heavily weighted control groups for fraud at later dates supports the validity of these control groups in estimating counterfactual spending without whistleblowing.

Overall, these results indicate that the specific deterrence benefits of whistleblowing cases often exceed the settlement values many times over, and greatly exceed the retrospective damages used to compute those settlement values. This indicates a large savings to the Medicare program as a result of these whistleblowing cases, exceeding both the recoveries to the government from the settlement as well as the whistleblower compensation.

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<sup>4</sup>See, e.g., Department of Justice Office of Public Affairs (2009), for one such settlement.

<sup>5</sup>See, e.g., Department of Justice Office of Public Affairs (2019), where the nation's largest inpatient rehabilitation provider was sued under the False Claims Act for unnecessarily admitting patients, as well as miscoding them, and settled for \$48 million.



## 5.5 Inference and Robustness

I conduct inference on the synthetic control deterrence estimates using permutation placebo testing, following Abadie et al. (2010). For each control, I construct a staggered synthetic control unit using all other control groups in the donor pool, and then construct the placebo deterrence value. I then compare the real estimated deterrence to the distribution of these placebo deterrence values. I conduct a 1-tailed test, which counts what fraction of placebos exceed the value of the treated unit's deterrence amounts, comparing positive deterrence values to other positive deterrence values and negative to negative.

Appendix Table A7 presents the results of the placebo test. These results indicate that the deterrence effects found are not due to chance. The deterrence total for the Outlier Payments case exceeds 100% of the placebo units. The small negative deterrence effect for Botox – that is, increased spending after whistleblowing – exceeds all but 3 of the 93 controls, indicating that this effect is statistically different from 0 despite the small magnitude. For the Kyphoplasty case, the reduction in inpatient spending exceeds 26 of the 30 placebos, and the corresponding increase in outpatient spending exceeds 14 of the 15 placebos. For the Unnecessary Inpatient Admissions case, there is strong evidence that the reduction in inpatient spending is not a chance finding; the 5 largest defendants (of 7) exceed between 93 and 99 of the 100 placebo units. However, substitution to outpatient spending shows mixed results, including statistically significant values in both the positive and negative direction. This mix of positive and negative effects indicates heterogeneity in how whistleblowing changed substitute outpatient spending at the defendant hospitals. Some hospitals may have reduced total volume after being sued, causing both inpatient and outpatient spending to decline, while others substituted from inpatient to outpatient spending. Taken together with the good pre-period fit shown in Figure 3, the placebo results indicate that the staggered synthetic control method measures large, statistically significant deterrence effects due to whistleblowing.

One potential concern about staggered synthetic controls is that controls that are shifted back-

ward in time to match the treated unit could potentially be contaminated by the event in question. If the event contaminates the controls, the pre-period fit of the controls on the treated unit would be an invalid way of constructing an estimate of the counterfactual untreated series. To mitigate these concerns, I repeat the staggered synthetic control exercise with the additional restriction that controls are only shifted forward in time; that is, the trends of the controls used in fitting the pre-period occurred exclusively before the treatment date, and therefore cannot be contaminated by spillovers. Appendix Figure A4 presents the corresponding figure for this analysis. The figure is nearly indistinguishable from the original Figure 3, and the deterrence measurements are nearly identical, if only slightly greater than the original estimates. Therefore, spillovers onto the staggered controls are not a source of bias in this analysis.

The staggered synthetic control methodology differs from the traditional synthetic control methodology of Abadie et al. (2010) in that it assumes common time trends but not common calendar-time shocks. To mitigate concerns that this is a source of bias, I partial out time fixed effects (at the month level) for both the treated unit and its controls, and then re-estimate the staggered synthetic control model. Appendix Figure A5 presents the main effects of this analysis, and Appendix Figure A6 shows the effects on the substitute procedures. The total deterrence effects from this method are \$27.6 billion, or around 1.5 times the main specification's estimated deterrence. The deterrence estimates of the Outlier Payments case are largely increased under this specification, while the deterrence estimates of the Kyphoplasty case are diminished. Qualitatively, Appendix Figure A5 shows good pre-period fits from the control units, and the same pattern of divergence between the synthetic control and the treated unit in the post-treatment period. Removing time fixed effects from the synthetic control estimator is similar in form to the demeaned estimator proposed by Ferman and Pinto (2021), who show that this can correct for bias due to unobserved confounding.

As a final set of robustness checks, mitigating concerns about the appropriateness of the selected controls, I consider an estimation strategy without synthetic controls, using either a flat line

or a linear projection. Appendix Figure A7 shows the result of the flat line projection on the main results. The total deterrence measurement under this method is \$5.56 Billion, which includes the net increases in substitute procedures (figure not shown). Even under this conservative estimate, in which expenditures would not have risen even in the absence of whistleblowing, whistleblowing produces very large deterrence effects. Appendix Figure A8 shows the result of the linear projection on the main results. The total deterrence measurement under this method is \$13.7 Billion, which includes the net increases in substitute procedures (figure not shown). This shows the magnitude of deterrence if pre-enforcement spending trends were to proceed linearly upwards in the absence of whistleblowing. These measurements are similar in magnitude to the main effects, and reinforce the reasonableness of the synthetic control estimates.

## 6 Estimating the Costs of Medicare Whistleblowing

Although False Claims Act litigation is conducted privately, whistleblowing incurs both public and private costs, as discussed in the model above. While FCA litigation produces strong deterrence effects, this policy could be inefficient if it does so by incurring high legal costs associated with enforcement. Conversely, if FCA costs are low, it indicates that the FCA is a cost-effective way of combatting healthcare fraud. The goal of this section is to provide an estimate of the public costs of healthcare-related FCA cases and to contextualize these costs against the benefits of private enforcement and the costs of other enforcement mechanisms.

### 6.1 Public Costs

Overall, I estimate that public expenditure on the 445 healthcare-related False Claims Act cases filed in 2018 amounted to less than \$108.5 million. Public expenditure on FCA occurs from a few different federal agencies: the Department of Justice, the Office of the Inspector General of Health and Human Services, and the federal courts. For each of these agencies, there are limitations

to estimating costs expressly associated with the False Claims Act, because data are aggregated across multiple responsibilities of these agencies. To overcome this limitation, I estimate FCA-related spending by combining data on the legal process of FCA lawsuits, data on the number of FCA lawsuits, and the agencies' public budgets. Each of the amounts included are intentionally conservative in the direction of overestimation.

The Department of Justice spent no more than \$99.1 million on healthcare-related whistleblower FCA lawsuits in Fiscal Year 2018. In the Health Care Fraud and Abuse Control Program Annual Report for Fiscal Year 2018 from the Department of Justice and HHS to Congress, Department of Justice expenditures on overall healthcare fraud amounted to \$135.3 million. However, these resources include \$25.3 million for the criminal division and \$10.9 million for the civil rights division, neither of which handle whistleblower lawsuits. This leaves \$99.1 million for all other DOJ spending related to healthcare fraud, including all healthcare anti-fraud spending by the DOJ civil division, the US attorneys, and the FBI. While certainly much of these expenditures were for non-FCA cases, particularly FBI expenditures on criminal healthcare fraud, \$99.1 million forms an upper bound of total healthcare whistleblower-induced spending by the DOJ in 2018.

False Claims Acts healthcare-related whistleblower lawsuits involve the Office of the Inspector General of Health and Human Services (OIG-HHS). The main relationship between OIG-HHS and the False Claims Act is through the Office of Counsel, a small internal department that provides general legal support to the Office and also oversees Corporate Integrity Agreements for companies settling False Claims Act lawsuits. The total expenditure of the Office of the General Counsel was \$7.1 million in 2018 (The Department of Health and Human Services and The Department of Justice, 2019). Although some of these expenditures support non-FCA responsibilities of the Office of Counsel, I use \$7.1 million as an upper bound on OIG-HHS spending on these cases.

I estimate that the Federal Courts, which try the whistleblower lawsuits, spent \$2.3 million in 2018 on FCA cases. While there are no data available from the Courts on case-specific spending, the average cost of lawsuits is an upper bound for the marginal cost of lawsuits. In 2018, the federal

courts spent a total of \$7.7 billion on all operations, handling 1.48 million federal lawsuits across a variety of topics, including criminal prosecutions, bankruptcy, and the court of international trade (The Administrative Office of the US Courts, 2019). The Department of Justice reported 446 healthcare-related lawsuits in 2018 (US Department of Justice, 2018) or about 0.03% of the total federal cases. Therefore, the average cost associated with these cases can be estimated at  $0.0003 \times \$7.7\text{Bil} = \$2.3\text{Mil}$ . Given that the federal court system handles nearly a million and a half lawsuits, the marginal costs associated with these additional 445 cases are potentially even smaller, as they benefit from use of an established court system largely devoted to other areas of law.

Overall, the total expenditures of the federal government on False Claims Act whistleblower healthcare lawsuits were no more than \$108.5 million in fiscal year 2018. This expenditure is small compared to the deterrence effects of just the few largest False Claims Act cases, and also to government expenditure on top-down antifraud enforcement. In Fiscal Year 2018, total federal healthcare fraud and abuse resources across agencies amounted to \$2.04 billion, of which the vast majority was unrelated to civil False Claims Act enforcement (The Department of Health and Human Services and The Department of Justice, 2019). The largest budget item by far is the Medicare Integrity Program (MIP) at \$809 million in FY 2018, focusing on top-down fraud identification including audits and medical reviews. In comparison to the large anti-fraud expenditure, whistleblowing is a particularly low-cost way to combat and deter healthcare fraud, and produces extensive public benefit.

Whistleblower payouts also appear as an accounting liability to the government when considering the costs of the False Claims Act. However, these payments do not affect social welfare, as discussed in Section 3, because they are transfers from the defendant to the whistleblower. Whistleblower payouts for healthcare-related cases in my data total to \$4.29 billion, which is a relatively small figure compared to the tens of billions of dollars in recovery and deterrence that these cases have produced. Statistics focused on whistleblower payouts, which are regularly included as a

“cost” in government accounting, misconstrue the nature of these payments which are not in fact a public cost at all.

## 6.2 Private Costs

Another important aspect of the False Claims Act is the private cost of whistleblower lawsuits, captured in the model as  $C_w$  and  $C_d$ . Private costs for plaintiffs and defendants are difficult to measure accurately, as there are no public data sources that compile this information. However, ballpark figures can be gleaned from other models of civil litigation costs that use surveys of attorneys’ hours and expenses to estimate costs. A 2013 study estimated that the median professional malpractice lawsuit cost \$122,140, the highest of all surveyed categories, while the median automobile tort lawsuit cost only \$43,238, the lowest category (Hannaford-Ago, 2013). Even if False Claims Act cases cost *double* the reported price of the average malpractice lawsuit for both plaintiff and defendant, the 446 healthcare-related whistleblower lawsuits filed in 2018 would cost only an estimated \$109 million. Therefore, both the public and private costs of whistleblowing lawsuits are dominated by the benefits of recovered funds and deterred overspending.

A final set of private costs or benefits of whistleblowing come in the form of health effects of patients whose care changes due to whistleblowing. While a full study of the health effects of whistleblowing is beyond the scope of this paper, Appendix G discusses the effects of whistleblowing on patient health and conducts a measurement exercise using data from the Kyphoplasty case. The major concern in measurement of health effects of the FCA is distinguishing the health effects of whistleblowing from secular trends in care. Using a design that controls for baseline observable characteristics of treated patients, Appendix G finds no evidence that the whistleblower-induced substitution from inpatient to outpatient surgical care harmed patients.

## 7 Conclusion

Private enforcement is a potentially valuable way to improve the federal provision of services and eliminate waste, fraud, and abuse. The United States relies upon a private enforcement regime to conduct a major form of federal anti-fraud enforcement, whereby whistleblowers conduct lawsuits on behalf of the federal government in exchange for a share of the funds they recover. Many of these lawsuits have been related to Medicare and the federal health insurance programs, which are particularly susceptible to fraud. Privatization comes with trade-offs that are not fully internalized by the enforcers: whistleblowing has the potential for large deterrence effects, but may impose costs on the government, private firms, and people receiving public services.

This paper models the trade-offs of whistleblowing and quantifies its effects using data from Medicare and the Department of Justice. I undertake a set of case studies of large whistleblower lawsuits and measure specific deterrence effects, the change in the type of spending a whistleblower indicated was fraudulent. I analyze four case studies for which whistleblowers recovered a total of \$1.9 billion in federal funds. I estimate that these lawsuits generated \$18.9 billion in specific deterrence effects. In contrast, public costs for all lawsuits filed in 2018 amounted to less than \$108.5 million, and total whistleblower payouts for all cases since 1986 have totaled to \$4.29 billion. Just the few large whistleblowing cases I analyze have more than paid for the public costs of the entire whistleblowing program over its lifespan, indicating a very high return on investment to the FCA.

Changes in medical care induced by whistleblowers can have effects on patient health. While a full study of these health effects is beyond the scope of this paper, I consider the health effects of kyphoplasty, a spine procedure for patients with osteoporosis that was affected by whistleblower lawsuits against more than a hundred hospitals. I find no evidence of harm to patients. This case study motivates further analysis of the effects of whistleblowing on patient care. In addition, whistleblowing generates changes to the care of patients that are potentially unrelated to the quality

of the provider or the procedure, and this may provide experimental variation that other researchers find useful in the analysis of medical outcomes.

Whistleblowing has other potential costs and benefits not quantified in this paper. The risk of litigation may cause providers to forgo misreporting in the first place, particularly when whistleblowers are empowered to directly sue for their own profit. These general deterrence effects are hard to measure without knowing the types of potential fraud that could have been committed. The deterrence effects presented here are lower bounds of the total deterrence effects due to these spillovers, and therefore the total deterrence may be much greater. Conversely, increased compliance requirements impose costs on providers that are not measured here, and I am only able to broadly estimate the private costs of whistleblower lawsuits.

In this paper I estimate the fiscal benefits of instances of privatized enforcement, taking the enforcement regime as given. However, a broader analysis would consider the effects of the existence of the False Claims Act as compared to no such privatized regime. This presents an opportunity for future research. Yet another counterfactual would be better public enforcement: paying whistleblowers 15-30% of recovered funds is expensive if the government could produce similar recoveries without whistleblowing. Given the vast amount of data collected by the Medicare program, some of the effects of whistleblowing could likely be accomplished through machine learning, pattern detection, and automated audits. The fact that these programs are not yet in place may point to the limited enforcement capacity of the federal bureaucratic institutions.

The results of this analysis suggest that privatization is a highly effective way to combat fraud. Whistleblowing and private enforcement have strong deterrence effects and relatively low costs, overcoming the limited incentives for government-conducted anti-fraud enforcement. A major benefit of the False Claims Act is not just the information provided by the whistleblower, but also the profit motive it provides for whistleblowers to root out fraud.



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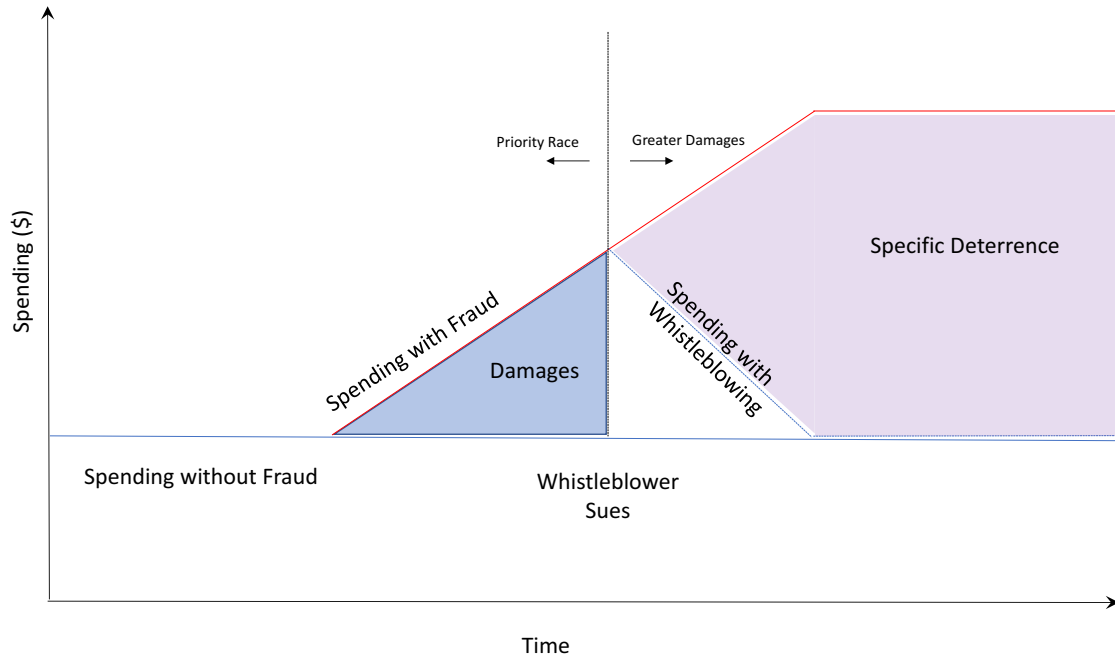
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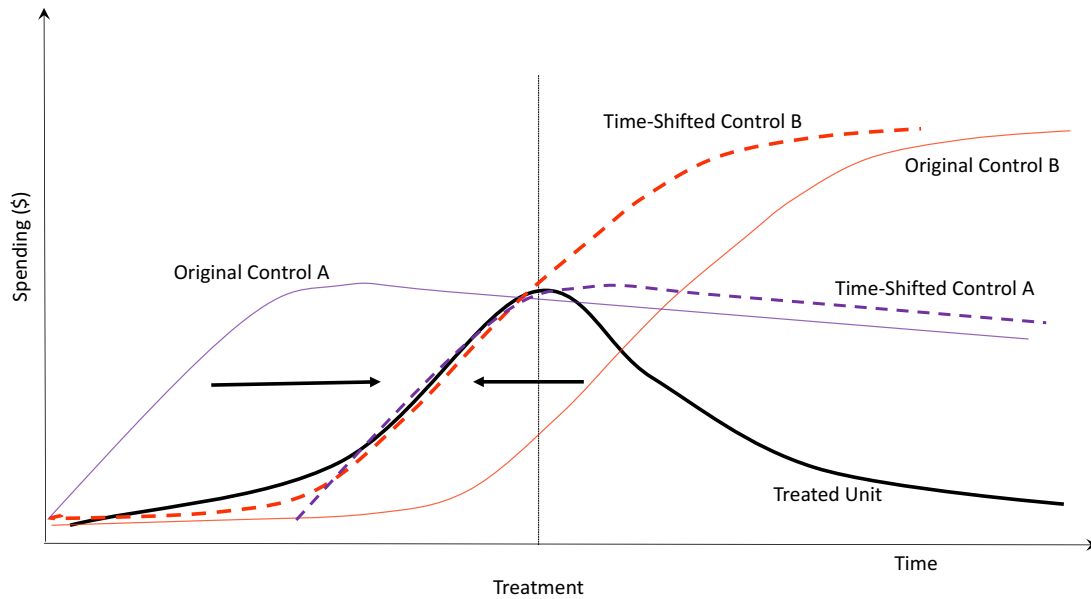
## Figures and Tables

Figure 1: Specific Deterrence



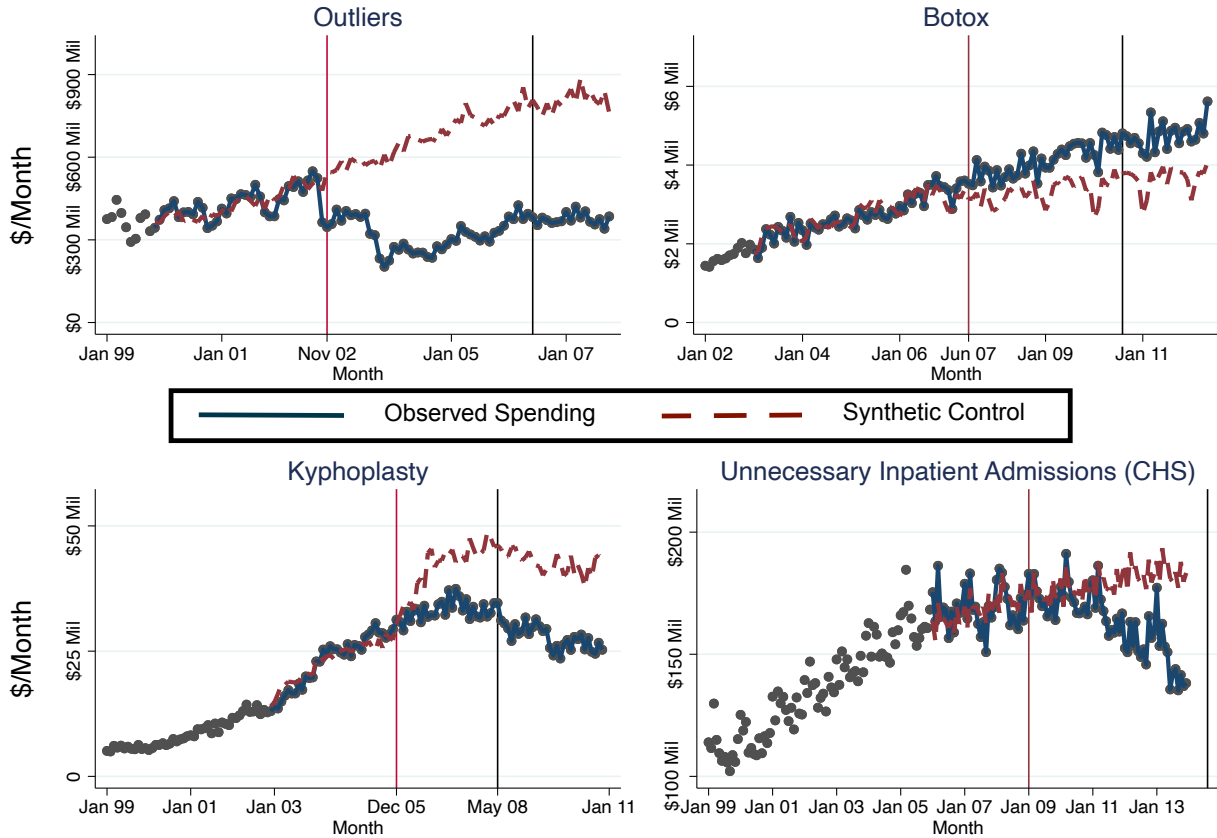
Notes: This figure describes the theoretical effects of a successful whistleblowing case on federal spending. When fraud is committed, the government has damages that are the difference between spending with fraud and the counterfactual spending without fraud. After the whistleblower sues, spending decreases back to its pre-fraud levels. Time trends are presented as linear trends for simplicity. Without loss of generality, fraudulent spending rises and eventually asymptotes, as it cannot grow infinitely even in the absence of enforcement. The specific deterrence effect is the difference between how much would have been spent without whistleblowing and how much is spent after whistleblowing occurs. Because whistleblowers are paid proportionally to the damages, they have incentives to blow the whistle later and allow the damages to accumulate; however, because the first whistleblower to come forward receives greater compensation, they have countervailing incentives to file as soon as possible.

Figure 2: Example of Staggered Synthetic Controls



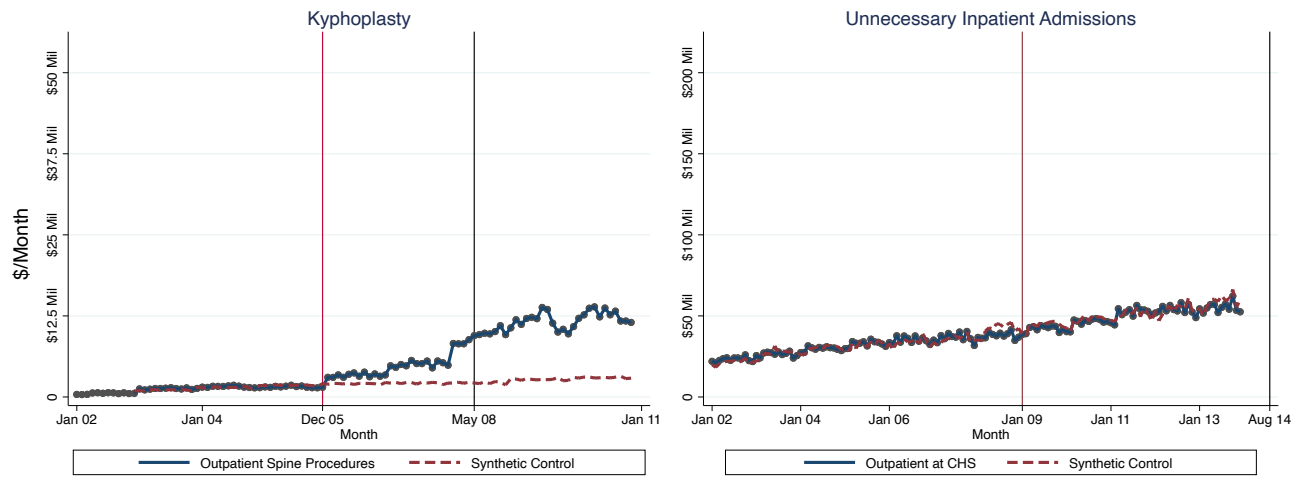
Notes: This figure exemplifies the fitting process for staggered synthetic controls. Spending on the treated unit is a solid black line that increases pre-treatment and decreases post-treatment. Control A exhibits a similar rise to the pre-period, but at an earlier time, and is shifted forward. Control B exhibits a comparable rise at a later period, and is shifted backward. The shifts are picked to best approximate the pre-treatment period in both shape and levels. These fits are agnostic to how the controls develop in the post-treatment period; Control A falls while Control B continues to rise. Following these fits, a synthetic control unit can be constructed from Time-Shifted Control A and Time-Shifted Control B.

Figure 3: Effects of Whistleblowing on Medicare Expenditure



Notes: This figure plots the main effects of the 4 case studies: Outlier Payments (top left), Botox (top right), Kyphoplasty (bottom left), and Unnecessary Inpatient Admissions (bottom right). For each case, the spending affected by whistleblowing is plotted as a solid line, while the synthetic control series is dashed. The dots represent the spending on the treated unit in the period before it overlaps with the synthetic control group. The first vertical line of each case represents the filing of the first related whistleblower lawsuit, which is used as the treatment date, and the second vertical line reflects the first settlement. Post-treatment effects are analyzed for 5 years after the treatment date. For the Unnecessary Inpatient Admissions Case (bottom right), multiple defendant hospitals were analyzed, and the series included here reflects Community Health Systems, the largest defendant hospital chain. Appendix Figure A2 plots the same figure for the other defendants in that case.

Figure 4: Synthetic Controls for Substitute Outpatient Spending



Notes: This figure plots the substitution effect to outpatient spending for the Kyphoplasty (left) and Unnecessary Inpatient Admission (right) case studies. These graphs correspond to the bottom half of Figure 3 and are scaled identically to those panels for comparison. In both case studies, whistleblowers alleged that patients should have been treated outpatient instead of inpatient. Outpatient spine procedure spending (left) rose following the kyphoplasty case as compared to the synthetic controls. However, there is no increase in outpatient spending at defendant hospitals (right) following the unnecessary admissions case. For the Unnecessary Inpatient Admissions case, multiple defendant hospitals were analyzed, and the series included here reflects Community Health Systems, the largest defendant hospital chain. Appendix Figure A3 plots the same figure for the other defendants in that case.

Table 1: Summary Statistics about Whistleblower Lawsuits

	Healthcare Whistleblower Lawsuits	All Whistleblower Lawsuits
Number of Lawsuits	3269	5967
Years	1986-2012	1986-2012
Government Intervened	31.6%	27.5%
Of Which Settled/Judged in Favor of Gvt.	91.0%	92.3%
Settled/Judged in Favor of Government	35.7%	32.2%
Of which Government Intervened:	80.5%	78.7%
Settlement Amounts (Among Cases Not Dismissed)		
Mean	\$22,678,349	\$17,450,907
Median	\$1,500,000	\$1,315,540
Standard Deviation	\$87,029,658	\$71,445,704
Total	\$26.47 billion	\$33.54 billion
Whistleblower Share (Among Cases Not Dismissed)		
Mean	\$3,798,847	\$2,968,751
Median	\$250,614	\$228,750
Standard Deviation	\$14,891,989	\$12,226,857
Total	\$4.23 billion	\$5.49 billion
Case Length (Days)		
Mean	1138	1140
Median	964	920
Standard Deviation	800	883

Notes: This table presents descriptive statistics about False Claims Act whistleblower lawsuits using data from a Freedom of Information Act Request filed with the Department of Justice.



**Table 2: Case Studies of Medicare Whistleblowing Enforcement and Deterrence Effects**

Type of Care	Type of Fraud	First Case Filed	First Settlement	# Press Releases	Settlement Total	Specific Deterrence	Deterrence Ratio
Inpatient	Manipulation of Outlier Payments	Nov 2002	Dec 2004	11	\$923 Million	\$17.5 Billion	18.92
Botox	Off-Label Promotion	June 2007	Aug 2010	1	\$600 Million	-\$41.7 Million	-0.69
Kyphoplasty	Inpatient Procedure Should be Outpatient	Dec 2005	May 2008	10	\$214.2 Million	\$281.1 Million	1.31
Inpatient	Unnecessary Hospital Admissions	Nov 2004	Dec 2007	7	\$172.3 Million	\$1.2 Billion	7.09
<b>Total</b>					<b>\$1.91 Billion</b>	<b>\$ 18.9 Billion</b>	
						<b>Average Ratio</b>	<b>6.81</b>

Notes: This table shows the 4 highest settlement value case studies of Medicare whistleblowing enforcement for which I have data. Case studies are constructed using Department of Justice press releases to link lawsuits with similar allegations. Appendix E contains more details about the grouping of lawsuits and on the potential case studies not analyzed here. Specific deterrence values are computed using a staggered synthetic control strategy to compare treated units to their counterfactual in the absence of whistleblowing. The specific deterrence is computed over 5 years post-treatment with a 10% annual discount rate compounded monthly. The deterrence ratio is computed as the ratio of the deterrence value to the settlement total.

# Appendix

## A Additional Institutional Details

In this appendix, I expound upon some of the institutional details of the False Claims Act.

In some False Claims Act lawsuits, the Department of Justice intervenes in what it believes to be a lucrative lawsuit by assigning its own attorneys, conducting additional investigation, and overseeing litigation. The Department of Justice retains the option to intervene in cases with the intention of dropping them, in order to facilitate the dismissal of cases it believes to lack merit. During the period of study in this paper, from 1986 through 2012, this was not practiced. However, an internal 2018 Department of Justice memo (the “Granston Memo”) promoted this type of intervention. This new policy has led to a variety of ongoing litigation, and the long term policy of the Department of Justice remains unclear (Latham and Watkins White Collar Defense and Investigations Practice, 2020). In other cases, the whistleblower does not receive federal support, and either pursues the case alone or drops it. All cases are filed under seal, meaning the defendant is not immediately notified of the filing, giving the government an opportunity to investigate and elect to intervene before the defendant is made aware. The Department of Justice must approve any settlements between the whistleblower and the defendant, regardless of their intervention status. In legal terms, the whistleblower is called a “relator” to the civil lawsuit.

This paper discusses the False Claims Act since 1986. The FCA was amended in 1986, but originally existed during the Civil War to combat fraud against the Union army. It was ineffective and out of use in the 20th century before the 1986 amendments.

The government and whistleblower only recover funds from the lawsuit if the defendant settles or the judge rules against them. Whistleblowers regularly earn 6-figure payouts and above from FCA cases, of which their attorneys, working on contingency, take around 30%. Defendants are also often issued criminal fines and can be sued for legal fees by successful whistleblowers;

furthermore, in egregious cases the Department of Justice can pursue criminal action against responsible individuals. Civil enforcement is compounded by the use of Corporate Integrity Agreements, where defendants who settle agree to additional federal oversight, or by the exclusion of the provider from the Medicare and Medicaid programs. Violators of the False Claims Act are jointly and severally liable, and so each defendant to an FCA case involving multiple parties could be held responsible for the full damages (O'Neil et al., 1995).

Critics may assert that whistleblowers could extort payments from firms without filing a False Claims Act lawsuit, using private nondisclosure agreements. From an institutional standpoint, this is unlikely because privately contracting with a whistleblower does not release the firm from liability for similar claims from other whistleblowers or from direct government enforcement, while such release of liability is standard in an FCA settlement. However, firms do face pressure to self-disclose billing errors to Medicare administrators, as this can circumvent the FCA process and allow an out-of-court repayment without large punitive damages.

Unlike other whistleblower programs, such as the IRS or SEC whistleblower programs, False Claims Act prosecution is conducted directly by the whistleblower. This eliminates the prosecutorial discretion component of government enforcement, and may lead to the litigation of cases for which there is little social harm or even explicit misconduct. Because there is no restriction on the filing of False Claim Act lawsuits, there is a potential for frivolous litigation by profit-motivated whistleblowers seeking a settlement. These problems are exacerbated by institutional details that have been analyzed as contributing to frivolous lawsuits in other legal literature: whistleblowers retain attorneys on contingency, face a potential for a very high-value settlement, and may take advantage of fee-shifting provisions in the case of successful lawsuits (see Bebchuk and Chang (1996) for a theoretical discussion of frivolous suits). Defending against FCA lawsuits can be expensive, and defendants should settle if the expected cost of settlement is below the expected costs of fighting the lawsuit (and potentially losing), regardless of the truthfulness of the whistleblower's claims.

There are some institutional barriers to whistleblowing that deter low-quality cases. First, whistleblowers are not allowed to represent themselves in court (United States District Court, D.C., 2003). Due to the costs of litigation, and the fact that plaintiffs' attorneys work on contingency, plaintiffs' attorneys have incentives not to take on low-quality lawsuits. This provides a barrier to filing frivolous cases. Furthermore, FCA cases are most likely to be successful if the government intervenes, due to the resources and investigatory power the federal government brings when litigating a case. Since low-quality lawsuits are unlikely to generate an intervention from the federal government, this further exacerbates the unwillingness of plaintiffs' attorneys to self-fund any low-quality cases. Empirically, Kwok (2013) studies data on FCA whistleblower attorneys and finds no evidence for "filing mills," i.e., law firms pursuing a large volume of low-quality cases.

Proponents of whistleblowing point to the volume of settled cases and the billions of dollars recovered as evidence of the effectivity of the Act. Attorney General Eric Holder said in a 2012 press release: "In the last quarter century, the False Claims Act's success has been unparalleled with more than \$30 billion dollars recovered...and \$8.8 billion since January 2009" (United States Department of Justice, 2012). Detractors suggest that profit-seeking whistleblowers use civil litigation to force settlements from providers, regardless of the validity of their allegations. In an *amicus* brief to the Supreme Court, the US Chamber of Commerce, a pro-business organization, wrote: "[whistleblowers] can extract settlements from defendants averse to high discovery costs, the risk of large losses, and...reputational harms" (Chamber of Commerce, 2015).

The False Claims Act has a separate provision for direct enforcement by the Department of Justice without whistleblowers, if for some reason the government has information about misreporting or fraud against federal programs without a whistleblower filing a lawsuit. That portion of the False Claims Act is not studied in this paper. Since 1993, FCA lawsuits filed by whistleblowers have exceeded FCA lawsuits by the government; in 2016, there were 501 new whistleblower suits to 69 federally initiated suits (US Department of Justice, 2018). These statistics are only included as a point of comparison.

## B Additional Detail and Discussion of the Model

### B.1 Social welfare multiplier

In the model in Section 3, the social planner values the government's portion of the recovery  $\pi(1-s)R$  and the deterrence effects  $\pi D_s + D_g$  with a multiplier  $\beta > 0$ . This reflects the fact that the disgorgement of previously misappropriated funds is a transfer from the defendant to the government, and the deterrence effects are cost savings to the Medicare program. Therefore, the social benefit of these values is the marginal benefit of public funds. Exact values for the coefficient  $\beta$  depend on how disgorged funds are used. FCA lawsuit recoveries are remitted to the Medicare trust fund, and deterrence values are dollars not spent by the Medicare trust fund. If these additional funds relax the federal budget constraint and reduce taxation,  $\beta$  may be greater than 1, as they remove the distortionary effect of taxes raised elsewhere. If the taxes increase the total expenditure on healthcare,  $\beta$  should reflect the marginal social value of Medicare expenditure. Hendren and Sprung-Keyser (2020) provide a deeper discussion of the marginal value of public funds (MVPF) and the welfare differences between decreased taxation and increased spending. They estimate the MVPF for many adult health policies were between 0.5 and 2, and estimate that the MVPF of the introduction of Medicare was 1.63.

The social value of whistleblowing also depends on how the social planner values the disutility of the defendant whose fraudulent funds were disgorged. This paper does not make the structural assumptions necessary to measure changes in defendant utility, nor do I estimate how much the social planner should weight the defendant's disutility of repaying funds they had ostensibly misappropriated. These parameters can also be captured by the value of the coefficient  $\beta$ .

## B.2 Additional Discussion of the Model

The model in Section 3 demonstrates how a lawsuit can provide deterrence. One might expect that providers who commit “rational fraud” do so having fully internalized the expected costs of their behavior, and so observing settlements would not affect their decisions. However, observing settlements can either update other providers’ beliefs about being caught, or increase the salience of the expected costs, thus causing behavioral changes and specific deterrence effects. In addition, behaviors that constitute litigable FCA violations may be “gray areas” of billing or care, in which case settlements can draw a clear line on what is acceptable behavior, and can prompt rule changes and clarifications from the Medicare administrators.

The timing of whistleblowing also factors into its social benefits as well as the whistleblower’s compensation. The faster that fraud is litigated against, the smaller the retrospective damages and, therefore, the smaller the whistleblower’s share  $sR$ . This could in theory cause whistleblowers to increase their payout by waiting before filing their lawsuit, if fraud is ongoing, to allow damages to realize. However, these effects are mitigated by a priority race, in which the first-to-file whistleblower generally receives the bulk of the compensation. The False Claims Act also has a statute of limitations of at most 10 years from the date of the fraud to the filing of the whistleblower lawsuit (31 US Code Section 3731, 1986). From a social welfare perspective, the timing of the whistleblower lawsuit is ambiguous, because smaller recoveries due to earlier litigation are reflected in a greater deterrence amount. In practice, plaintiff attorneys report that they tend to file the lawsuit as quickly as they are able to put together a good case.

## C Cleaning of the FOIA Data on Qui Tam Whistleblower Suits

Data on the full set of whistleblowing lawsuits were gathered from a Freedom of Information Act (FOIA) request I conducted on the Department of Justice. For each lawsuit, the available data include: the docket number, district of filing, and case caption; the date the Attorney General was

served notice of the suit; the primary federal agency to which the lawsuit related; whether or not the government intervened (assigned its own attorneys to help with the case), and what date that election was made; the date of the settlement, judgement, or dismissal; the settlement amount if any, and the whistleblower's share. Each line of the FOIA dataset contains information about a suit that was dismissed, or in the event of a settlement, a settlement value related to that suit. Lawsuits against multiple defendants can have more than one settlement, and therefore appear in more than one line of the data. To correct this issue, I collapse the data by docket, filing district, and year: if two lawsuits contain identical docket numbers and were filed within the same state and year, I assume they are a single suit, and create a total of their settlement values. For the descriptive statistics on medical-related lawsuits, I restrict to suits for which the primary federal agency is either Health and Human Services, the Center for Medicare and Medicaid Services, or the Food and Drug Administration.

## **D Staggered Synthetic Control Methodology**

This appendix discusses the staggered synthetic control methodology used to produce the main results of this paper.

Unlike difference-in-difference designs, but similar to other synthetic control applications, my analysis has a single treated unit in each case study and multiple untreated controls. Recent papers have begun to apply synthetic control weighting methods to difference-in-difference designs, focused on the case of multiple treated units— see, e.g., Ben-Michael, Feller and Rothstein (2019). Those papers apply the weighting procedure of synthetic controls to the difference-in-difference setting; this paper instead applies the asynchronous method of staggered difference-in-difference onto a synthetic control setting.

## D.1 Motivating Model

Consider spending on a type of medical care that could be affected by whistleblowing treatment. For  $i = 1, \dots, N$  and time  $t$ , we would observe the spending level  $Y_{it}^U$  in the absence of treatment and  $Y_{it}^I$  following treatment. Call  $T_i$  the treatment period for unit  $i$ , which is the filing of the whistleblower's lawsuit. Whistleblowing treatment has no effect on periods  $t < T_i$ ; therefore  $Y_{it}^U = Y_{it}^I$  for all  $t < T_i$ .

Let  $\delta_{it}$  be the effect of treatment at time  $t$ . Because  $Y_{it}$  represents spending,  $\delta_{it}$  represents the change in spending on a procedure following whistleblowing. Thus the spending level can be written as:

$$Y_{it}^I = Y_{it}^U + \delta_{it} \mathbb{I}_{t \geq T_i}$$

Let  $i = 1$  be the unit treated by whistleblowing, which is the only unit subject to treatment; thus  $Y_{it}^U = Y_{it}^I$  for control units  $i > 1$  for all  $t$ . The treatment effect of interest is  $\delta_{1t}$ , which is given by:

$$\delta_{1t} = Y_{1t}^I - Y_{1t}^U$$

in periods  $t \geq T_i$ .

Because  $Y_{1t}^I$  is always observed for all times  $t \geq T_i$ , estimation of the treatment effect relies on estimation of  $Y_{1t}^U$ , which is not observed in post-treatment periods.

Suppose that control units exhibit similar time trends at different points in calendar time, beginning at  $t_{0i}$ , which varies between units. Suppose that for all units,  $Y_{it}^U$  is given by a factor model, the same assumption of Abadie et al. (2010):

$$Y_{it}^U = \kappa_\tau + \lambda_\tau \mu_i + \varepsilon_{it} \tag{5}$$



Here,  $\tau = t - t_{0i}$  is the time after the start of the control unit's trend begins;  $\kappa_\tau$  is a common time effect across all units at time  $\tau$  relative to the unit's start of the trend;  $\lambda_\tau$  is a vector of common factors describing the trajectory of an outcome along a common trend; the parameter  $\mu_i$  is an unknown vector describing the individual factor weights; and  $\varepsilon_{it}$  is a set of unobserved shocks of 0 mean.

Consider a  $(N - 1 \times 1)$  vector of weights  $\vec{W} = (w_2, w_3, \dots, w_N)$ , such that  $w_i \geq 0$  for  $i = 2, \dots, N$  and  $\sum_{i=2}^N w_i = 1$ . These values represent weights on the untreated control units, and every value of the vector  $\vec{W}$  represents a possible synthetic control. Then, a weighted average of the control units is given by:

$$\sum_{i=2}^N w_i Y_{it} = \kappa_\tau \sum_{i=2}^N w_i + \lambda_\tau \sum_{i=2}^N w_i \mu_i + \sum_{i=2}^N w_i \varepsilon_{it}$$

If weights  $w_i^*$  can be constructed such that:

$$\sum_{i=2}^N w_i^* \mu_i = \mu_1$$

Then it holds that

$$\begin{aligned} E \left[ \sum_{i=2}^N w_i^* Y_{it} \right] &= E \left[ \kappa_\tau + \lambda_\tau \sum_{i=2}^N w_i^* \mu_i + \sum_{i=2}^N w_i^* \varepsilon_{it} \right] \\ &= E[\kappa_\tau + \lambda_\tau \mu_1] + \sum_{i=2}^N w_i E[\varepsilon_{it}] = E[Y_{1t}^U] \end{aligned}$$

Therefore, the weighted average of the control units provides an unbiased estimator of the untreated counterfactual of the treated unit:

$$\sum_{i=2}^N w_i^* Y_{it} = \widehat{Y}_{1t}^U$$

In practice, these weights will be estimated, which means that there will be bias in the synthetic control estimate. Considerable other research has addressed the issues of this bias, such as Ferman and Pinto (2021) and Ben-Michael et al. (2020). I make the same argument as Abadie et al. (2010), that the bias of the estimator is bounded if the pre-treatment fit is good for a long series of pre-treatment periods.

Given these weights, we can estimate  $\widehat{\delta}_{1t} = \widehat{Y}_{1t}^U - Y_{1t}^I$ . Here,  $\widehat{\delta}_{1t}$  is the change in spending due to whistleblowing. By integrating  $\widehat{\delta}_{1t}$  over the post-whistleblowing periods, we can estimate a discounted specific deterrence effect:

$$D = \int_{t=T_1} (\widehat{Y}_{1t}^U - Y_{1t}^I) \beta^{t-T_1} dt \quad (6)$$

where  $T_1$  is the treatment period and  $\beta^{t-T_1}$  is a discount factor starting at the treatment period.

## D.2 Implementation

The practical estimation of the model presented in Appendix D.1 can be performed as a two-step procedure: estimating the time shift for each control unit, and then finding synthetic control weights  $w_i$ . Figure 2 provides a simple graphical explanation of the time-shifting process for two controls, one shifted forward in time and one shifted backward.

First, I consider the set of control units on similar pre-treatment trends to the treated unit. These units are qualitatively similar, representing similar types of medical care. Inpatient Diagnosis Related Codes (DRGs) affected by whistleblowing are compared to other DRGs; hospitals are compared to other hospitals. This follows directly from the suggestion in Abadie et al. (2010),

who state that “researchers trying to minimize biases caused by interpolating across [units] with very different characteristics may restrict the donor pool to [units] with similar characteristics to the [unit] exposed to the event or intervention of interest.”<sup>6</sup> Control units are chosen to be on similar pre-treatment trends to the treated unit; in general, they are on similar upward trajectories to the treated unit in the pre-treatment period.

I align the control units with the treated unit to ensure they are experiencing common time trends in the pre-treatment period. For each control, I construct a set of leads and lags, and find the lead or lag with the best fit to the treated series in the pre-period. With any fixed set of data, producing leads and lags creates missing data at the front or back of the series: in a monthly series, if one uses a 5 month lag, the first 5 months of available data have no value. In practice, this means that shifting the control units too far forward or back in time leaves a limited set of data for the evaluation of pre-treatment fit and post-treatment effects. Here, I bound the time shifts to ensure that there are 36 months of pre-treatment data, used to construct the synthetic control weights, and 60 months of post-treatment data, used to compute the deterrence effect.<sup>7</sup> Within these bounds, I select the appropriate lead or lag for each control unit that minimizes average square distance from the treated unit in the pre-period:

$$\min_d \frac{\sum_t^M (Y_{1t} - Y_{it+d})^2}{M} \quad (7)$$

for control unit  $i$ , where  $d$  indexes the different leads and lags, and  $M$  is the number of pre-treatment periods in which the shifted control and the treated unit overlap.<sup>8</sup> The use of a single lead or lag for each potential control reduces the dimensionality of the donor pool when fitting the synthetic control weights, mitigating concerns about overfitting that can arise from having too

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<sup>6</sup>Abadie et al. use the word “region”, not “unit” in this quote, but the authors also directly indicate that “region” is a generic term. They write: “we adopt the terms ‘region’ or ‘unit’ and ‘intervention’ or ‘treatment,’ which can be substituted for ‘country,’ ‘state,’ ‘city,’ etc. and ‘event,’ ‘shock,’ ‘law,’ etc., respectively for specific applications.”

<sup>7</sup>In circumstances where the treatment period is too close to the start of the data, 36 pre-treatment periods are unavailable, and all of the available periods are used.

<sup>8</sup>Average square distance and not total square distance must be used because the number of points over which this sum is evaluated depends on the time shift.

many controls (see, e.g., Ferman (2020)).

After associating each control with a time shift, I conduct the standard synthetic control process to choose weights as per Abadie et al. (2010). Weights are chosen to minimize mean-square error over all pre-treatment periods in which all of the controls overlap:

$$\min_{\vec{W}} \sum_{t \in M^*} \left( Y_{1t} - \sum_{i=2}^N w_i Y_{it+d_i^*} \right)^2 \quad (8)$$

where  $M^*$  is the set of periods for which all of the time-shifted controls overlap with the treated unit;  $d^*$  is the optimal time shift found by 7; and  $\vec{W}$  is the set of all potential  $(N - 1 \times 1)$  vectors of weights  $(w_2, \dots, w_N)$  where  $w_i \geq 0$  and  $\sum_{i=2}^N w_i = 1$ . Given the optimal time shift for each control, the Stata package “Synth” finds the optimal weights  $w_i^*$ .<sup>9</sup>

Once these weights are found, the synthetic control unit is produced as the weighted sum of the control groups:

$$\widehat{Y_{1t}^U} = \sum_{i=2}^N w_i^* Y_{it+d^*}$$

Appendix Table A2 presents the root mean square prediction error (RMSPE) of the pre-treatment fit of the synthetic control group on the treated unit. The small RMSPE values for each case validate the assumption of good pre-period fit necessary to ensure that the bias of the synthetic control method is small.

In this paper, the outcome variables  $Y_{it}$  are all spending amounts. Therefore, the difference between the synthetic control and treated unit is a difference in spending, which can be integrated over the post-treatment periods. I estimate the specific deterrence effect as sum of the discounted difference between the treated and synthetic control over 5 years post-treatment:

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<sup>9</sup>The two-step procedure for staggered synthetic controls is a tractable way to implement this methodology by leveraging existing methods. Separating the time shift component from the weighting component also ensures that synthetic control units are not constructed of multiple instances of the same control at different points in time.

$$\hat{D} = \sum_{t=T}^{T+60} \frac{\widehat{Y_{1t}^U} - Y_{1t}}{(1.1^{1/12})^{t-T}} \quad (9)$$

where  $t$  is the time in months,  $T$  is the treatment period, and the denominator  $1.1^{1/12}$  provides the monthly rate for a 10% annual discount rate. Deterrence is totaled for 5 years from the treatment date of filing. A positive deterrence value indicates that post-whistleblowing spending  $Y_{1t}$  is lower than that of the synthetic control group  $\widehat{Y_{1t}^U}$ .

There are some circumstances where the reduction in spending due to whistleblowing is immediately offset by an increase in spending on a substitute procedure. For example, in two of the whistleblower lawsuits described below, the allegations centered around the unnecessary use of inpatient medical procedures that could have been performed outpatient at lower cost. In these circumstances, I estimate the treatment effect for both the main (inpatient) and substitute (outpatient) effects and compute deterrence as the net reduction in spending:

$$\hat{D}_{net} = \hat{D}_{main} - \hat{D}_{substitute} \quad (10)$$

## E Constructing Case Studies from DOJ Press Releases

The FOIA data described in Appendix C present a complete set of court-related information, but do not give information about the alleged behaviors for which the whistleblower sued, which is necessary for the case studies conducted here. To find details about the nature of these lawsuits, I scraped the Department of Justice press release archives for all press releases that contain the words “false claims,” “Medicare,” and either “qui tam” or “whistleblower.” The DOJ makes an effort to publicize all of its successful cases, in particular because this strengthens later cases against providers who claim ignorance about what conduct constitutes an FCA violation.

From this universe of press releases, I group lawsuits with similar types of conduct into case studies. First, I read and hand-coded all press releases from 1994 through 2014, which totaled to

325 press releases. The majority of press releases describe settlements; however, press releases occasionally describe government intervention in a case, or provide year-end totals of successful recoveries, which I discarded. Then, each settlement press release was coded for the type of medical care and the type of fraud it pertains to.

Certain types of care and certain types of fraud cannot be analyzed with my data and were omitted from the pool of potential cases to study. For example, cases regarding hospital cost reports, cases against Medicare claims processors, or cases that primarily concerned Medicare Advantage plans were discarded due to a lack of data. Similarly, some of the alleged frauds involve illegal kickbacks or improper financial relationships between providers. My available Medicare data do not contain financial structure information about providers, and so these types of cases were excluded from this study.

Following these restrictions, there are 170 remaining press releases that I group into potential case studies. Press releases are grouped by the type of fraud and the type of care they describe, and within each case study I create a total settlement amount. For 3 of the largest individual settlements, each against hospitals, the settlement press releases describe multiple types of allegations relating to different types of fraud reflected in other press releases. For these lawsuits, the settlements were apportioned to the different case studies based on how much money was paid for each type of conduct, as described in the settlement agreement or press release. For example, the June 2006 Tenet Healthcare settlement (described in Appendix [F.4](#)) was a \$900 million settlement, but the press release states that only \$788 million was for outlier payments while \$46 million was for DRG upcoding. The outlier payment case study therefore is apportioned \$788 million from this press release and the DRG upcoding case study gets \$46 million.

This categorization process results in 54 distinct case studies. There are 23 cases with total settlements of less than \$10 million and each contains 1 or 2 press releases. The top 11 case studies detail more than \$100 million in settlements each; these cases are described in Appendix Table [A3](#). If a lawsuit began before the data are available, I am unable to observe a pre-whistleblowing period,

and therefore the case is omitted. In one case study, hospice care, there is insufficient data in the court filings or within the public records to identify the defendant providers, and this case is also omitted. Appendix Table [A3](#) details the exclusion reasons for each of the top cases that were omitted, usually the timing of the first lawsuit. Researchers with access to earlier data may be able to conduct similar analyses on these examples of whistleblowing.

The press release data do not contain sufficient detail to conduct analyses in the Medicare data, only to generally compare allegations. To augment the details of the press releases, I collect whistleblower complaints and settlement agreements from the lawsuits detailed by the press releases. The identification of these cases is done either by docket number, which the press release sometimes specifies, or by defendant name. The FOIA data described in Appendix Section [C](#) were also used for mapping from press releases to court case docket numbers, which allowed for the retrieval of court documents. Whistleblower allegations and settlement documents contain specifics on the allegations of fraud or misconduct, including information on the medical coding of related procedures.

## **F Lawsuit Details for Case Studies**

### **F.1 Outlier Payment Case Study Details**

Medicare reimburses most inpatient stays under a prospective payment system, with each stay classified under a Diagnosis Related Group (DRG). Hospitals are paid a fixed reimbursement for each DRG based on the average costs of treating patients under that DRG. This incentivizes providers to keep costs down, as they can recover profits by spending less per patient than the DRG pays. However, this contains the potential incentive to avoid treating high-cost patients. To correct this issue, Medicare has a system by which hospitals treating exceptionally high cost patients receive additional reimbursements called outlier payments. The gravamen of the accusations in the out-

lier payment lawsuits was that the defendants manipulated the reimbursement process for outlier payments to classify more patients as outliers and receive additional payments.

Between December 2004 and March 2010, the Department of Justice published 11 press releases detailing settlements related to outlier payment falsification. The outlier-related conduct from these press releases totals to \$923 million in settlements. The first whistleblower complaint alleging outlier falsification comes from US ex rel. [Under Seal] v. Tenet Healthcare Corporation et al., Case No. 02-8309, (E.D. Pa.). The filing of the Tenet Case, November 4, 2002, is used as the treatment date for this case. This lawsuit settled in June 2006 and was followed immediately by a Department of Justice press release. The Tenet settlement contains \$788 million of recovery for outlier falsification, the bulk of the settlement total for this case study. Around the time of filing, Tenet also received substantial negative press regarding its overuse of outlier payments; the timing of these reports, days before the filing of the lawsuit, may indicate that the whistleblowing case was leaked to investors.

One lawsuit against a different defendant, HealthSouth, which was filed in 1998 and settled in 2004, contained \$89 million of settlement to resolve allegations of outlier payment manipulation. This lawsuit was originally filed in 1998; however, looking at the court documents from this case, whistleblowing was only a portion of this settlement, and the allegation of outlier falsification was not alleged by the whistleblower. Rather, it appears the Department of Justice included a provision for outlier falsification in this settlement at a later date, following the filing of the Tenet lawsuit after 2002. Therefore, I consider the Tenet lawsuit the first outlier lawsuit, and use its filing date as the treatment date.

Outlier data were gathered from the 100% Medpar files, which detail each inpatient stay paid for by Medicare, from 1999–2016. There are more than 5 million total stays classified as cost outliers in this period, and at its peak usage in 2002 (pre-whistleblowing), outlier payments exceeded \$500 million per month. The outlier payment system also theoretically contained a provision for outpatient outlier payments. However, in practice there are almost no outlier payments listed in the



outpatient claims files, even at the height of inpatient outlier spending. This analysis is therefore restricted to inpatient cost outliers.

The control groups for the Outlier payment case are other types of expenditure that are of similar size and nature to outlier payments. Medicare pays for durable medical equipment (DME), home health aide services (HHA), hospice care (HOS), and skilled nursing facilities (SNF) as part of its broader package of benefits for older Americans. Spending on each of these types of care are included in the pool of potential controls. Furthermore, Medicare has a system for compensating hospitals that provide services to primarily low income patients, called disproportionate share hospital (DSH) adjustments. Much like outlier payments, DSH payments are an adjustment above regular inpatient DRG pricing.

Appendix Table [A4](#) details the time shifts (in months) and synthetic control weights for these control groups in constructing a synthetic control unit. The synthetic control method places the greatest weight on DSH payments, which are the most similar in nature to outlier payments and were also the subject of a later whistleblower lawsuit for improper use.

The time series of the Outlier payment expenditure shows a dip in outlier claims one month before the whistleblower filed. Inpatient stays claim processing takes time, and hospitals have up to one year to file a claim; in practice, they do so quickly to receive reimbursements, but not necessarily in the same month as the hospital stay. The whistleblower suit was filed during the first week of November of 2002, and we see a dip in October outlier claims, reflecting changes in billing practices for claims not yet filed at the time of the lawsuit.

## **F.2 Botox Case Study Details**

The whistleblower lawsuits against Botox alleged that Botox was prescribed for non-FDA approved, non-Medicare-reimbursable uses. The whistleblowers further allege that Allergan, the maker of Botox, explicitly promoted the product for these “off-label” uses, giving Allergan civil liability for the False Claims made to the Medicare and Medicaid programs. In September 2010,

Allergan settled with the Department of Justice to resolve 3 pending whistleblower lawsuits of the same accusations: these cases have federal court docket numbers 1:07-cv-1288, 1:08-cv-1883, and 1:09-cv-3434, all conducted in the Northern District of Georgia. The first lawsuit was filed on June 5, 2007, which is used as the treatment date for this case. As part of this settlement, Botox agreed to pay \$600 Million to the federal government, which includes both a civil settlement and a criminal penalty, for which whistleblowers received \$37.8 million. This settlement was described in a Department of Justice press release in September 2010.

Botox injections are outpatient procedures. Outpatient treatments are given a Current Procedural Terminology (CPT) or Healthcare Common Procedure Coding System (HCPCS) code that determines the reimbursement for the procedure, and an ICD-9 diagnosis code for the condition being treated. Documents from the whistleblower lawsuits provide details on the coding of outpatient Botox procedures. Medicare allowed reimbursement for Botox injections coded under CPT/HCPCS codes 64612, 64613, 64614, 64640, 64650, 67345, or J0585. The settlement agreement specifies that it resolves liability for false claims under ICD-9 diagnosis codes for spasm of muscle (728.85), other facial nerve disorders (351.8), spasmodic torticollis (333.83), unspecified torticollis (723.5), and bladder conditions (788.30 through 788.34, and 599.82).

Botox spending data were compiled from 100% samples of outpatient claims plus 20% samples of Carrier File (physician office visit) claims from January 2002-September 2015, using the CPT codes listed above and filtered for claims where the principal diagnosis matched the ICD-9 codes specified in the settlement. Data start at 2002 due to the availability of cleaned files, and data are truncated from October 2015 onwards due to the change from ICD-9 to ICD-10 diagnosis codes. To construct a full estimate of spending, spending on each outpatient CPT/HCPCS code from the 20% carrier file was multiplied by 5, then added to the spending from the 100% outpatient file. Spending for Botox under the relevant diagnoses codes grew from \$20 million dollars in 2003 to \$39 million in 2006, the year before the lawsuit against Allergan was filed.

There are 40,401 CPT/HCPCS codes observed in our data, motivating a restriction of these

groups to better potential controls. The use of too many potential controls for the synthetic control method can result in overfitting (Ferman, 2020), so it is inappropriate to allow the synthetic control method to select controls from the entire pool. The candidate control groups used for this study are all other outpatient CPT/HCPCS codes for which spending started within 10% of the range of Botox's spending and saw a rise over any 3-year period between 2002 and 2011 within 25% of Botox's observed rise, of which there are 93 control units. Table A5 shows the weights and time shifts for the 10 control groups given the highest weights by the synthetic control method.

Many of the Botox controls were later subject to enforcement. Department of Justice Office of Public Affairs (2017) details a 2017 whistleblower settlement regarding unnecessary ultrasounds. Unnecessary retroperitoneal ultrasound usage specifically under CPT code 76775, the code given weight in the Botox synthetic control, was also the subject of 2018 provider self disclosure resulting in civil penalties (Office of the Inspector General of Health and Human Services, 2018). Debridement was also subject to overuse, motivating a 2007 report by the Office of the Inspector General of Health and Human Services (Office of the Inspector General of Health and Human Services, 2007), as well as a whistleblower lawsuit (United States *et al.* ex. rel. Raalte *et al.*, Docket 6:14-cv-00283 M.D. Fl.).

### F.3 Kyphoplasty Case Study Details

The main allegations of the kyphoplasty lawsuits were that hospitals, at the urging of the product manufacturer Kyphon, conducted kyphoplasty as an inpatient procedure rather than outpatient. Under Medicare, inpatient stays are paid a fixed amount for the Diagnosis Related Groups (DRG) under which a patient is coded. Therefore, for short inpatient stays, providers receive the full reimbursement and incur relatively low costs. Kyphon allegedly instructed its sales representatives and marketers to push usage of the DRGs 233, 234, and 216, which are various non-specific inpatient spine surgery codes not intended for kyphoplasty. The specific descriptors of these DRGs were, in 2005, the year the lawsuit was filed: DRG 234: "Other musculoskeletal system & connective

tissue O.R. procedure without comorbidities and complications”; DRG 233, *ibid.*, “... with comorbidities and complications”; and DRG 216: “biopsies of musculoskeletal system & connective tissue” (Center for Medicare and Medicaid Services, 2005). The whistleblowers further allege that Kyphon sold a bone biopsy kit that they encouraged physicians to use on all kyphoplasty patients to receive greater reimbursement through use of DRG 216.

Tracing spending on DRGs across time requires cross-walking when new versions of the DRG coding are released. This occurred once in the relevant time period, in October 2007. This change was a complete overhaul of the DRG system, and changed from DRGs to a severity-based system (called MS-DRGs). Under this change, sets of 1 to 2 DRGs before October 1, 2007 usually correspond to 3 DRGs after that date. No 1 to 1 crosswalk exists, and so I collapse the DRGs into groups which can be cross-walked through this change. The DRGs allegedly promoted by Kyphon exhibit this pattern: DRG 216 became MS-DRGs 477, 478, and 479, and DRGs 233-234 became MS-DRGs 515, 516, and 517. I create groups for the DRGs that map across this change, and these DRG groups provide the control units. I omit DRGs that were entirely eliminated or newly generated during this switchover, as they cannot be analyzed across the relevant time period. There was a second DRG coding change in October 2015, but this change was close to the end of the available data and happened many years after the relevant lawsuit, so these are not necessary for analysis. Inpatient data from after October 2015 are dropped when constructing control units.

The treated unit for this analysis is the total payment for stays of 7 nights or fewer under the groups corresponding to DRGs 233, 234, and 216, the DRGs allegedly promoted by Kyphon. The set of controls are payments for stays of 7 nights or fewer under other DRG groups. I include DRG groups which experienced a more than double growth in annual spending over any 3-year period before 2011. The restriction to growing groups picks DRG groups on similar trajectories to the treated unit, which experienced a 2.5 times increase between 2002 and 2004, the year before the lawsuit was filed. The cutoff for growing controls is placed at 2011 to ensure that the data can be shifted back to match the kyphoplasty series and still allow for 5 years of post-treatment

comparison, as my data end in 2015. I exclude DRGs which saw discontinuous jumps (a 500%+ increase in any single month, likely reflecting a major coding change rather than a usage change), or which were not in use for 12 or more months of the pre-whistleblowing period. There are 30 DRG groups included as controls. Appendix Table A6 details the time shift and synthetic control weights for these DRGs.

The kyphoplasty lawsuits alleged that kyphoplasty should have been coded as an outpatient procedure rather than inpatient. Outpatient procedures are billed to Medicare under HCPCS codes. Kyphoplasty was a new technology during this period, and coding for it changed over the course of the relevant period. Kyphoplasty was often billed under the catch-all unlisted spine procedure code 22899, but also was coded under the HCPCS codes 22523, 22524, 22525, 22513, 22514, 22515, C9718, or C9719 at various times, the latter two very infrequently. Furthermore, to measure substitution effects to outpatient procedures, I need to consider spending on vertebroplasty, a close substitute procedure, which was coded under HCPCS codes 22520, 22521, 22522, 22510, 22511, or 22512.

For the purposes of the health analysis in Section G, the codes listed in the previous paragraph are used to identify outpatient kyphoplasty and vertebroplasty, as almost everything billed under these codes were in fact those procedures. However, whistleblowers also alleged that Kyphon, the maker of the kyphoplasty kit, also pushed providers to miscode the procedure under HCPCS codes 22327, 22325, 22328 for open reduction of thoracic or lumbar vertebrae. Kyphoplasty is not an open procedure, but is rather percutaneous. To analyze the sum of the fiscal effects, and to construct appropriate control groups, the outpatient deterrence analysis considers spending on **all** outpatient spine procedures, in the CPT code range 22010-22899. Some of these procedures were unaffected by whistleblowing, and therefore will difference out on average before and after the treatment period and will not bias the deterrence measurement. As controls, I consider other categories of surgical outpatient procedures on the musculoskeletal system, all of which are in the 20000-29999 range, of which the treated unit is a subset. These categories are constructed from the

AAPC Coder code ranges (AAPC Coder, 2019) and include procedures like shoulder surgeries, hip surgeries, etc. and are not substitutes for the treated procedure. Two other codes in this range, CPT Codes 20000 and 20005, which correspond to surgical drainage procedures, were also included; these codes were deprecated in 2019. Table A6 gives the time shifts and weights for these control units.

## **F.4 Unnecessary Inpatient Admission Case Study Details**

When a patient visits a hospital, particularly for emergency services, physicians at that hospital make a decision on whether to admit the patient for an inpatient stay, which generally results in an overnight stay of at least one night. Instead of admitting patients, doctors have the ability to treat a patient outpatient, or to hold them for observation without admission. Inpatient admission receives greater reimbursement than outpatient or observational care. Under Medicare rules, inpatient stays are reserved for acute illnesses, and hospitals are expected to conduct utilization reviews to ensure that patients are admitted appropriately. The allegations in this case study are that the defendant hospitals improperly admitted Medicare patients because of the greater reimbursement provided.

Between 2007 and 2014, the Department of Justice issued press releases detailing 7 settlements with different providers and provider chains regarding this conduct. Four of the settlements concerned a single hospital: St Joseph’s Atlanta; Wheaton Hospital in Wheaton, Minnesota; El Centro Medical Center in Southern California; and Overlook Medical Center in Summit, NJ. Two of the settlements concerned groups of 6 hospitals: Shands Hospitals and Morton Plant Hospitals, both in Florida. The final settlement was against Community Health Systems (CHS), described by the Department of Justice in its press release as the “nation’s largest operator of acute care hospitals.” CHS settled for \$98 million for conduct in 119 hospitals in 28 states. The total recovery from these 7 settlements was \$172.29 million.

The evidence suggests that the conduct described in these cases was localized among the defendants. Appendix Figure A9 plots the total inpatient spending from all providers in the US and

shows no changes with the filing of the first lawsuit in October 2004. This is unsurprising, as total Medicare inpatient spending was around \$10 billion per month at the time of filing, and the total of these settlements was less than \$200 million. Therefore, the computation of specific deterrence conducted here focuses only on the defendant hospitals. This may undercount spillover affects to other hospitals who were also deterred from unnecessary inpatient admissions as a result of these settlements.

The goal of this analysis is to measure the specific deterrence effects of these lawsuits on spending at the defendant providers. Because the lawsuits indicate that patients were unnecessarily admitted to the hospital rather than being seen outpatient, I expect a decrease in inpatient spending and an increase in outpatient spending. To measure this change, I construct control units using a set of untreated hospitals. Because some of the untreated hospitals may have been affected by spillovers, I restrict my control sample to hospitals in the 23 states (including the District of Columbia) with no defendant providers. These control units see different patient populations than the defendants and are less likely to be influenced by their behavior. This ensures the control units are isolated from the treated units, at least geographically, to mitigate spillover effects. Next, I construct a random sample of 100 control units for each defendant. For the four defendants that were 1 hospital, the control units are 100 randomly selected hospitals. For the two defendants which were 6 hospitals, the control units are 100 units of 6 randomly grouped hospitals, drawn with replacement from the set of control hospitals. For CHS, which had 119 hospitals settle, I construct 100 control units of 119 randomly grouped hospitals, drawn with replacement from the set of control hospitals. These control units serve as the controls for the inpatient spending. For outpatient spending, I repeat the same process, drawing from the set of outpatient providers in states with no defendants.

Each of the 7 defendants here is conducted as its own case study. Each has its own controls, and the treatment date for each defendant is the earliest filing date of the lawsuit(s) settled in the settlement agreement with that hospital. There are multiple lawsuits against some hospitals

because of multiple whistleblowers. Because CHS constitutes 119 of the 135 hospitals in this study, plots from CHS are included in the main results. Inpatient and outpatient plots from the other defendants are presented in Appendix Figures [A2](#) and [A3](#) respectively.

## G The Effects of Whistleblowing on Patient Care and Health

Whistleblowing under the False Claims Act creates incentives for providers to change the way they treat patients, which can have effects on patient health. These changes could be either beneficial or harmful for patient health: if whistleblowing curbs behavior that was profitable to providers at the expense of patient health, then we expect whistleblowing to benefit patients. However, whistleblowing could also change where or how patients are treated in harmful ways, or induce defensive behavior among physicians, influencing their care decisions away from what is beneficial to patients and instead to what would be justifiable if they were sued. This echoes similar concerns about defensive medicine from the medical malpractice literature, notably Kessler and McClellan (1996), as well as evidence that increased disclosure from hospital “report cards” led to increased provider selection and patient sorting (Dranove et al., 2003).

The literature on health care fraud has largely been unable to identify the health effects of antifraud actions. Eliason et al. (2021) show that prior authorization requirements aimed at eliminating fraud in dialysis ambulance transportation had no effects on patient health, with outcomes including dialysis appointment attendance, hospitalization and death. However, the bulk of literature on health care fraud can not address how patients fared. Here, I lay out the issues surrounding the issue of patient health effects from antifraud enforcement, and then conduct a descriptive exercise using data from the Kyphoplasty case study.

The most major issue in measuring the effects of whistleblowing on patient care is that, much like deterrence effects, causally estimating changes in care surrounding enforcement requires a counterfactual estimation about how care would have evolved in the absence of whistleblowing.



The standards of care are regularly changing in medicine, with different procedures coming in and out of favor as technology changes, as research informs care, and as best practice develops. Even if care stayed the same after whistleblowing, we cannot rule out a counterfactual in which care would have improved in the absence in whistleblowing. Moreover, there is a large literature on physician learning, and so changes in care can have a path-dependency, whereby the failure to do a procedure might mean the failure to realize the gains from learning to perform care better.

Even without the issues posed by counterfactual estimation, in general, measuring the effects of changes in care is difficult because it lacks a natural unit. In the case of deterrence effects, there exists the common unit – money – with which to measure the outcome. Patient health is multi-faceted, and observing treatment is much easier than measuring health effects. Common estimates of patient health outcomes in the health economics literature are somewhat coarse, such as mortality or hospital readmission. As such, comparisons across types of care are more difficult, which inhibits strategies like synthetic controls traditionally used for counterfactual estimation.

With these issues in mind, a full study of the health effects of whistleblowing is beyond the scope of this paper and motivates future work. Here, I conduct a descriptive exercise to examine how patient care changed surrounding Kyphoplasty due to the whistleblower case described in [Section 5.3.3](#).

Kyphoplasty is the appropriate case study for the discussion of provider care decisions for a few reasons. First, there was a large reduction in inpatient usage of this procedure and a substitution to outpatient procedures, indicating a change in actual care decisions by providers. This is in contrast to the Outlier Payments case study, which seems to be a change in billing procedures, or to the Botox case, where there was little effect on usage. Second, kyphoplasty is a single procedure with previously studied health effects, allowing for a targeted analysis of the effects of whistleblowing on patient care. This is in contrast to the unnecessary inpatient admissions case, which related to a broad set of medical procedures. As such, kyphoplasty is the largest-settlement-value case study for which I can conduct an analysis of provider care decisions.

As discussed in Subsection 5.3.3, Kyphoplasty is a spine procedure to repair compressed vertebrae in patients with osteoporosis. Kyphoplasty can be very beneficial for patient health: a meta-analysis of vertebral compression fractures (VCFs) shows that patients with VCFs have 2.5 times the mortality rate of patients without them, and that kyphoplasty is successful at reducing mortality rates compared with non-operative care (Kurra et al., 2018). One potential mechanism is that vertebral compression fractures can compromise pulmonary function, leading to greater rates of pneumonia, and surgical intervention corrects this issue (Chen et al., 2013). Estimates from the meta-analysis range from 35% to 70% mortality reduction over a 3 to 5 year period after receiving kyphoplasty, indicating a potentially valuable mortality reduction from this procedure. Still, Kyphoplasty remains a controversial procedure among the medical community due to the heterogeneity of its effectiveness found by different studies, and its potential overuse among inappropriate patients. The overall effectiveness of Kyphoplasty is beyond the scope of this paper; instead, I am interested in how the whistleblower lawsuits against Kyphoplasty providers changed patient care and health outcomes.

In False Claims Act lawsuits, whistleblowers alleged that Kyphon, the maker of the kyphoplasty surgical kit, encouraged short inpatient stays for the surgery, and that hospitals complied and treated patients inpatient. Kyphoplasty can be safely performed outpatient, but inpatient stays allowed hospitals to receive greater reimbursement and for Kyphon to charge more for the surgery kit. Short-stay inpatient treatment for kyphoplasty was drastically reduced following whistleblowing, and there was substitution to outpatient spine procedures. Figure 3 (bottom left) and Figure 4 (left) show the reduction in inpatient claims and increase in substitute outpatient claims in terms of total spending.

There are three major channels by which the whistleblower lawsuit against Kyphoplasty could affect patient care and health outcomes. First, the whistleblower lawsuit could cause a reduction in the number of patients receiving any treatment (inpatient or outpatient), because post-lawsuit the treatment was less profitable for providers. Second, there could be differences in the effects of

inpatient versus outpatient treatment, and so a substitution from inpatient to outpatient treatment could have treatment effects. Third, there could be changes along the selection margin for which type of patients receive inpatient or outpatient surgical intervention. In each of these cases, it is not obvious *a priori* even which direction these changes would affect patient health; a reduction in surgical intervention, a change in where care occurs, and a change in who is treated could each either improve or harm patient health outcomes.

To analyze these effects, I collect data on all patients that have an osteoporosis chronic condition flag using the 100% sample of Medicare claims data. Data are available from 2002 through 2015. The Kyphoplasty lawsuit was filed in 2006 and settled in 2008, and so this produces a panel with years on either side of the lawsuit. Data are collected at the patient level from the first year osteoporosis is indicated by the Chronic Conditions file. For each patient, I collect inpatient short-stay Kyphoplasty and hospital outpatient spine surgery claims, as well as baseline characteristics in the year they first present with osteoporosis, including chronic conditions and demographic information such as age, sex, and zip code.

Appendix Figure [A10](#) addresses the question of a change in total patient treatment volume. In the pre-lawsuit period, there was a rise in patients receiving inpatient kyphoplasty, and the lawsuit corresponds to a reduction in inpatient care and a substitution to outpatient care. The total volume of patients treated does not drastically decline after 2006, but does experience a small decline. This does not allow us to observe the counterfactual growth in treatment that could have occurred in the absence of whistleblowing, or whether those patients would have benefited from the treatment. However, there is no evidence of a sharp reduction in total volume, and so changes due to treatment volume are probably small.

Next, I conduct a cohort study of patients with an osteoporosis diagnosis. Patients are grouped by the cohort year in which they are first flagged with osteoporosis, and I follow patients for the 5-year period  $[t, t + 4]$  around their first osteoporosis flag. Death and treatment are all measured within 5 years to ensure that patients earlier in the sample are not given a longer window with

which to experience death or observe treatment. Due to this cohort design, and the fact that data are available from 2002 to 2015, the 5-year cohorts cover 2002 through 2011.

There are major challenges in addressing the treatment effect of inpatient kyphoplasty and substitute outpatient procedures. First, there are secular time trends, which confound treatment and selection effects among those who receive treatment, both before and after whistleblowing. Appendix Figure [A11](#) shows the mortality of patients receiving kyphoplasty or a substitute outpatient procedure over time. We see that in the period before the lawsuit, patients receiving inpatient treatment and outpatient treatment are getting sicker over time, as measured by their 5-year mortality. The rise in mortality could reflect either the use of the surgery on a sicker patient population, or a worsening of the actual effects of the surgery over time due to other confounding effects. Because medical care tends to improve in quality over time, selection effects seem to be the more likely channel, although we cannot rule out the latter. At the timing of the lawsuit, there is no discontinuous jump in mortality for patients receiving treatment in either . If whistleblowing had harmed patients because outpatient care was worse for patients, we would expect a large increase in mortality. Therefore, this result largely rules out a large harm to patients from having received outpatient treatment, although it confounds treatment and selection effects.

Appendix Figure [A11](#) also shows the mortality of all osteoporosis patients. It is flat at the timing of the lawsuit, indicating that the reduction in treatment volume shown in Appendix Figure [A10](#) did not cause a measurable spike in mortality among the untreated.

To further address selection and measure changing treatment effects, I examine the changing treatment effect over time that accounts for selection on observables. I consider a regression that estimates the effect on death from receiving inpatient and outpatient treatment in any year, with controls for patient baseline health characteristics in the cohort year when they first were flagged with osteoporosis. I estimate:

$$Died_i = \alpha_0 + \beta_i TreatedIP \times CohortYear_i + \gamma_i TreatedOP \times CohortYear_i + \delta CohortYear_i + \zeta X_i + e_i \quad (11)$$

Here, the dependent variable is an indicator for death; the variables of interest are indicators for inpatient and outpatient treatment, interacted with year effects; and I control for a vector of patient baseline characteristics including chronic condition indicators, age at diagnosis, sex, race, and zip code. Treatment and death are measured in the 5-year cohort window.

Appendix Table A8 shows the result of Equation 11. The coefficients of interest are  $\gamma_i$  and  $\beta_i$ , the interaction between inpatient and outpatient treatment (respectively), and cohort year. 2005 is the omitted year, whose coefficient is 0 by construction. Both sets of coefficients show strong time trends, with both inpatient and outpatient treated patients being more likely to die over time. Because patient baseline characteristics are controlled for, the increase in mortality over time indicates that either the treatment effect is changing over time or, more likely, that there are unobservable characteristics on which the patients are being selected. However, these secular time trends are not the goal of this analysis – instead, I focus on the change in these time trends around the lawsuit. If whistleblowing hurt patients, we would expect a sharp uptick in mortality at the time of the lawsuit, particularly among patients receiving outpatient treatment, i.e. those who responded to the lawsuit’s changes in care. There is no evidence of a discontinuous jump in either inpatient or outpatient treatment effect at the timing of the lawsuit. This indicates that whistleblowing did not measurably worsen patient health.

Overall, these results do not suggest evidence that the whistleblower lawsuit harmed patients by substituting treatment to outpatient care. There is no evidence of a spike in mortality among patients receiving outpatient care, even when controlling for patient baseline health characteristics, allowing us to rule out the hypothesis that outpatient surgical procedures were harmful to patients. There is also no large, discontinuous drop in patient volume at the time of the lawsuit, indicating

that access to care was preserved. One effect appears to be a reduction in patient volume relative to the pre-whistleblowing time trend, but this does not allow us to address the counterfactual of which patients would have received treatment, and whether those patients were appropriate candidates for the procedure. Overall, this descriptive exercise allows me to rule out large negative harms to patients due to the kyphoplasty lawsuit, and motivates future research about the health effects of anti-fraud whistleblowing.

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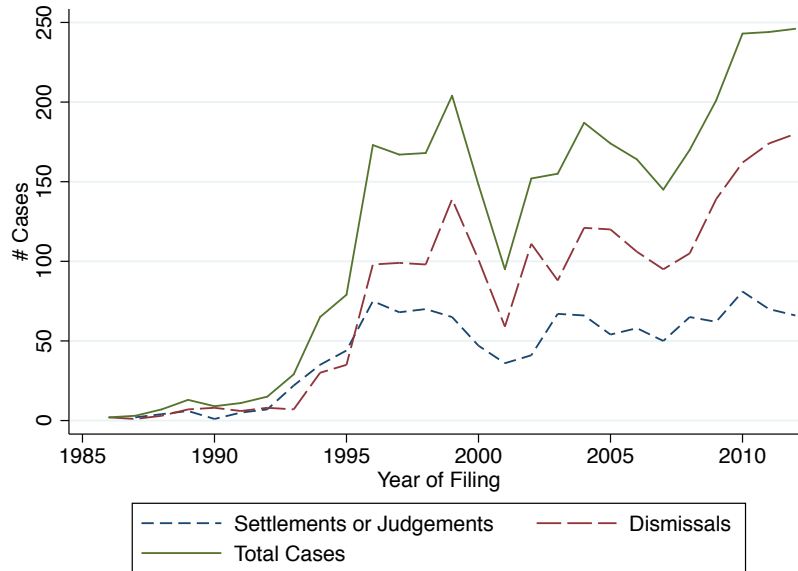


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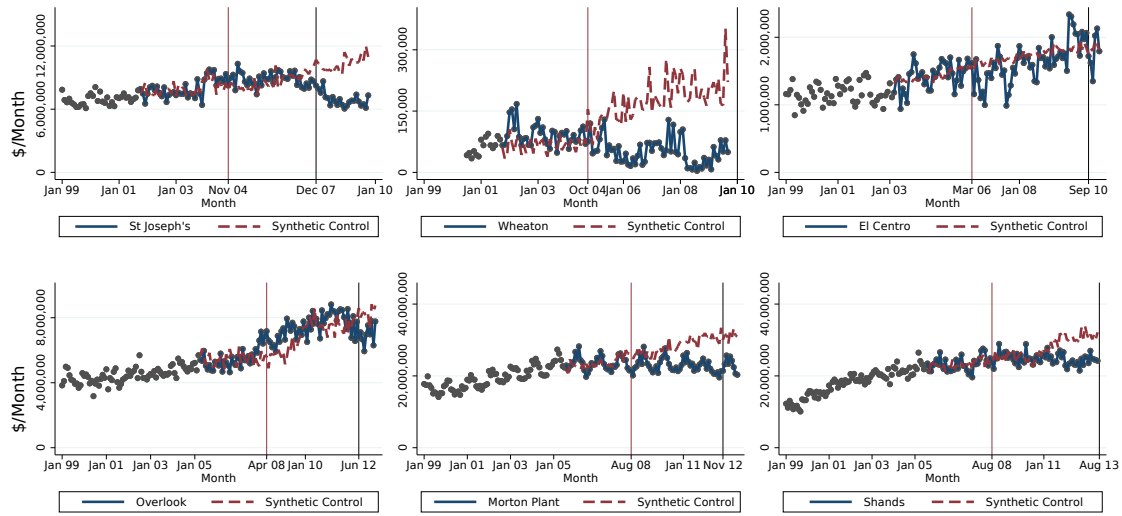
## Appendix Figures and Tables

Figure A1: Trends in Healthcare Whistleblowing Lawsuits



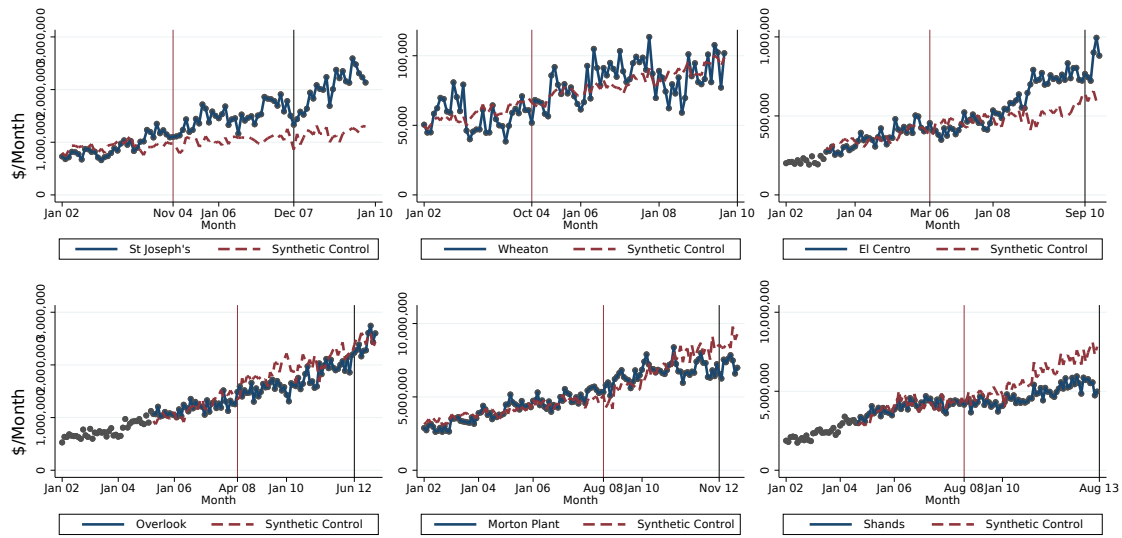
Notes: This figure plots the number of healthcare-related whistleblower lawsuits by year and splits the data by the outcome of the lawsuit. Data begin in 1986, when Congress amended the False Claims Act to allow for whistleblower lawsuits, and go through 2012, the last available year of complete data. Settlements rose to around 50 per year in 1995 and have stayed relatively constant, while total cases and dismissed cases have both continued to rise.

Figure A2: Inpatient Spending at Other Defendants in the Unnecessary Admissions Case Study



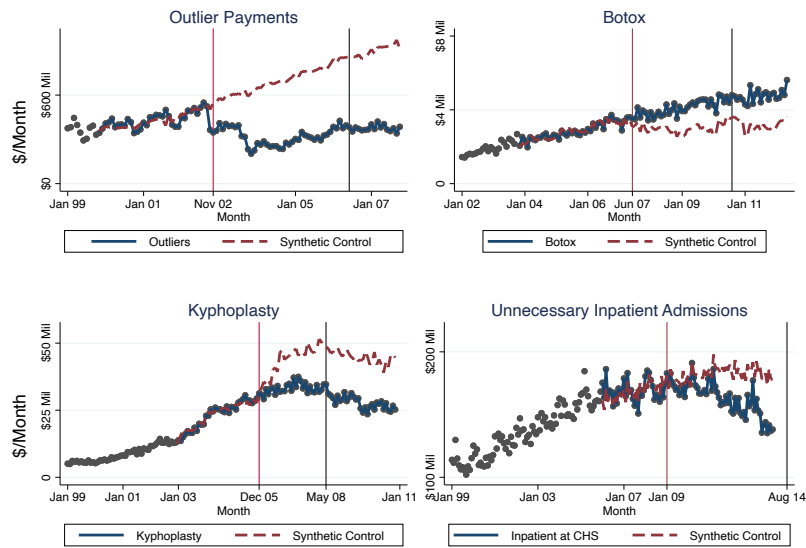
Notes: This figure plots the staggered synthetic control strategy for inpatient spending at the other defendant providers in the unnecessary inpatient admissions case. The largest defendant, CHS, appears in the bottom-right panel of Figure 3. On average, inpatient spending at these providers fell relative to the synthetic control group.

Figure A3: Substitute Outpatient Spending at Other Defendants in the Unnecessary Admissions Case Study



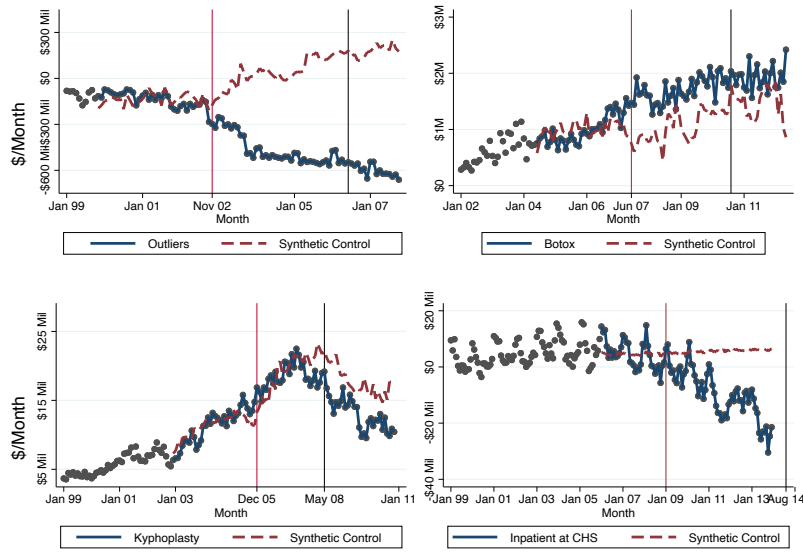
Notes: This figure plots the staggered synthetic control strategy for outpatient spending at the other defendant providers in the unnecessary inpatient admissions case. The largest defendant, CHS, appears in the right panel of Figure 4. On average, outpatient spending at these providers did not increase, even when inpatient spending fell. However, there is heterogeneity among the defendants, with some experiencing increases in outpatient spending and others experiencing decreases.

Figure A4: Robustness Check: Only Allowing Forward Time Shifts



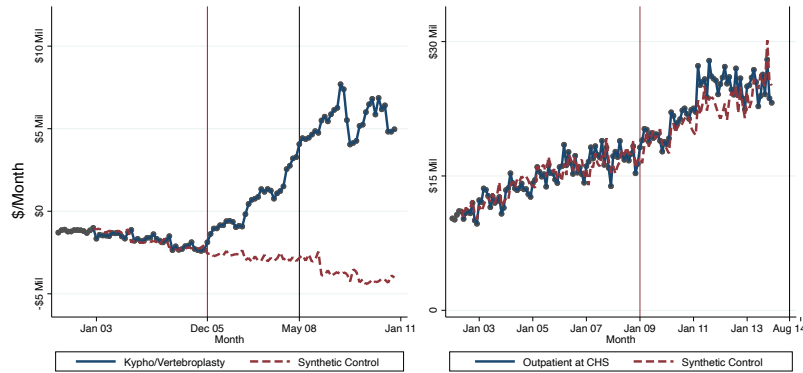
Notes: This figure repeats Figure 3, but only allows controls to be shifted forward in time. The results match the original specification.

Figure A5: Robustness Check: Removing Time Fixed Effects, Main Results



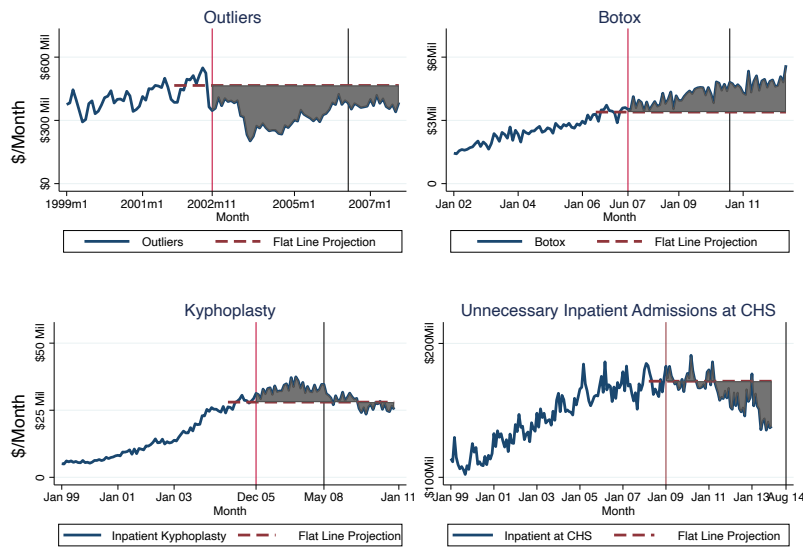
Notes: This figure repeats Figure 3, but partials out time fixed effects from the treated and control units before applying the synthetic control methodology. The results qualitatively match the original specification in terms of fit and directional trends, and the estimated total deterrence effects exceed the original specification.

Figure A6: Robustness Check: Removing Time Fixed Effects, Substitution Results



Notes: This figure repeats the substitution results from Figure 4, but removes fixed effects from the treated and control units before applying the synthetic control methodology. The results qualitatively match the original specification in terms of fit and directional trends, and the estimated total deterrence effects exceed the original specification.

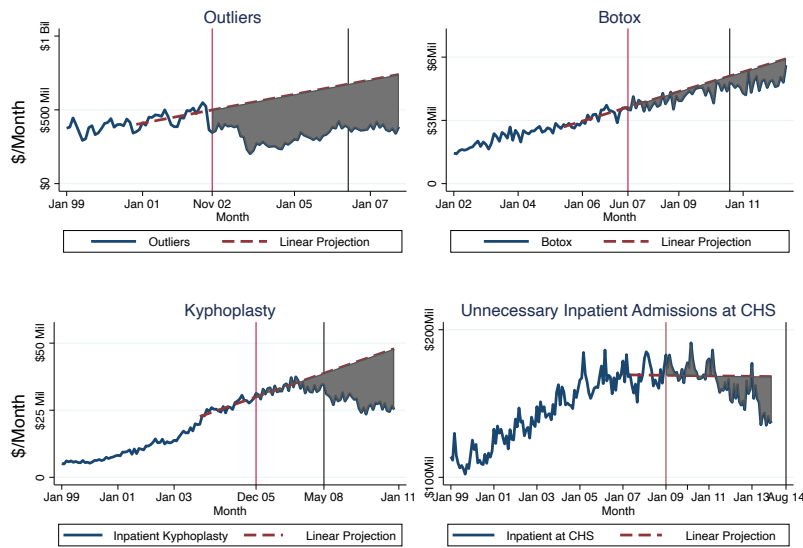
Figure A7: Robustness Check: Flat Line Projection



Notes: This figure repeats Figure 3, but replaces the control strategy with a flat line projection of the 12 months of spending prior to whistleblowing. The total deterrence measurement under this method, including substitution to outpatient spending for the Kyphoplasty and Unnecessary Inpatient Admissions Case, is \$5.56 billion.

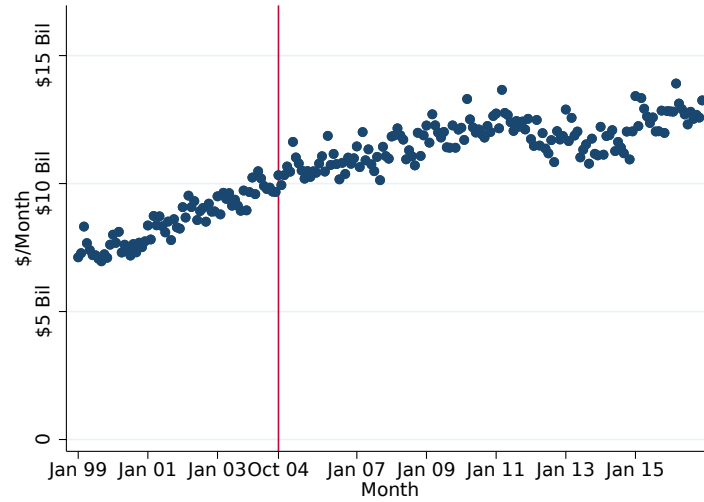


Figure A8: Robustness Check: Linear Projection



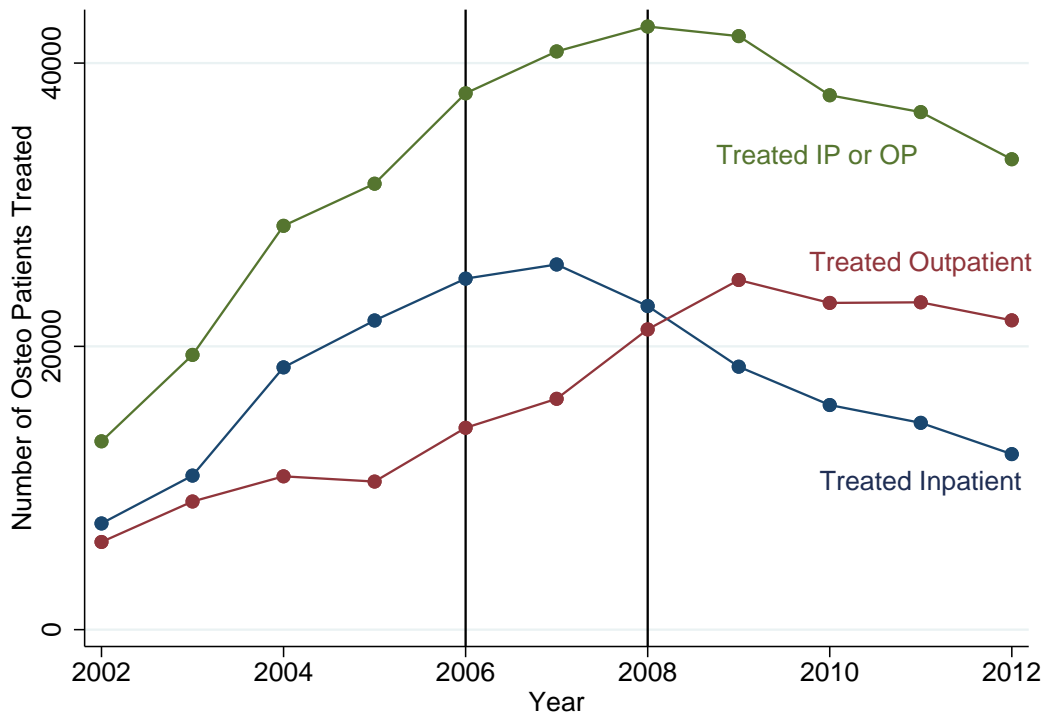
Notes: This figure repeats Figure 3, but replaces the control strategy with a linear projection of the 24 months of spending prior to whistleblowing. The total deterrence measurement under this method, including substitution to outpatient spending for the Kyphoplasty and Unnecessary Inpatient Admissions Case, is \$13.7 billion.

Figure A9: Total Inpatient Spending Over Time



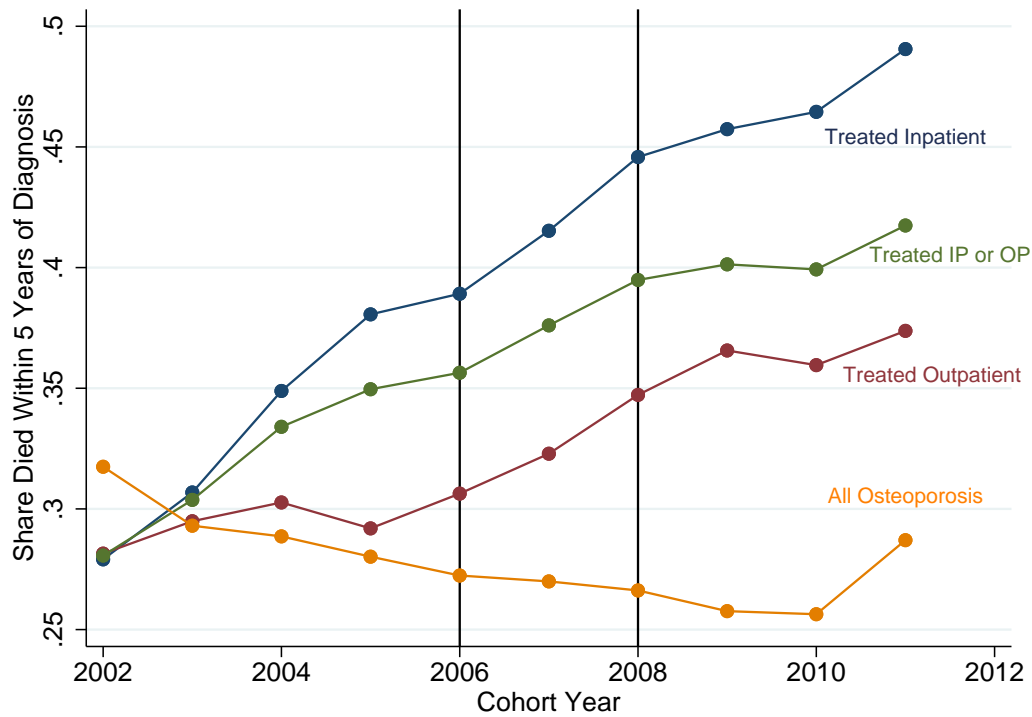
Notes: This figure plots total inpatient spending against the timing of the first unnecessary inpatient admissions lawsuit. There is no visible change in overall inpatient spending, which motivates an analysis focused on the defendants in these lawsuits.

Figure A10: Kyphoplasty Treatment Volume around Whistleblowing



Notes: This figure plots the number of Medicare Fee-for-Service osteoporosis patients receiving inpatient short-stay kyphoplasty or outpatient spine surgery around the timing of the whistleblower lawsuit against Kyphon. The sample are all patients with an osteoporosis chronic condition flag. The first vertical line corresponds to the filing of the first whistleblower lawsuit, and the second line corresponds to the settlement of that lawsuit. While a substitution from inpatient to outpatient surgery occurred, total treated patient volume is only modestly affected.

Figure A11: Kyphoplasty Treatment and Death, 5 Year Cohort



Notes: This figure plots 5-year mortality among Medicare Fee-for-Service osteoporosis patients receiving inpatient short-stay kyphoplasty or outpatient spine surgery around the timing of the whistleblower lawsuit against Kyphon. The sample are all patients with an osteoporosis chronic condition flag. The first vertical line corresponds to the filing of the first whistleblower lawsuit, and the second line corresponds to the settlement of that lawsuit.

Table A1: Deterrence Effects of Major Whistleblowing Categories, Excluding Botox

Type of Care	Type of Fraud	First Case Filed	First Settlement	# Press Releases	Settlement Total	Specific Deterrence	Deterrence Ratio
Inpatient	Manipulation of Outlier Payments	Nov 2002	Dec 2004	11	\$923 Million	\$17.5 Billion	18.92
Kyphoplasty	Inpatient Procedure Should be Outpatient	Dec 2005	May 2008	10	\$214.2 Million	\$281.1 Million	1.31
Inpatient	Unnecessary Hospital Admissions	Nov 2004	Dec 2007	7	\$172.3 Million	\$1.2 Billion	7.09
				<b>Total</b>	<b>\$1.31 Billion</b>	<b>\$ 18.96 Billion</b>	
						<b>Average Ratio</b>	<b>9.11</b>

Notes: This table summarizes the results of case studies on the 3 large categories of Medicare whistleblowing enforcement, with the Botox case study excluded. Specific deterrence values are computed using a staggered synthetic control strategy to compare treated units to their counterfactual in the absence of whistleblowing. The specific deterrence is computed over 5 years post-treatment with a 10% annual discount rate compounded monthly. The deterrence ratio is computed as the ratio of the deterrence value to the settlement total.

Table A2: RMSPE of Synthetic Control Results

Case Study	Dependent Variable Pre-Period Mean	Synthetic Control RMSPE	Fraction RMSPE
Outlier Payments	$4.31 * 10^8$	$4.03 * 10^7$	0.0935
Botox	$2.72 * 10^6$	$2.10 * 10^5$	0.0773
Kyphoplasty – Inpatient	$2.29 * 10^7$	$1.90 * 10^6$	0.0830
Kyphoplasty – Outpatient	$1.45 * 10^6$	$2.23 * 10^5$	0.154
Unnecessary Inpatient Admissions – Inpatient at CHS	$1.69 * 10^8$	$7.03 * 10^6$	0.0416
Unnecessary Inpatient Admissions– Outpatient at CHS	$3.17 * 10^7$	$2.56 * 10^6$	0.0808

Notes: This table presents the Root Mean Square Prediction Error (RMSPE) of the staggered synthetic control strategy that estimates the main deterrence effect and substitution effect presented in Figures 3 and 4.

**Table A3: Potential Case Studies of Medicare Whistleblowing Enforcement**

Type of Care	Type of Fraud	First Settlement Year	Settlement Total	Included or Omitted	Reason for Omission
Pharmaceuticals	Off-Label Promotion	2004	14,359,380,000	Omitted	Part D Data Start 2006
Inpatient	Outlier Payment Falsification	2004	923,033,623	Included	
Botox	Off-Label Promotion	2010	600,000,000	Included	
Inpatient	DRG Upcoding	2000	458,260,000	Omitted	Lawsuit Filed 1995
Home Health	Medically Unnecessary Care	2000	424,700,000	Omitted	Lawsuit Filed 1995
Nursing Home	Inadequate Care	2001	219,000,000	Omitted	Lawsuit Filed 1996
Kyphoplasty	Inpatient Should be Outpatient	2008	214,238,775	Included	
Physical Therapy	Unlicensed providers; Group Therapy Billed as One-on-One	2004	185,600,000	Omitted	Lawsuit Filed 1998
Hospital	Unnecessary Admissions	2007	172,296,460	Included	
Nursing Home Therapy	Falsified Hours Spent	2000	132,700,000	Omitted	Lawsuit Filed 1996
Hospice	Ineligible Patients	2006	114,886,000	Omitted	Defendants Not Identifiable from Court Data
Laboratory Tests	Medically Unnecessary; Unbundling Tests	1997	111,161,000	Omitted	Lawsuit Settled Before Data Start

Notes: This table describes the potential case studies of whistleblowing enforcement described in Appendix E. Each case study is constructed from a group of lawsuits. These are all of the case studies for which settlements totaled to more than \$100 million. Four of the top case studies are conducted in this paper. Seven case studies are omitted because the first lawsuit was filed before the data are available. My available data start in 1999 for all types of Medicare except outpatient care and pharmaceuticals, which start in 2002 and 2006 respectively. One case study, ineligible hospice patients, is omitted because the lawsuit documents do not identify the defendant providers.

Table A4: Synthetic Control Weights and Time Shifts for Outlier Payments Case

Control	Time Shift (Months)	Synthetic Control Weight
DME	+9	.049
DSH	+1	.837
HHH	+10	.024
HOS	-23	.083
SNF	+10	.007

Notes: This table details the synthetic control time shifts and weights used for the Kyphoplasty case. The control units are other types of Medicare spending, described in detail in Appendix F.1. The time shift describes the number of months the control unit must be shifted to align with the treated unit in the pre-whistleblowing period. Positive values mean the control unit is shifted forward in time, and negative months mean the control unit is shifted back in time. For example, a time shift of +9 means that the control unit in March 2005 serves as a control for the treated unit in December 2005.



Table A5: Synthetic Control Weights and Time Shifts for Botox Case

CPT Code	Shortened Descriptor	Time Shift (Months)	Synthetic Control Weight
76775	Ultrasound, retroperitoneal	0	0.602
11043	Debridement, muscle and/or fascia	0	0.226
76830	Ultrasound, transvaginal (non-hyphenobstetrical)	+23	0.004
00300	Anesthesia (integumentary system, muscles and nerves of head, neck and posterior trunk), NOS	+40	0.003
01480	Anesthesia, open procedures on bones of lower leg, ankle, and foot, NOS	+40	0.003
14041	Adjacent tissue transfer or rearrangement	+37	0.003
22614	Arthrodesis, posterior or posterolateral technique, single level; each additional vertebral segment	+34	0.003
29580	Paste/Unna boot	+23	0.003
36245	Selective catheter placement, arterial system	0	0.003
43249	Esophagogastroduodenoscopy, flexible, transoral	+17	0.003

Notes: This table details the synthetic control time shifts and weights used for the Botox case. The control units are other types of outpatient care, described in detail in Appendix F.2. The time shift describes the number of months the control unit must be shifted to align with the treated unit in the pre-whistleblowing period. Positive values mean the control unit is shifted forward in time, and negative months mean the control is shifted back in time. For example, a time shift of +17 means that the control unit in June 2005 serves as a control for the treated unit in November 2006.

Table A6: Synthetic Control Weights and Time Shifts for Kyphoplasty Case

<b>Inpatient</b>				
DRG V-24	MS-DRG V-25	Descriptor	Time Shift (Months)	Synthetic Control Weight
462	945, 946	Rehabilitation	47	0.431
533, 534	037, 038, 039	Extracranial Procedures	3	0.049
524	69	Transient Ischemia	5	0.045
518	250, 251	Percutaneous cardio procedures w/o coronary artery stent	17	0.045
535	222, 223	Cardiac defibrillator implant with cardiac catheterization	-5	0.037
519, 520	471, 472, 473	Cervical spinal fusion	-12	0.035
155, 156, 567, 568	326, 327, 328	Stomach, esophagealm and duodenal procedures	-58	0.03
515	226, 227	Cardiac defibrillator implant w/o cardiac catheterization	21	0.029
523	896, 897	Alcohol/drug abuse or dependence w/o rehabilitation therapy	-58	0.026
496	453, 454, 455	Combined anterior/posterior spinal fusion	-58	0.025

<b>Outpatient</b>			
CPT Code Range	Surgical Category	Time Shift(Months)	Weight
20000, 20005	Incision and Drainage	0	0.158
22900-22999	Abdomen	0	0.115
21920-21936	Back or Flank	0	0.096
21501-21899	Neck or Thorax	0	0.079
26990-27299	Pelvis or Hip	0	0.077
21010-21499	Head	0	0.076
27301-27599	Femur or Knee	0	0.061
27600-27899	Leg or Ankle	0	0.058
29000-29799	Casts	11	0.051
25000-25999	Forearm or Wrist	11	0.048

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Notes: This table details the synthetic control time shifts and weights used for the Kyphoplasty case. The top panel describes the controls for inpatient spending, which are groups of other inpatient DRGs. The bottom panel describes the controls for outpatient spending, which are other CPT code ranges of surgery on the musculoskeletal system. These controls are described in detail in Appendix F.3. The time shift describes the number of months the control unit must be shifted to align with the treated unit in the pre-whistleblowing period. Positive values mean the control unit is shifted forward in time, and negative months mean the control is shifted back in time. For example, a time shift of +3 means that the control unit in September 2005 serves as a control for the treated unit in December 2005.

Table A7: Placebo Tests for Synthetic Controls

Case	Deterrence Value	1-Tail Placebo Test		
Outlier Payments	+\$17.46 Billion	0.0 ( $n = 5$ )		
Botox	-\$41.67 Million	0.03 ( $n = 93$ )		
Case	Inpatient Deterrence	1-Tail Placebo Test	Outpatient Deterrence	1-Tail Placebo Test
Kyphoplasty	+ \$538.9 Mil	0.13 ( $n = 30$ )	-\$257.8 Mil	0.067 ( $n = 15$ )
Unnecessary Inpatient Admission:				
Defendant: St Joseph's Atlanta	+\$44.8 Mil	0.01 ( $n = 100$ )	-\$27.4 Mil	0.00 ( $n = 100$ )
Defendant: Wheaton Hospital	+\$5.8 Mil	0.13 ( $n = 100$ )	-\$83.8k	0.31 ( $n = 100$ )
Defendant: El Centro Medical Center	+\$5.3 Mil	0.35 ( $n = 100$ )	-\$4.0 Mil	0.02 ( $n = 100$ )
Defendant: Overlook Hospital	-\$16.0 mil	0.02 ( $n = 100$ )	+\$10.7 mil	0.08 ( $n = 100$ )
Defendant: Morton Plant Hospitals	+\$266.6 Mil	0.01 ( $n = 100$ )	+\$12.7 Mil	0.07 ( $n = 100$ )
Defendant: Shands Hospitals	+ \$124.2 Mil	0.02 ( $n = 100$ )	+\$50.7 Mi	0.00 ( $n = 100$ )
Defendant: Community Health Systems	+\$693.2 Mil	0.07 ( $n = 100$ )	+\$54.5 Mi	0.20 ( $n = 100$ )

Notes: This table summarizes the placebo test for the synthetic control strategy. For each control group, I compute the placebo deterrence effect, using the staggered synthetic control method with all other controls. The 1-tail test counts how many placebo groups exceed the deterrence value of the treated unit. For the kyphoplasty and unnecessary admissions cases, this test is conducted separately for the inpatient and outpatient spending. Deterrence effects are positive if spending on the treated unit is less than the control unit, and negative if spending on the treated unit is greater than the control unit.

Table A8: Treatment Effects around Kyphoplasty Whistleblowing Lawsuit, 5-Year Cohort

5-Year Mortality	
Treated Inpatient	0.0257*** (0.00285)
Treated IP $\times$ 2002 Cohort	-0.0656*** (0.00375)
Treated IP $\times$ 2003 Cohort	-0.0429*** (0.00396)
Treated IP $\times$ 2004 Cohort	-0.0205*** (0.00395)
Treated IP $\times$ 2005 Cohort	0 (.)
Treated IP $\times$ 2006 Cohort	0.00336 (0.00408)
Treated IP $\times$ 2007 Cohort	0.0123** (0.00416)
Treated IP $\times$ 2008 Cohort	0.0296*** (0.00436)
Treated IP $\times$ 2009 Cohort	0.0306*** (0.00474)
Treated IP $\times$ 2010 Cohort	0.0351*** (0.00507)
Treated IP $\times$ 2011 Cohort	0.0355*** (0.00526)
Treated Outpatient	-0.0256*** (0.00362)
Treated OP $\times$ 2002 Cohort	-0.00784 (0.00464)
Treated OP $\times$ 2003 Cohort	0.00608 (0.00492)
Treated OP $\times$ 2004 Cohort	0.00536 (0.00504)
Treated OP $\times$ 2005 Cohort	0 (.)
Treated OP $\times$ 2006 Cohort	0.0116* (0.00503)
Treated OP $\times$ 2007 Cohort	0.0235*** (0.00501)
Treated OP $\times$ 2008 Cohort	0.0373*** (0.00488)
Treated OP $\times$ 2009 Cohort	0.0505*** (0.00484)
Treated OP $\times$ 2010 Cohort	0.0449*** (0.00498)
Treated OP $\times$ 2011 Cohort	0.0425*** (0.00503)
Cohort FE	X
Patient Baseline Characteristics	X
N	9494860

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ 

Notes: This table estimates inpatient Kyphoplasty and outpatient spine surgery treatment effects interacted with cohort year on 5-year mortality for the universe of Medicare Fee-for-Service osteoporosis patients from 2002 to 2014. These correspond to the  $\beta$  and  $\gamma$  coefficients from Equation 11 in Appendix G. Coefficients are relative to the omitted year 2005, the year before the whistleblower lawsuit was filed.