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Regulatory costs of being public: Evidence from bunching estimation ☆

Michael Ewens [a,*], Kairong Xiao [b,*], Ting Xu [c,*]

[a] Columbia Business School and NBER, United States of America
[b] Columbia Business School, United States of America
[c] Rotman School of Management, University of Toronto, Canada

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ABSTRACT

We quantify the costs of major disclosure and governance regulations by exploiting a regulatory quirk: many rules trigger when a firm's public float exceeds a threshold. Consistent with firms avoiding costly regulation, we document significant bunching around three major regulatory thresholds. Estimations reveal that the three examined rules' compliance costs range from 1.2% to 1.8% of market capitalization for firms near thresholds. For a median U.S. public company, total costs amount to 4.3% of market capitalization, and at least 2.3% absent regulatory avoidance frictions. These cost estimates are robust across various extrapolation assumptions, ranging from 2.1% to 6.3% of market capitalization. Regulatory costs have a greater impact on private firms' IPO decisions than on public firms' going private decisions, but such costs only explain a small part of the decline in the number of public firms.

0. Introduction

A central explanation for the decline in the number of publicly listed companies in the U.S. is the increased burden of disclosure and governance regulations. Indeed, practitioners often point to heightened regulatory costs as the culprit of the disappearing public firms, while recent major de-regulations such as the 2012 JOBS Act were directly motivated by the perceived costs of being public. For instance, in the comment letter to the SEC, Morgenstern and Nealis (2004) write that (p. 1) "the Sarbanes-Oxley Act of 2002 and it's implementing regulations have significantly increased the costs and regulatory burdens associated with being a public company." These issues continue today. Presumably anticipating pushback to proposed climate disclosure rules in 2022, the associated SEC proposal incorporates regulatory cost estimates.[1] Thus, estimating regulatory costs is a central part of the debate on the regulation's merits. Understanding the role of regulations in the cost of being public and the decline in the number of public firms can address concerns on possible capital market dysfunction (Weild, 2011, p. 1).

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* Corresponding authors.
E-mail addresses: michael.ewens@columbia.edu (M. Ewens), kairong.xiao@gsb.columbia.edu (K. Xiao), tingxu.xu@rotman.utoronto.ca (T. Xu).

[1] See section IV.C and referenced public comments in "The Enhancement and Standardization of Climate-Related Disclosures for Investors" (Release Nos. 33-11042).

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Researchers have explored this "regulatory overreach hypothesis", but the evidence is mixed.[2] A key challenge faced by the prior literature is that firms often engage in regulatory avoidance in response to regulations, as many public firm regulations trigger only when a firm's size exceeds a certain threshold. Firms seeking to avoid costly regulation can bunch their public float below the threshold. Such manipulation may create challenges for traditional identification strategies. Furthermore, the existing evidence has been mainly qualitative rather than quantitative and considers only partial direct costs (e.g., in-house labor costs). Most existing literature provides regulatory exposure indices rather than the quantitative estimates of dollar value of regulatory costs central to policy making decisions. As Leuz and Wysocki (2016) write in their survey of the literature (p. 529): "evidence on the causal effects of disclosure and financial reporting regulation is often difficult to obtain and still relatively rare; [. . .] while we have a lot of evidence that is qualitatively useful, we are still far from being able to perform quantitative cost-benefit analyses."

In this paper, we advance the literature in two ways. First, rather than facing manipulation as an identification impediment, we build upon Dharmapala (2022), who first uses a bunching approach (Saez, 2010; Chetty et al., 2011; Kleven and Waseem, 2013) to document statistically significant bunching of public firms below a regulatory threshold. We demonstrate that firms' endogenous bunching around regulatory thresholds can be used to infer regulatory costs. The central insight of the approach is a revealed preference argument: greater bunching by public firms to avoid financial regulation implies higher regulatory costs. This approach allows us to analyze multiple regulatory changes over 20 years, which provide a more comprehensive understanding of the regulatory costs borne by public firms. The method also outputs cost estimates that aggregate both direct and indirect costs net of the benefits from compliance. Second, this approach quantifies the monetary value of regulatory costs, which allows us to conduct a novel set of counterfactual analyses on the effects of regulation on the choice of public and private status. Quantification crucially improves upon existing estimates, which typically only reveal cross-sectional variations in regulatory costs. The regulatory cost estimates are also critical inputs into regulators' and policymakers' quantitative cost-benefit analyses.

We begin by examining three major regulatory thresholds on a firm's public float (i.e., value of trading equity) introduced since 1992. Each regulatory threshold is associated with a set of exemptions from disclosure and internal governance rules. The first threshold is \$25m, which stemmed from the introduction of the "Small Business Issuers" and scaled disclosures in 1992. Firms below \$25m float had less stringent disclosure requirements on financial data, business operation, risk, and governance.[3] The second threshold is \$75m introduced in 2002. Firms below \$75m are exempted from the SOX 404 requirement to hire an outside auditor to attest to their internal controls. The third threshold is \$700m implemented in the JOBS Act in 2012. Newly public firms below this threshold ("Emerging Growth Companies") receive several financial reporting accommodations, deferred compliance with new accounting rules, and an exemption from SOX 404(b). These regulatory thresholds create variation in the major components of disclosure and internal governance regulations faced by public firms.

These thresholds appear to lead to significant bunching in the distribution of firms' public float in the years the regulations are in place.[4] As shown by Fig. 1, the density falls discretely at each regulatory threshold. On its own, such bunching provides compelling evidence that regulations triggered by these thresholds impose significant compliance costs on firms, and that these costs seem to outweigh the regulations' potential benefits to firms such as lower costs of capital. We find that firms close to the thresholds manipulate their public float mainly by substituting debt for equity, without changing their operations or insider ownership.

The validity of bunching estimation relies on the "smoothness" assumption: the distribution of the public float is smooth in the absence of regulation. Consistent with this identifying assumption, we find no excess mass in years before the regulatory threshold is introduced or after it is eliminated, making it unlikely that other factors are changing at the threshold. We also find no excess mass around placebo thresholds without regulations.

Motivated by the above bunching patterns, we develop a model to guide our estimation. In the model, firms can avoid regulatory costs by reducing their public float to a level below the regulatory threshold. However, bunching distorts firms' leverage away from the optimum. Firms thus face a trade-off between regulatory costs and capital structure distortion costs. The optimal bunching choice depends on how far away a firm's undistorted public float is from the regulatory threshold. Firms that are just above the threshold shrink their public float to avoid regulation because the associated leverage distortion is small. Firms that are far above the threshold do not bunch because the cost of leverage distortion outweighs the cost of regulation. There exists a marginal firm that is indifferent between the two costs and hence bunching or not. We can infer the net regulatory cost facing this marginal firm from its leverage distortion cost.

To estimate the marginal firm, we employ the fuzzy bunching estimator by Alvero and Xiao (2020), which is suitable for the noisy bunching patterns in our public float data. This estimator infers the marginal firm from the area between the actual cumulative distribution function (CDF) with regulation and the counterfactual CDF in the absence of the regulation. We then translate the estimated float distortion to a dollar value of regulatory costs facing the marginal firm using the leverage distortion cost function from Binsbergen et al. (2010). Finally, we extrapolate the regulatory costs to other firms using the sensitivities of the regulatory costs to firm characteristics estimated from subsample analysis and the relative share of variable versus fixed costs estimated from SEC surveys (SEC, 2011) and Audit Analytics data.

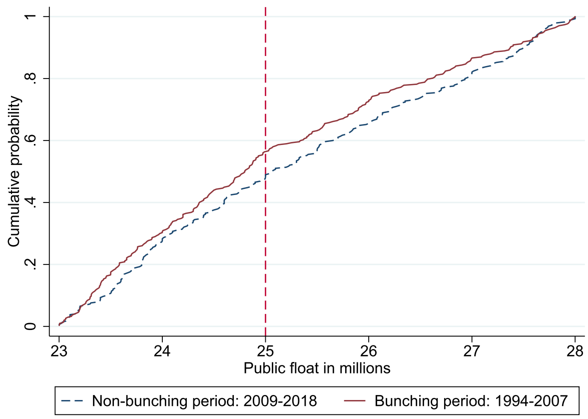
Our estimates show that the net present value of compliance costs ranges from 1.2% to 1.8% of market capitalization for firms near regulatory thresholds. For a median U.S. public company, total costs amount to 4.3% of market capitalization, and at least 2.3% absent regulatory avoidance frictions. These cost estimates are robust across various extrapolation assumptions, ranging from 2.1% to 6.3% of market capitalization. In the cross-section, we find that firms facing higher competition or growth experience higher regulatory costs, consistent with existing theories. Aggregate regulatory costs have increased significantly in the first few years after SOX, but have been declining since, especially after the JOBS Act. Smaller firms bear disproportionate amounts of regulatory costs relative to their size because a large portion of these costs is fixed. Nevertheless, various regulatory exemptions introduced by the SEC substantially alleviated the regulatory burden for firms below the regulatory thresholds.

Using the estimated regulatory costs, we investigate how regulation affects the number of public firms. Doidge et al. (2017) show that the decline in the number of public firms is driven by both low IPO

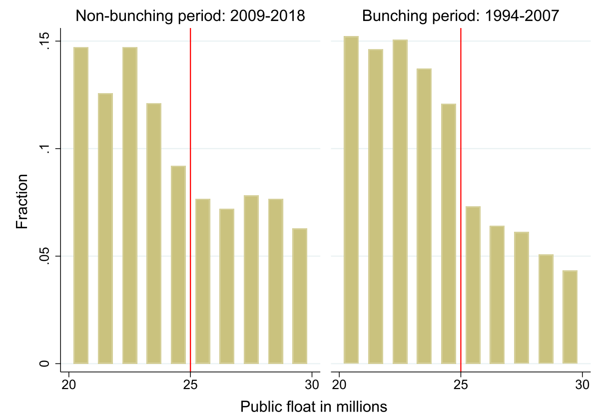
[2] Earlier works such as Gao et al. (2013) and Doidge et al. (2013) cast doubt on this narrative by noting that the decline in IPOs precedes major regulatory changes such as Sarbanes-Oxley (SOX). In contrast, recent work such as Dambra et al. (2015) finds that IPO activity partially increased after the regulatory relief of the 2012 JOBS Act. Other explanations of the decline in the number of public firms include declining business dynamism (Decker et al., 2016; Doidge et al., 2017), shifting investment to intangibles (Kahle and Stulz, 2017; Doidge et al., 2018), increased availability of private equity (Ewens and Farre-Mensa, 2020), changing economies of scale and scope (Gao et al., 2013), and changing acquisition behavior (Gao et al., 2013; Eckbo and Lithell, 2021).

[3] These scaled disclosures were later expanded to firms with less than \$75m float in 2008 with the introduction of "Small Reporting Companies.".

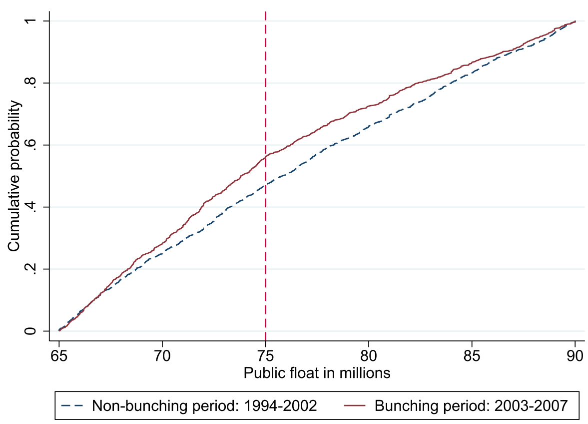
[4] Gao et al. (2009), Iliev (2010), Weber and Yang (2020), Liu (2020), and Dharmapala (2022) have also documented bunching below \$75m.



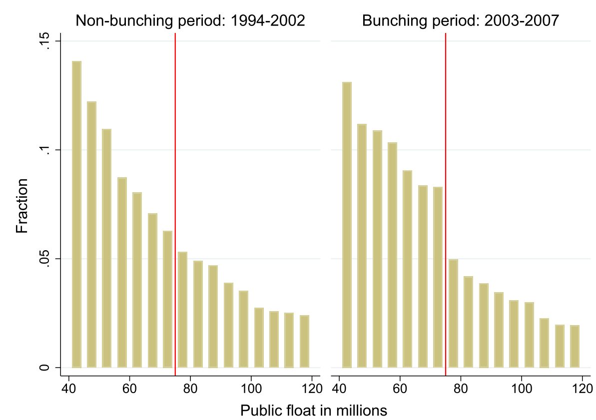
(a) CDF: $25 mil



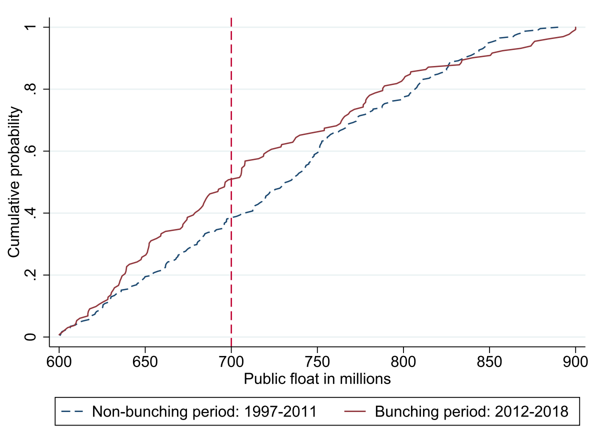
(b) Histogram: $25 mil



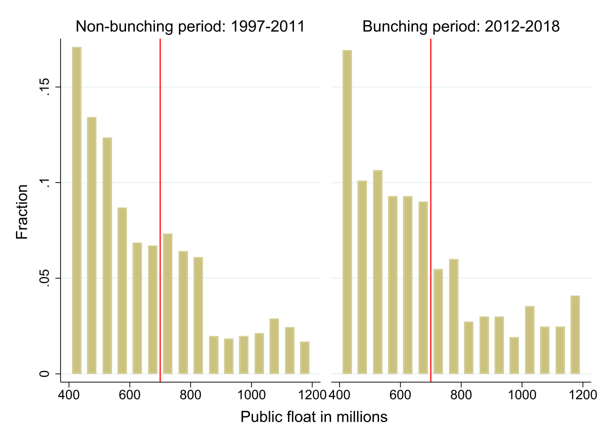
(c) CDF: $75 mil



(d) Histogram: $75 mil



(e) CDF: $700 mil



(f) Histogram: $700 mil

Fig. 1. CDFs and Histograms for Public Float around Regulatory Thresholds. These figures show the cumulative distribution functions and histograms for firms' public float around regulatory thresholds in bunching and non-bunching years. Bunching years are years when the threshold-based regulation is in place. Non-bunching years are years before the regulation is introduced or after it expires.

rates and high delisting rates, each explaining about half of the decline. We first examine the effect of regulatory costs on private firms' IPO decisions, using a sample of 21,066 VC-backed firms. We find that regulatory costs significantly impact these firms' decisions to go public: a one-standard-deviation increase in regulatory costs is associated with a 6.5% decrease in IPO likelihood. However, our counterfactual analysis shows that major regulatory changes in the 2000s have had limited impact on IPO volumes. Removing SOX only increases the average annual IPO likelihood after 2000 from 0.95% to 0.96%, because many potential IPO candidates are small enough to be exempted from this regulation. Removing all estimated regulatory costs increases the average annual IPO likelihood after 2000 from 0.95% to 1.4%, which explains only 7.3% of the decline in IPO likelihood from pre-2000 to post-2000.

Next, we examine the impact of the estimated regulatory costs on public firms' decisions to go private. We find that they cannot explain going private decisions. This finding is likely to be explained by the fact that some of the regulatory costs are irreversible, upfront costs, which would enter into firms' going public decisions but are sunk costs for their going private decisions. Our result is consistent with Kaplan (1989), Guo et al. (2011), and Bernstein and Sheen (2016), who show that many going-private deals are motivated by financial or operational engineering reasons, rather than to avoid regulatory costs. Our result also echos Leuz (2007), Leuz et al. (2008), and Bartlett (2009), who find little evidence on the effect of regulations on going private transactions.

Overall, our findings suggest that regulatory costs affect firms' public-vs-private choice mainly through their going public decision. Nevertheless, regulatory costs only explain a small fraction of the disappeared IPOs, in contrast to the popular claim by practitioners. Instead, our results are consistent with Gao et al. (2013) and Doidge et al. (2013), who suggest that regulatory changes in the early 2000s did not cause the decline of public firms.

Although we believe our estimation approach addresses some limitations in the current literature, its implementation requires several assumptions. First, although we study three major regulatory changes over 20 years, the bunching estimator only uses threshold-based regulations and thus excludes uniformly implemented regulations (e.g., Reg FD or the introduction of EDGAR). Nevertheless, our analysis covers important regulatory changes that are often attributed to changes in the number of public firms, such as SOX in 2002 and JOBS Act in 2012. Second, our baseline bunching estimation forms the counterfactual distribution using the years before the regulatory threshold is introduced or after it is eliminated. We show that our estimates are robust to dropping the two years before regulation changes to exclude potential anticipation-based bunching or using a smooth polynominal to estimate counterfactual distributions in the bunching samples. Third, we use the leverage distortion costs estimated by Binsbergen et al. (2010) to translate observed bunching to a dollar value of regulatory costs. The main results are robust to alternative parameters for leverage distortion costs and the Korteweg (2010) leverage distortion cost function. Finally, our extrapolation relies on a decomposition of variable versus fixed costs, estimated using data that largely reflect direct rather than indirect compliance costs and omit compliance benefits. To assess the robustness of this extrapolation method, we bound our estimates in the range of 2.1%–7.8% after varying assumptions about variable vs. fixed costs, adjusting the extrapolation model, and accounting for omitted variables and statistical variations.

This paper contributes to a growing literature on the disappearing public firms puzzle. Aside from the "regulatory overreach hypothesis" and the aforementioned papers, the literature has also proposed five other major hypotheses: (1) declining business dynamism (Decker et al., 2016; Doidge et al., 2017), (2) shifting investment to intangibles (Kahle and Stulz, 2017; Doidge et al., 2018), (3) increased availability of private equity (Ewens and Farre-Mensa, 2020), (4) changing economies of scale and scope (Gao et al., 2013), and (5) changing acquisition behavior (Gao et al., 2013; Eckbo and Lithell, 2021). Using the new bunching estimation strategy developed from the public economics literature, our paper provides an in-depth study of the "regulatory overreach hypothesis" by estimating the regulatory costs of being a public firm, examining the margins through which regulatory costs affect public-vs-private decisions, and *quantifying* how much of the decline in IPOs can be attributed to heightened regulatory costs. Our study suggests that regulatory costs only explain a small fraction of the decline in public firms; non-regulatory factors facing public firms seem to be playing a more important role.

Our paper also adds to the extensive literature studying the impact of disclosure and internal governance regulations on firms. As surveyed by Leuz and Wysocki (2016), most of this literature has been qualitative. We quantify the net compliance costs of these regulations, providing useful inputs to regulators' cost-benefit analysis. Our estimates also shed light on the ongoing debate on whether public firms face excessive regulatory burdens (Coates, 2007). Related to our work, Gao et al. (2009), Iliev (2010), Alsabah and Moon (2020), Weber and Yang (2020), and Liu (2020) study the effects of regulatory thresholds on public firms' outcomes such as earnings quality, audit fees, leverage, and stock prices.[5] While these works have also documented bunching, we are the first to use a *bunching estimator* to translate bunching to dollar costs of regulations. Rather than facing regulatory avoidance as an identification challenge, our approach exploits it for identification. Our approach thus complements traditional identification strategies such as difference-in-differences and regression discontinuity by expanding the scope of regulations that can be studied. Our work closely aligns with Dharmapala (2022), which pioneered the use of a bunching method to identify statistically significant bunching below the $75 million threshold following SOX. Our paper extends Dharmapala (2022) by showing that bunching firms adjust primarily through changing capital structure. Furthermore, drawing upon the debt cost function developed by Binsbergen et al. (2010) and Korteweg (2010), our research uniquely quantifies the regulatory costs derived from bunching. This novel step carries substantial implications for researchers and policymakers seeking to grasp the dollar value of regulatory costs. Our paper also differs from Bertomeu et al. (2020) and Cheynel and Liu-Watts (2020), who estimate the cost of voluntary disclosure, rather than the costs of mandated disclosure and internal controls.

Our paper also advances the literature on regulatory economics. An important question in this literature is how to measure regulatory burdens. Existing literature has proposed various measures, such as the number of rules facing firms (Porta et al., 1998; Al-Ubaydli and McLaughlin, 2017), number of employees hired by regulators (Jackson, 2007), labor spending on compliance-related occupations (Simkovic and Zhang, 2020), hours firms spend on regulatory paperwork (Kalmenovitz, 2019), complexity of regulatory languages (Amadxarif et al., 2019), and how frequently firms mention regulations in their 10-K (Gong and Yannelis, 2018; Calomiris et al., 2020). We introduce a revealed preference approach using regulatory-based bunching that complements existing approaches in several ways. First, existing approaches often generate an index of regulatory exposure, while we directly quantify the dollar costs of regulations, which can be used as inputs into regulators' cost-benefit analysis. Second, most existing measures only capture direct regulatory costs (e.g., paperwork costs, labor costs, or external fees), while our revealed preference approach additionally captures indirect costs, such as proprietary costs, diversion of managerial attention, and operational distortions. Our approach also nets out the benefits of compliance to generate a net cost estimate. That said, our approach can only be applied to threshold-based regulations, which is a limitation. Nevertheless, many regulations are threshold-based and are increasingly so. Thus, our approach has ample applications.

Finally, our application of bunching estimation to public firms adds to a growing literature that uses the bunching technique to study finance topics. Prior applications include mortgage (DeFusco and Paciorek, 2017; DeFusco et al., 2020), small business lending (Bachas et al., 2020b,a), municipal bonds (Dagostino, 2018), student loans (Fagereng and Ring, 2021), bankruptcy fees (Antill, 2020), and banks (Alvero et al., 2023). The prior literature typically uses large administrative data with little noise. Hence, their bunching pattern exhibits a sharp density spike at the threshold and is suitable for the traditional

[5] Dambra et al. (2015), Chaplinsky et al. (2017), Barth et al. (2017), and Dambra and Gustafson (2020) study the impact of JOBS Act on IPO firms; Coates and Srinivasan (2014) survey the literature on the effect of SOX on firm outcomes; Iliev and Vitanova (2019) study the effect of Say-on-Pay on compensation and firm value. Similarly, several papers also noted regulatory avoidance behavior in other contexts. See, for example, Ballew et al. (2021), Bouwman et al. (2018), and Bindal et al. (2020) on banking regulation, Bernard et al. (2018) on disclosure of private firms, and Schivardi and Torrini (2008) and Amirapu and Gechter (2020) on labor regulation.

"sharp bunching" approach. Our setting has a smaller sample size and the running variable contains more randomness (i.e., public float fluctuates with stock prices). Thus, the bunching pattern is much noisier. Alvero and Xiao (2020) show that using the sharp bunching approach on noisy data would lead to under-estimation. Given that many corporate finance settings feature relatively small samples and noisy data, the Alvero and Xiao (2020) fuzzy bunching methodology used here can be fruitfully applied to future research.

1. Data and institutional background

1.1. Data sources

The SEC uses public float to determine firms' compliance status with multiple regulations. Formally, it is defined as the market value of all outstanding common equity (voting and non-voting) held by non-affiliates at the end of the second fiscal quarter.[6] Firms must disclose their public float according to this definition at the top of their 10-K. We collect public float data for all U.S. listed firms from 10-K filings (including 10-KSB, 10-KT, and 10-K405) using a customized web-crawling script. We restrict to all fiscal years from 1994 (the year EDGAR starts and financial statements are machine-readable) to 2018. We further require firms to have non-missing sales in Compustat and non-missing public float. These restrictions exclude shell and pink sheet companies. We match these firms to Jay Ritter's IPO database to identify the year a firm went public. To estimate the cost structure of regulatory costs, we obtain audit fees data from Audit Analytics and SOX 404 compliance costs data reported in a SEC survey SEC (2011). Lastly, we use a sample of VC-backed firms from VentureSource to study the impact of regulatory costs on IPO decisions. We also use a sample of public firms that went through going private transactions (identified using 13e-3 filings) to study the impact of regulatory costs on going private decisions.

1.2. Institutional background

SEC regulations on public firms can be characterized into two major categories: disclosure and governance. In this section, we describe the institutional details surrounding several regulatory reliefs offered by the SEC in the past three decades, which helps shed light on regulatory costs faced by public firms. We focus on four types of regulatory reliefs: scaled disclosure, non-accelerated filing, exemption from SOX Section 404, and Emerging Growth Company benefits. These benefits apply to firms of different sizes as determined by their public float, and sometimes by their revenue. For each rule change, we also provide the SEC's original assessment of costs and benefits. Although our bunching estimation does not rely on the exogeneity of these regulatory changes, we detail their history and potential lobbying or anticipation in Appendix Section A.1.2.

Scaled Disclosure. Enacted in August of 1992, the SEC implemented a new set of rules centered on the SB-2 registration form and refined the class of companies called "Small Business Issuers" (SBI). These new rules refined Regulation S-K, a regulation about the information requirements in filings. These regulatory changes significantly expanded the set of companies that could take advantage of scaled disclosure from Form S-18. Some of the scaled disclosures included pared down selected financial data, simplified description of business, limited executive compensation information, no disclosure on beneficial ownership and less extensive details provided in annual reports. Appendix Table A.1 provides the full list of scaled disclosure items.

The 1992 rule change resulted in the introduction of small business annual reports (10-KSB) and quarterly reports (10-QSB). In its simplest form, a company could use the new SBI definition if it had a public float less than \$25m and annual revenues less than \$25m. Once a company began reporting with the SEC, it remained SBI until *either* its revenue or public float exceeded the \$25m threshold for two consecutive years (in its 10-KSB). In 2008, the scaled disclosure regulatory relief was expanded to a broader set of firms called "Smaller Reporting Companies" (SRC), defined as firms with less than \$75m public float and less than \$50m in revenues (see Appendix A.1.4 for details on SRC). With the introduction of SRC, the SEC eliminated all SBI filings as such as 10-KSB and 10-QSB. The \$25m threshold for scaled disclosure thus ends in 2008.

Non-Accelerated Filer. First proposed in 1998 and eventually enacted in April 2002, the SEC created a new category of registered firms called "Accelerated Filers." Such firms were required to file their finalized annual and quarterly reports within 75 and 35 days of the end of the fiscal period, respectively. Before this change, all registered firms had to file these reports within 90 and 45 days. The stated goal was "modernizing the periodic reporting system and improving the usefulness of periodic reports to investors." (SEC, 2002, sec I.B) Importantly for our purposes, the SEC and public commenters recognized that the burden of accelerating filing may be higher for smaller firms. After the phase-in period, the new rule applied to firms whose public float was \$75 million or more as of the last business day of its most recently completed second fiscal quarter, among other conditions that accelerated filers need to satisfy.[7] Firms that did not satisfy these conditions are "Non-Accelerated Filers."

SOX Section 404 Exemption. The passage of the Sarbanes-Oxley (SOX) Act in 2002 introduced many new disclosure and governance rules for public companies. Section 404 concerns a firm's internal controls and is widely considered as the costliest part of SOX (Zhang, 2007; Gao et al., 2009). Expecting a disproportionate burden of this section on small firms, the law provided an initial 5-month extension to both part (a) and (b) to firms with public floats less than \$75m in 2002. The former requires that firms provide a management's report on their internal controls, while the latter requires that the firm hire an outside auditor to attest to the firm's internal controls. Firms with floats above this threshold – accelerated filers – had to comply with 404(a) and (b) on or after November 15, 2004. Firms whose public float did not exceed \$75m – non-accelerated filers – in 2002, 2003 or 2004 could choose to not comply with both parts of Section 404. These exemptions were later extended multiple times and then made permanent.[8]

Emerging Growth Companies. The JOBS Act (2012) introduced the "Emerging Growth Company" (EGC) category for firms that went public after December 8, 2011. A company qualifies as an EGC if it has total annual gross revenues of less than \$1 billion (\$1.07 billion after 2017) during its most recently completed fiscal year and, as of December 8, 2011, had not sold common equity securities under a registration statement. A company retains its EGC status until it crosses one of the following thresholds: 1) reaching \$1 billion (\$1.07 billion after 2017) in gross revenue, 2) past the fifth anniversary of its IPO, 3) issuing more than \$1 billion of non-convertible debt within a three-year period, 4)

[6] Before 2002, public float was computed within 60 days of 10-K filing date. Rule 405 defines an affiliate as a "person that directly, or indirectly through one or more intermediaries, controls, is controlled by, or is under common control with" an issuer. Appendix Section A.1.1 provides more details on public float data.

[7] These conditions include i) The company has been subject to the reporting requirements of Section 13(a) or 15(d) of the Exchange Act for a period of at least 12 calendar months; ii) The company has previously filed at least one annual report pursuant to Section 13(a) or 15(d) of the Exchange Act; iii) The company is not eligible to use Forms 10-KSB and 10-QSB.

[8] The delay in compliance was later extended in September 2005 to 2007 (SEC Release NOS. 33-8731; 34-54295; File No. S7-06-03). In August 2006, non-accelerated filers were given extensions of 404(a) to 2007 and 404(b) to 2008. The SEC notes in that report for both rules, these "deadline[s] could be further postponed." The exemption from 404(b) continued to be extended until non-accelerated filers were permanently exempt with the passage of the Dodd-Frank Act in 2010.

Table 1
Summary of regulatory thresholds.

Panel A: Key Public Float Thresholds					
Time period	Scaled Disclosure	Non-accelerated filer (NAF)	Exempt from SOX Section 404	Emerging Growth Company (EGC)	
1992–2002	< $25 mil				
2003–2007	< $25 mil	< $75 mil	< $75 mil		
2008–2011	< $75 mil	< $75 mil	< $75 mil		
2012–2018	< $75 mil	< $75 mil	< $75 mil	< $700 mil	
Panel B: Public Float Intervals and Associated Regulatory Benefits					
Time Period	< 25 mil	25–75 mil	75–700 mil	> 700 mil	Binding Thresholds
1992–2002	Scaled disclosure	N/A	N/A	N/A	25 for SD
2003–2007	Scaled disclosure + filing delay + 404 exempt	filing delay + 404 exempt	N/A	N/A	25 for SD 75 for 15d+404
2008–2011	Scaled disclosure + filing delay + 404 exempt		N/A	N/A	75 for SD+delay+404
2012–2018	Scaled disclosure + filing delay + 404 exempt + EGC benefits		EGC benefits	N/A	75 for SD+delay+404 700 for EGC

This table summarizes regulatory thresholds used in our paper. Panel A presents the time-varying threshold for each type of regulatory benefits. Panel B summarize the set of regulatory benefits enjoyed by firms in each public float interval. The last column of Panel B summarizes key exploitable thresholds in each time period and the associated benefits each threshold identifies.

has more than $700 million public float (i.e., becomes a large accelerate filer). We focus on the last public float threshold because it is more difficult to manipulate gross revenue and it is rare for new public firms to issue more than $1 billion of non-convertible public debt in the first five years post-IPO. Notably, although a firm can transition out of the EGC status, it cannot transition into EGC if it did not elect EGC status during IPO filing.

There are several benefits of being an EGC, which are best summarized as a combination of scaled disclosure and relaxation of some internal governance rules. First, an EGC filer faces less extensive disclosure requirements in initial and subsequent registration statements, particularly in the description of executive compensation and the time periods covered by the MD&A section; they also enjoy delayed filing of 10-K and 10-Q relative to large accelerated filers. Second, EGC filers need only provide two years' rather than three years' of audited financial statements in initial registration statement and subsequent annual reports. Third, EGC filers do not need to provide an auditor attestation of internal control under SOX 404(b). Fourth, these filers can delay compliance with new accounting standards. Lastly, EGC filers can use test-the-waters communications with qualified institutional buyers and institutional accredited investors when issuing securities.[9]

1.3. Summary of regulatory thresholds

Despite the above regulations' differences, they share a common eligibility criterion—public float.[10] Panel A of Table 1 summarizes the various regulatory reliefs described above and the associated public float cutoffs. Panel B describes the set of regulatory benefits enjoyed by firms in different public float categories. In particular, the last column summarizes the key thresholds that can be exploited in each time period and the associated benefits if firms stay below the threshold. These variations in cutoffs and their effective periods give us a rich empirical setting to separately identify the value of different regulatory reliefs.

Our empirical design exploits firms' bunching behavior around three public float cutoffs: $25m, $75m, and $700m.[11] Panel C of Table 3 summarizes the thresholds and samples used to identify different sets of regulatory reliefs. Specifically, we use the period when the regulatory relief is in place as the bunching period, and the period before the relief is introduced (or after it expires) as the non-bunching period. The non-bunching period acts as the counterfactual distribution of firms' public float in the absence of bunching incentives. We use bunching around $25m in 1994–2007 to identify the value of scaled disclosure, bunching around $75m in 2003–2007 to identify the value of SOX 404 exemption and delayed filing, and bunching around $700m in 2012–2018 to identify the value of EGC benefits. Section 3.4 provides more details on the estimation samples.

1.4. How significant are these regulations?

The regulations detailed above constitute important components of regulations faced by U.S. registered (i.e., public) firm. For example, the internal governance provisions of SOX only emerged with the law's passage and are widely regarded as the costliest part of SOX (Zhang, 2007; Gao et al., 2009). The regulations studied here capture the two fundamental goals of the Securities Act of 1933: 1) requiring that investors receive financial and other significant information, and 2) prohibiting fraud and misrepresentations. However, quantifying the importance of these rules relative to *all* public firm regulations is challenging. That said, in Appendix Section A.1.5, we attempt one quantification of a threshold regulation's scope using the Small Business Issuer (SBI) classification introduced in 1992.

1.4.1. Other public firm regulations

Although the regulations we study capture the two fundamental aspects of the Securities Act of 1933, it is important to note that they do not encompass all regulations faced by public firms. For example, we do not study regulations related to securities exchange and trading, which are regulated by the Securities Exchange Act of 1934. We also do not study industry-specific regulations, such as regulations on financial institutions (e.g., Dodd-Frank Act) or mining safety regulations on mining companies. Many of these industry-specific regulations apply to both public and private firms and hence should not affect firms' public-vs-private choice, which we study in Section 5. Lastly,

[9] Since 2007, being below $700m float also gives firms additional 15 days in filing 10-Ks and 10-Qs relative to large accelerated filers that are above $700m. However, as documented in both Alsabah and Moon (2020) and our Fig. 1, there is no bunching in float below $700m before 2012 when there was filing delay benefits but no other EGC benefits, suggesting that the value of this 15-day filing delay is negligible for firms around $700m float.

[10] For regulations that also have a revenue-based threshold, we condition on firms being below the revenue threshold in forming our samples, so that public float is the only relevant margin for regulatory avoidance. We do not find significant bunching below the revenue thresholds (see Figure A.1), consistent with revenue being much harder to manipulate than public float.

[11] In certain periods, the $75m and $700m thresholds were also associated with a few alternative regulations. We discuss these regulations in Section 6.1 and show that they do not affect our estimates.

our methodology precludes us from studying uniformly implemented regulations that are not threshold-based such as Reg FD and options expensing requirements. A more comprehensive list of non-threshold-based SEC regulations is summarized in Appendix Table A.3.

2. Empirical facts

2.1. Bunching at regulatory thresholds

Fig. 1 shows the distributions of firms' public float around the three regulatory thresholds detailed in Section 1.2. The left panels plot the CDFs and the right panels plot the histograms. If there is bunching in public float, the CDF should be steeper before the cutoff and flatter after the cutoff, leading to a bulge in the distribution relative to the counterfactual CDF without bunching. Further, the histogram should also show a sharp drop in density after the cutoff than before it. Fig. 1 shows just such a pattern. For all three thresholds, the CDF in bunching years is more concave than that in non-bunching years, generating a clearly visible gap between the two. The histograms also show a sharp drop in the density of firms' public float after the cutoffs in bunching years and a smooth density around the cutoffs in non-bunching years. These bunching patterns themselves suggest that the regulations triggered by these thresholds are *on average* costly for firms, so that they are willing to avoid them.[12] In contrast, in Fig. 2, we find no bunching nor differences in float distributions across bunching and non-bunching years around three placebo thresholds unrelated to any regulations. These placebo figures suggest that the float distribution in non-bunching years serves as a good counterfactual for the distribution in bunching years. Our bunching estimators exploit these bunching patterns to estimate the implied regulatory benefits associated with staying below the regulatory cutoffs.

2.2. How firms manipulate public float

In this section, we examine how firms manipulate their public float, which directly informs how we model the costs of bunching in Section 3.2. Firms can 1) reduce investment, 2) increase debt, or 3) increase inside ownership to fund the reduction in public float. The first margin concerns firms' operations while the latter two concern the financing side of firms' balance sheet. If a firm reduces equity without increasing debt, its operation (and thus investment) would need to shrink. On the other hand, if a firm keeps its operations constant, a shortfall in equity will need to be filled with debt, leading to higher leverage. Alternatively, firms could keep both leverage and investment constant and only adjust the fraction of shares held by insiders vis-à-vis public investors.[13]

To test the above margins, we compare the characteristics of firms just above and just below each threshold. If, for example, firms manipulate float by substituting debt for equity, we should observe that bunching firms on average have higher leverage than similar non-bunching firms. Given that bunching firms tend to concentrate just below the threshold, we should in turn observe that firms just below the threshold have higher leverage on average than firms just above it. One concern with the above comparison is that firms on the two sides of the threshold may be inherently different due to their size differences. To address this, we further compare the differences in bunching and non-bunching years. In non-bunching years, any differences between firms above and below threshold should reflect their inherent differences, rather than the outcome of manipulation. Hence, we estimate the following specification on a small window of firms around each of the three thresholds:

$$Y_{i,t} = \theta \times \textit{Below threshold}_{i,t} + \beta \times \textit{Below threshold}_{i,t} \times \textit{Bunching years}_t + X_{i,t} + \varepsilon_{i,t} \quad (1)$$

where *Below threshold*$_{i,t}$ indicates a firm's public float being below threshold, *Bunching years*$_t$ indicates treated years as in Table 3, and $X_{i,t}$ is a vector of controls that include industry fixed effects, year fixed effects, and the lagged dependent variable. To address the potential bias introduced when using the lagged dependent variable as a control, we use the twice-lagged level of the dependent variable as an instrument. The dependent variable $Y_{i,t}$ is book leverage, investment, or fraction of non-affiliated shares (i.e., one minus the fraction of closely-held shares). We do not include firm fixed effects because most firms show up only once in our narrow window sample. As such, our comparisons are largely cross-sectional rather than within-firm.

Table 2 reports the estimation results where each panel considers a different threshold. Column 1 shows that public float distortion leads to increases in book leverage. In contrast, the remaining columns show that firms neither alter their investment nor insider ownership around the threshold changes. Column 2 considers the standard CAPEX-based measure of investment. Columns 3 and 4 use alternative measures of investment that incorporate intangibles such as R&D and SG&A (Ewens et al., 2020). The signs are as predicted in some specifications, but lack statistical and economic significance. The final column reports the change in insider ownership result. The coefficient estimates are statistically and economically insignificant. Figure A.2 shows that, in bunching years relative to non-bunching years, there is a run-up in book leverage from fiscal Q1 to Q2, when public float is measured, and that the higher leverage sustains into Q3. This finding corroborates the idea that firms bunch by manipulating leverage.

Table A.4 further examines whether firms change other aspects of their operations to avoid regulation. Using the same specification as Table 2, we find no significant changes in a wide variety of operational outcomes, including total assets, tangibility, asset turnover, and profitability, consistent with no changes in investment. We also examine how firms reduce their public float, regardless of how they fund these reductions. The main way is to increase payouts, including dividends and repurchases. Column 5 of Table A.4 confirms this: in bunching years firms just below the thresholds have higher total payouts than firms just above.

Overall, these results together suggest that firms keep their public float below threshold through increasing payouts, while using debt to fill the equity shortfall with unchanged operations. This is likely due to the fact investment is often lumpy and irreversible, while leverage can be adjusted in a more granular manner. Consistent with our finding, Weber and Yang (2020) and Alsabah and Moon (2020) also find leverage to be the main margin of adjustment around the \$75m and \$700m threshold, respectively. In the following exercise, we infer the regulatory costs based on the adjustment of leverage.

3. Bunching estimator of regulatory costs

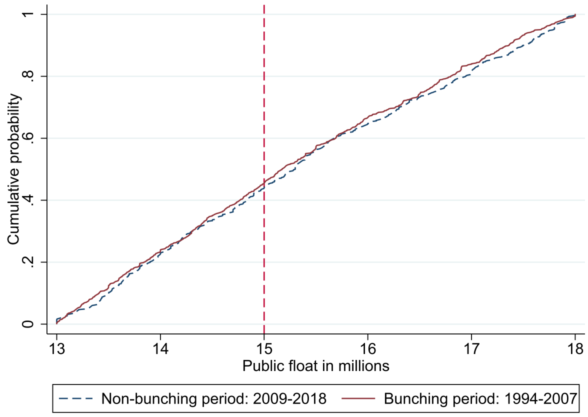
This section lays out the bunching estimator that we use to quantify regulatory costs.

3.1. A primer for bunching estimation

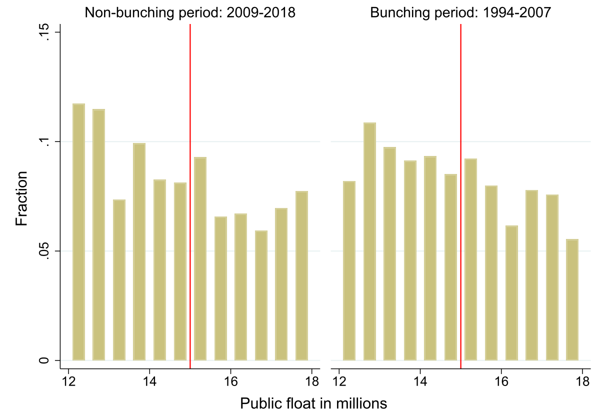
The public finance and labor economics literatures originally developed bunching estimation to analyze taxpayers' strategic response to changes in tax rates at tax brackets (Saez, 2010; Chetty et al., 2011; Kleven and Waseem, 2013). The key idea is simple: if a threshold-based policy results in a discrete change in the payoff function of rational

[12] The bunching patterns do not imply that regulatory compliance is on net costly for *all* firms. For example, some firms may find it beneficial to voluntarily comply even if they are below the threshold. This may happen if the signaling value of voluntary compliance outweighs the costs of compliance.

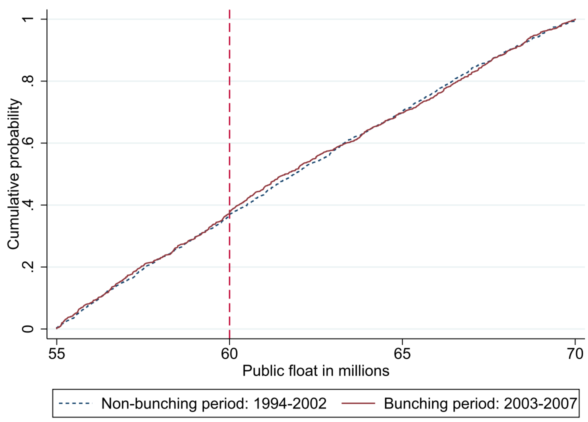
[13] Theoretically firms can also manipulate their quarterly earnings to influence stock prices. However, second quarter earnings are typically announced after the end of the second quarter (i.e., when public float is computed), making such manipulation infeasible for most firms.



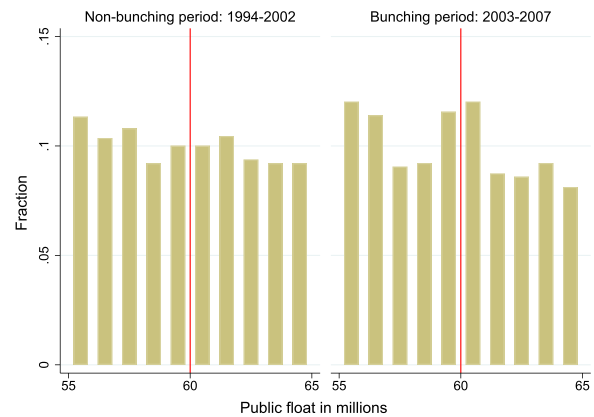
(a) CDF: $15 mil



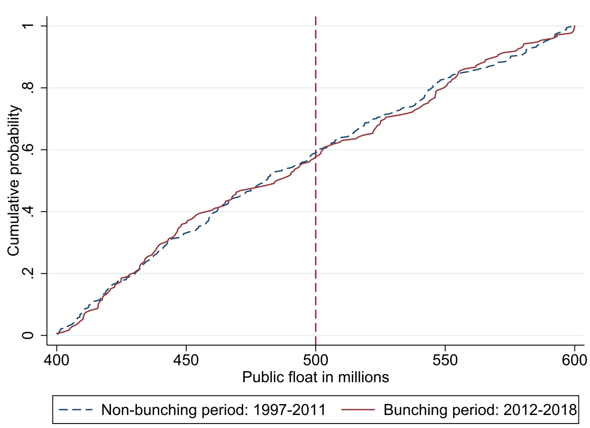
(b) Histogram: $15 mil



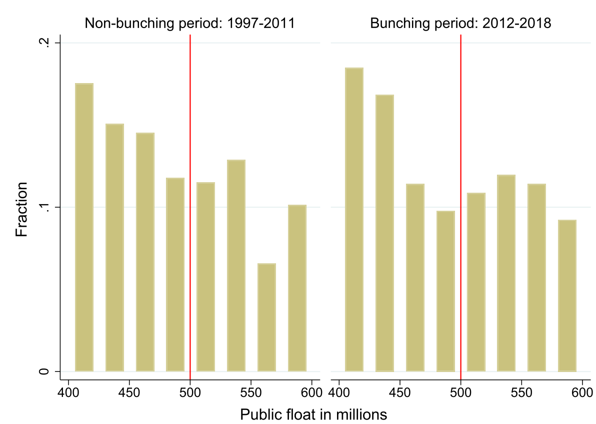
(c) CDF: $60 mil



(d) Histogram: $60 mil



(e) CDF: $500 mil



(f) Histogram: $500 mil

Fig. 2. CDFs and Histograms for Public Float around Placebo Thresholds. These figures show the cumulative distribution functions and histograms for firms' public float around three placebo thresholds that are below our actual regulatory thresholds: $15M, $60M, and $500M. The samples are based on the same sample periods and filters as for our main samples, except for public float range.

agents, then some agents should bunch at the threshold, and the extent of bunching should reveal the underlying economic parameters about the policy or the payoff function.

Bunching estimation typically involves two steps. First, one estimates a behavioral response to the threshold using the bunching variable distribution. The goal here is to answer the question: how many agents choose to bunch? In the second step, the behavioral response is translated to a structural parameter through the lens of an economic model of the agent's payoff. The observed bunching is a result of two forces: (1) policy-induced payoff change (how costly it is to cross the threshold), and (2) the elasticity of the behavioral response (how costly it is to manipulate the bunching variable). Larger policy-induced payoff change or higher elasticity of the behavioral response will lead to greater observed bunching.

Table 2
How firms manipulate public float.

Dep. var.	*Book leverage* (1)	*Investment1* (2)	*Investment2* (3)	*Investment3* (4)	*Non-aff. own.* (5)
	Panel A. $25m threshold				
Below $25m × Bunching years	0.098*	0.025	0.013	0.013	-0.034
	[0.050]	[0.025]	[0.023]	[0.039]	[0.090]
Year FE and SIC3 FE	Yes	Yes	Yes	Yes	Yes
N	1213	1120	1119	1077	571
Mean of dep. var.	0.263	0.055	0.131	0.192	0.743
	Panel B. $75m threshold				
Below $75m × Bunching years	0.014**	-0.008	-0.011	-0.013	0.032
	[0.006]	[0.009]	[0.008]	[0.010]	[0.045]
Year FE and SIC3 FE	Yes	Yes	Yes	Yes	Yes
N	3117	3015	3003	2867	2240
Mean of dep. var.	0.170	0.047	0.09	0.133	0.729
	Panel C. $700m threshold				
Below $700m × Bunching years	0.050*	-0.016	-0.003	0.003	-0.012
	[0.028]	[0.010]	[0.029]	[0.036]	[0.043]
Year FE and SIC3 FE	Yes	Yes	Yes	Yes	Yes
N	229	228	227	226	185
Mean of dep. var.	0.199	0.057	0.12	0.172	0.800

This table examines how firms manipulate public float around regulatory thresholds. Specifically, we compare book leverage, investment, and non-affiliated ownership between firms just above and those just below the threshold, in bunching and non-bunching years. The three panels correspond to samples around the $25M, $75M, and $700M thresholds, respectively. *Book leverage* is total debt divided by total assets; $Investment1$ is capex divided by lagged total assets; $Investment2$ is (capex + R&D) divided by lagged (total assets + knowledge capital); $Investment3$ is (capex + R&D + γ*SG&A) divided by lagged (total assets + knowledge capital + organizational capital), where γ, knowledge capital, and organizational capital are from Ewens et al. (2020); *Non-aff. own.* is the fraction of shares held by public investors. Samples in the top (middle) (bottom) panel focus on firms with a public float between $20M and $30M ($60M and $90M) ($600M and $800M). Bunching and non-bunching years are defined in Table 3. All panels include year fixed effects, industry (3-digit SIC) fixed effects, and the lagged dependent variable in year $t-1$. The lagged dependent variable is instrumented using the twice-lagged value in $t-2$. Robust standard errors clustered by industry and year are in parentheses. * indicates statistical significance at the 10% level, ** at the 5% level, and *** at the 1% level.

Table 3
Bunching estimates of regulatory costs.

Threshold	$ 25 mil (1)	$ 75 mil (2)	$ 700 mil (3)
		Panel A. Estimates	
Marginal firm ($\bar{e}$) ($m)	26.869	94.524	833.416
	[0.349]	[1.786]	[12.371]
Regulatory costs (k) ($m)	0.022	0.132	0.873
	[0.007]	[0.020]	[0.125]
PV(regulatory costs)/Public float (%)	1.205	1.841	1.164
	[0.404]	[0.281]	[0.167]
Non-bunching fraction (α)	0.470	0.770	0.510
	[0.136]	[0.048]	[0.131]
Δ Leverage	0.051	0.108	0.070
	[0.010]	[0.010]	[0.007]
		Panel B. Parameters	
Public float/Assets (η)	2.000	0.880	1.572
Tobin's Q (q)	2.720	1.680	3.570
Interest rate (r)	0.115	0.093	0.049
Marginal cost of debt (β)	4.637	5.130	6.192
		Panel C. Sample	
Bunching sample	1994-2007	2003-2007	2012-2018
Non-bunching sample	2009-2018	1994-2002	1997-2011
Identified regulation	Scaled disclosure	SOX 404+ filing delay	EGC benefits
Sample size	1378	10028	1575

This table presents the bunching estimation results. *Marginal firm* is the public float of the firm that is indifferent between bunching and not bunching. *Regulatory costs* are the estimated annual costs of regulation k and are in $ million. *PV(regulatory costs)/Public float* is the percentage of the present value of future regulatory costs over public float. Bootstrapped standard errors are reported in brackets.

We adapt the existing bunching method to our setting in two ways. First, in the classic bunching setting, the policy-induced payoff change is known (e.g., changes in tax rate) and the goal is to estimate the elasticity of the behavioral change (e.g., labor supply elasticity). In our setting, the elasticity of the behavioral response is known (i.e., the leverage distortion cost for firms) and the goal is to estimate the unknown policy-induced payoff change (i.e., regulatory costs). Second, in a classic bunching setting, agents would only bunch *at* the regulatory threshold, creating a sharp spike at the regulatory threshold in the probability density function (PDF) (see Fig. 4(a)). In our setting, firms cannot perfectly control their public float due to volatility in share price. Firms may also "overshoot" and bunch far below the threshold to avoid crossing the threshold due to share price appreciations. As a result, the bunching pattern is quite fuzzy, as shown in the right panel of Fig. 1. We thus use the fuzzy bunching estimator developed by Alvero and Xiao (2020). Intuitively, bunching creates a bulge in the cumulative distribution function (CDF), as shown in Fig. 4(b). The fuzzy bunching estimator uses this bunching bulge's area to measure bunching. We detail this method in Section 3.3.

3.2. Model

We now describe the economic model of the payoff of the firms. Suppose there is a set of firms indexed by the optimal equity that they would like to choose in the absence of regulatory distortions, z. Since we find that firms do not manipulate insider ownership, we use equity and public float interchangeably in the model. Now a regulation imposes a cost of $k(z)$ if a firm's equity is above $\underline{e}$. Note that regulatory costs may be a function of firm size z since a portion of compliance costs could be variable costs that scale with size. Firms choose the quantity of equity e relative to the undistorted level z to maximize its payoff:

$$\max_{e} -\Phi(e-z) - k(z)\mathbf{1}_{\{e\geq \underline{e}\}}. \tag{2}$$

The first term of the payoff function, Φ, captures the costs that a firm incurs if its actual equity e deviates from its undistorted optimum z. Motivated by the empirical findings in Section 2 that firms bunch by substituting debt for equity, Φ can be interpreted as the capital structure distortion costs. We obtain the functional form of Φ from Binsbergen et al. (2010, 2011)[14]:

$$\Phi(e-z) = \frac{1}{2}\beta\eta q z r^2 \left(1-\frac{e}{z}\right)^2 \tag{3}$$

where e is the actual equity; z is the optimal equity in the absence of regulatory distortion; β is the slope of marginal cost curve of debt from Binsbergen et al. (2010, 2011); η is public float-to-book asset ratio; q is Tobin's Q; r is interest rate on debt. In Section A.4.5, we show that our estimates are robust to using an alternative leverage distortion cost function from Korteweg (2010).

Our main estimation uses firms just above the float of the marginal bunching firm in the bunching period to parameterize η, q, and r, because these firms are uncontaminated by potential bunching incentives.[15] In Section 6.3, we show that our estimates are similar if we use firms *around* the float of the marginal bunching firm to obtain these parameters. We do not use data in the non-bunching period because these financial ratios can vary significantly with market conditions. Binsbergen et al. (2010) estimate β to be 4.733 for the average Compustat firm. We estimate a local version of β on the subsample of firms around each of the thresholds, following Binsbergen et al. (2010)'s method. Table A.14 shows that the local β is 4.637, 5.130 and 6.192 for the three thresholds, respectively.

The second term of the payoff function (2), $k(z)\mathbf{1}_{\{e\geq \underline{e}\}}$, is the cost of regulation for a firm of size z. If a firm's equity is above a regulatory threshold, $\underline{e}$, then the firm is subject to that regulation which imposes a cost of $k(z)$. $k(z)$ captures both the direct costs of regulation, including fees to lawyers and accountants and costs of investing in the internal control system, and the indirect costs, including the competition effect of disclosing proprietary information, productivity loss from diverting resources from operation to compliance, and any constraints regulations impose on firms' operating decisions. The indirect costs are typically difficult to measure because they are not recorded in financial statements. However, indirect costs affect firms' bunching decisions so that they can be estimated via our revealed preference approach. $k(z)$ may also include the benefits of regulation for those in compliance. For instance, better disclosure can reduce a firm's cost of capital. Thus, $k(z)$ should be interpreted as the net cost of regulation: compliance costs net of the benefits from compliance. We do not attempt to separately identify compliance costs and the benefits of compliance because for firms' compliance decisions or their public-private choice, what matters is the net costs. Importantly, this net cost function does not incorporate the social benefits of regulations, such as the effects on competition, investor welfare, and other general equilibrium outcomes. Instead, we are interested in the net cost facing firms that have to comply with these regulations, which is a useful input for policymakers to compare against the social benefits of regulations.

Fig. 3 shows the optimal choice of equity under different scenarios. Fig. 3(a) shows that, in the absence of the regulation, firms choose the optimal equity amount $e = z$ to minimize capital structure distortion. However, after the regulation is introduced, the payoff function is shifted downward by k in the region where the equity is above the regulatory threshold, as shown by Fig. 3(b). The discrete jump in regulatory costs creates an incentive to bunch. Specifically, firms just above the regulatory threshold find it more profitable to reduce their equity to $\underline{e}$ and avoid the regulatory costs. However, bunching is costly because of the costs from sub-optimal leverage, $\Phi(e-z)$. The loss in firm value is an increasing function of the undistorted equity because larger firms need to reduce more equity to bunch below the threshold, thus leading to a larger loss in firm value. Fig. 3(c) shows that if a firm's undistorted equity is far larger than the threshold, then it chooses not to bunch and instead incur the regulatory costs, $k(z)$. There exists a marginal firm $z = \overline{e}$ that is indifferent between bunching and incurring regulatory costs, as shown in Fig. 3(d). The indifference condition of the marginal firm reveals the regulatory costs. Formally, regulatory costs can be calculated as follows:

$$k(\overline{e}) = \Phi\left(\underline{e} - \overline{e}\right) \tag{4}$$

where $\underline{e}$ is the regulatory threshold and $\overline{e}$ is the undistorted equity of the marginal firm that is indifferent between bunching or not bunching. The marginal firm $\overline{e}$ is unique under a mild regularity condition, $\Phi_{zz}(z-\underline{e}) > k_{zz}$. If we know the size of the marginal firm $\overline{e}$, we can estimate the regulatory cost $k(z)$ for the marginal firm. In Section 3.3, we will estimate the value of the function $k(z)$ at one point—the corresponding marginal firm, $\overline{e}$—for each threshold. In Section 4.3, we will extrapolate the regulatory cost to firms of other sizes based on the fraction of fixed versus variable costs as well as other firm characteristics.

So far, our discussion holds the undistorted equity z constant for each firm. However, the model also applies to a setting where z grows over time. In this case, firms decide whether to bunch each year, depending on how far the undistorted optimal equity in that year is from the regulatory threshold. If the undistorted equity exceeds the regulatory threshold by a small amount, the firm will bunch at the threshold. The firm may stop bunching after a few years when the undistorted equity has grown much larger, and it becomes too costly to bunch. The implicit assumption is that firms do not have to commit to a bunching decision. Instead, they can decide whether to bunch period by period. This assumption is reasonable because firms can adjust their public

[14] Binsbergen et al. (2010, 2011) estimate marginal cost of debt functions for individual firm-years from variations in the tax benefits of debt. They then simulate the marginal benefit functions of debt according to the tax code. The cost of leverage distortion is the triangular area between the marginal cost and marginal benefit curves of leverage as shown in Figure 1 of Binsbergen et al. (2011), or $\frac{1}{2}\beta(\Delta IOB)^2 v$, where IOB is interest over book assets a, and v is firm value. Using the notations in this paper, the leverage distortion cost for a firm with optimal float z bunching at e is $\Phi(e-z) = \frac{1}{2}\beta(\Delta IOB)^2 v = \frac{1}{2}\beta\left(\frac{r(e-z)}{a}\right)^2 qa = \frac{1}{2}\beta r^2 \frac{z}{a}\left(\frac{e}{z}-1\right)^2 qz = \frac{1}{2}\beta r^2\eta q z\left(1-\frac{e}{z}\right)^2$.

[15] Specifically, we use firms with a float in [$27m, $33m], [$95m, $105m], and [$840m, $1000m] for the $25m, $75m, and $700m threshold, respectively.

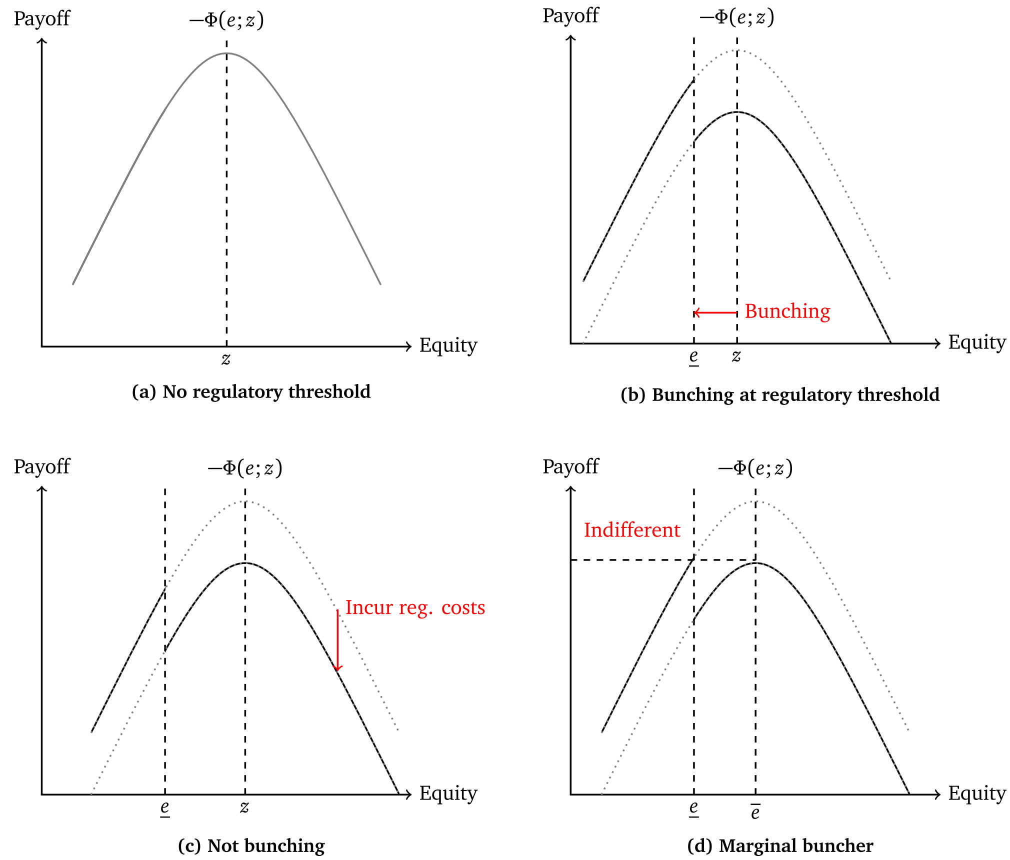


Fig. 3. Firm Payoff as a Function of Public Float. This figure illustrates the shape of a firm's payoff as a function of the public float e. Panel (a) illustrates a concave payoff function in the absence of a regulatory threshold. Panel (b) shows a new payoff function when a regulatory threshold is introduced at $\underline{e}$. The discontinuity in the payoff induces firms whose public float was somewhat above the threshold to bunch. Panel (c) shows a firm whose undistorted optimal float is way above the regulatory threshold and therefore chooses not to bunch. Panel (d) shows a payoff function for the marginal bunching firm who is indifferent between bunching and not bunching.

floats regularly by changing their payout policy. This assumption is also consistent with Figure A.3, which shows that most firms stay below the threshold for just a few years.

3.3. Estimation

We use the Alvero and Xiao (2020) fuzzy bunching estimator. Intuitively, bunching creates a bulge in the CDF, as shown in Fig. 4(b). The fuzzy bunching estimator uses the area of this bunching bulge to infer the marginal firm $\overline{e}$. Note that the marginal firm is not an actual firm. It is a *hypothetical* firm of a particular float size that will be indifferent between bunching or not. Formally, the bunching range $\Delta e \equiv \overline{e} - \underline{e}$ is given by:

$$\widehat{\Delta e} = \sqrt{\frac{2A}{f_0\left(\underline{e}\right)}}, \tag{5}$$

where $A \equiv \int \left(F(e) - F_0(e)\right) de$ is the bunching area, and F and F_0 are the actual and counterfactual CDFs, respectively. The intuition of the fuzzy bunching estimator can be shown in Fig. 4(b): the bunching area can be approximated by a triangle with a height of $f_0 \Delta e$ and a base of Δe. The area of the triangle is then $A = f_0(\Delta e)^2/2$, from which we can then solve for the bunching range Δe. Note that the integration can be calculated over the entire sample range or an interval that just contains the bulge. In theory, using a larger window will not bias the results because the actual and counterfactual distributions should overlap with each other outside of the bunching range (Alvero and Xiao, 2020). In the data, there could be confounding regulations far away from the threshold, which may contaminate our estimation. Therefore, in the estimation, we use a window that just contains the bunching bulge for each threshold. We have also verified that no other regulatory thresholds exist in our estimation window that would contaminate our estimation.

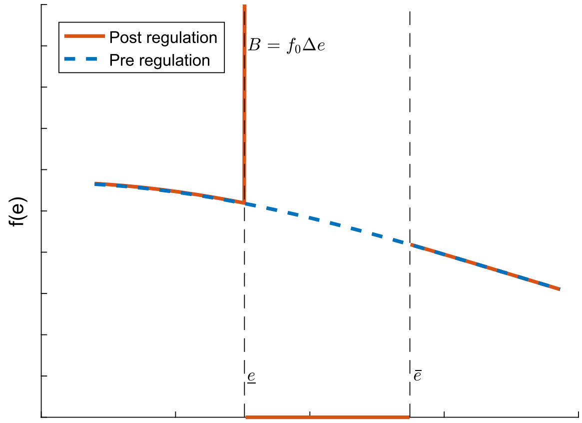
In many bunching settings, agents face optimization frictions such as switching costs, constraints, inattention, or inertia. In the context of our setting, constraints such as debt covenant restrictions and governance requirements (e.g., board approval) could limit the manager's ability to control float. Ignoring such frictions may bias the bunching estimates (Chetty, 2012). In the estimation, we follow Kleven and Waseem (2013) to introduce a parameter α to account for optimization frictions. This parameter can be interpreted as the fraction of non-optimizing firms that are not responding to bunching incentives. An analogous notion for the non-optimizing agents is the non-compliers in the instrumental variable approach and the fuzzy regression discontinuity design. α can be estimated from the probability mass in the dominated region $[\underline{e}, \overline{e}]$ using the following formula:

$$\hat{\alpha} = \frac{2\left(F\left(\overline{e}\right) - F\left(\underline{e}\right)\right)}{f_0\left(\underline{e}\right)\left(\overline{e} - \underline{e}\right)} - 1. \tag{6}$$

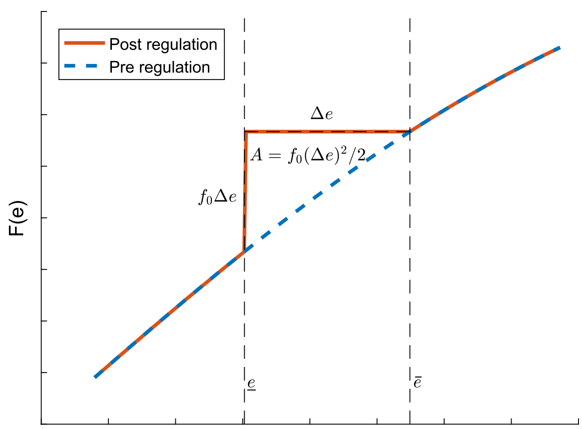
Note that in the presence of data noise, some mass may be moved into the dominated region. The above formula corrects this displaced mass.

The bunching range Δe adjusted for optimization frictions is given by:

$$\widehat{\Delta e} = \sqrt{\frac{2A}{(1-\alpha) f_0\left(\underline{e}\right)}}. \tag{7}$$



(a) Probability density function



(b) Cumulative distribution function

Fig. 4. Moments of Distribution Functions Used in Bunching Estimator. This figure shows the probability density function (upper panel) and the cumulative distribution function (lower panel) of public float in the presence of bunching. $\underline{e}$ is the regulatory threshold. $\overline{e}$ is the float of the marginal bunching firm. Δe is the bunching range from $\underline{e}$ to $\overline{e}$. B is the excess mass at $\underline{e}$. A is the area between the cumulative distribution functions before and after the regulation. f_0 is the probability density at $\underline{e}$.

3.4. Estimation samples

We estimate the above bunching model on samples of firms around each of our three regulatory thresholds. For each threshold, we use the years since its introduction as the "bunching sample" and examine the distribution of firms' public float around that threshold. We also construct the "non-bunching sample" using years before the threshold's introduction or after its expiration, which provides the counterfactual distribution of firms' public float in the absence of bunching incentives.

Specifically, to analyze firms' bunching below the $25m threshold, we focus on firms that were Small Business Issuers (SBI) in the previous fiscal year and will be eligible this year if public float stays below $25m. These are the firms with less than $25m gross revenue in the current and previous fiscal years and whose public float is less than $25m in the previous fiscal year. The sample period to construct the bunching distribution (bunching period) is 1994 to 2007. Since scaled disclosure was extended from firms below $25m float to those below $75m in 2008, the $25M cutoff no longer applies after 2008. The sample period to construct the counterfactual distribution (non-bunching period) is thus 2009 to 2018.[16]

To exploit the $75m threshold, we focus on non-accelerated filer firms that had less than $75m public float in the previous fiscal year. We focus on the bunching period of 2003 to 2007 to identify the combined value of SOX 404 internal control exemption plus delayed filing of 10-Ks and 10-Qs. Our non-bunching period is 1994 to 2002.

Last, we analyze firms' bunching around the $700m threshold for Emerging Growth Company status. We obtain all IPOs from 1997 to 2018 from Jay Ritter's website (Ritter, 2020), the Kenney-Patton IPO Database (Kenney and Patton, 2013), and SDC. We restrict the sample to U.S. issuers with a positive public float after IPO. Because firms cannot transition back into EGC after transitioning out, we restrict to firms that were EGC-eligible in the previous year, i.e., firm-years with less than $1 billion gross revenue in the previous and current fiscal years,[17] and with less than $700m public float in the previous fiscal year. Additionally, we restrict to the first three years after IPO since firms have the strongest incentives to bunch for EGC benefits when they are newly public (Alsabah and Moon, 2020). Our bunching period is from 2012 to 2018 and our non-bunching period is from 1997 to 2011.

Bunching estimation needs to be done in a local window around the regulatory threshold to avoid other thresholds or other confounding factors. Following the literature, we choose the estimation windows visually so that they just contain the bunching bulge. Our baseline estimation uses [$23m, $29.5m] for the $25m threshold, [$67.5m, $105m] for the $75m threshold, and [$630m, $840m] for the $700m threshold. We assess the robustness of the results with respect to the estimation window in Section 6.6.

4. Estimation results

4.1. Baseline results

Table 3 reports the bunching estimates of regulatory costs for each of the three thresholds. We first examine the $25m threshold in column 1, which identifies the costs of enhanced disclosure. We find that the marginal firm that is indifferent between bunching and not bunching has a $26.9m undistorted public float. Bunching of this marginal firm leads to a leverage distortion of 5.1 percentage points. The indifference condition of this marginal firm implies that the annual regulatory costs associated with enhanced disclosure are around $0.022 million per year. Using the cost of equity faced by the marginal firm, 6.7%, to discount the perpetuity of annual regulatory costs, we find that the present value of these regulatory costs accounts for 1.2% of the marginal bunching firm's public float. The share of non-optimizing agents, α, is 0.47, which suggests a fair amount of optimization frictions. For comparison, Kleven and Waseem (2013) find a non-optimizing share of 0.5–0.8 in a sample of individual taxpayers, while Best et al. (2015) find a non-optimizing share of 0.36 in a sample of mortgage borrowers.[18]

16 We exclude the transitioning year 2008 from our non-bunching period because firms could still choose to file as a Small Business Issuer in 2008 if their fiscal year ends after December 15th. Theoretically, we could also use the years before the introduction of this threshold (i.e., pre-1992) as the non-bunching period, but this precedes the introduction of EDGAR, which precludes from collecting public float data. We could not use a post-expiration period as the non-bunching period for the $75mil and $700mil thresholds because they are still in place and have not expired.

17 The gross revenue threshold was adjusted to $1.07 billion from 2017 onward.

18 If we assume that the share of non-optimizing agents is zero, that is, no frictions in regulatory avoidance, the estimated regulatory costs would be 30%-60% lower than the baseline, depending on the threshold, as shown in Table A.18.

Table 4
Benchmarking estimated regulatory costs.

Threshold	\$ 25 mil (1)	\$ 75 mil (2)	\$ 700 mil (3)
Regulatory costs (k)	0.022	0.132	0.873
Identified regulations	Scaled disclosure	SOX 404 + filing delay	EGC benefits
Total assets	14.70	117.68	566.30
EBITDA	-0.23	11.24	35.35
Net income	-0.90	4.33	6.19
k/Total assets	0.15%	0.11%	0.15%
k/EBITDA	-9.71%	1.17%	2.47%
k/Net income	-2.45%	3.05%	14.11%

This table benchmarks the estimated annual regulation costs k against the marginal bunching firms' total assets, EBITDA, and net income. All numbers are in millions of USD except percentages.

Column 2 reports the estimation for the \$75m threshold in the 2003–2007 period. This threshold relates to the regulatory costs of SOX 404 and accelerated filing deadlines. Here, the marginal bunching firm has an undistorted float of \$94.5m. Bunching of this marginal firm leads to an increase in leverage ratio of 10.8 percentage points. The indifference condition of this marginal firm implies that the annual regulatory costs associated with SOX 404 compliance and accelerated filing are \$0.132 million per year. Based on a local discount rate of 7.6%, the present value of these annual regulatory costs accounts for 1.84% of the marginal bunching firm's firm value.

Lastly, column 3 reports the estimates for the \$700m threshold. This threshold identifies regulatory costs of losing EGC benefits, which contain scaled disclosure, SOX 404 exemption, and a few other regulatory reliefs on disclosure and security issuance. The estimates show that the marginal bunching firm has an undistorted float of \$833m. Bunching of this marginal firm leads to an increase in leverage ratio of 7 percentage points. The magnitude of this leverage change is close to that documented in Alsabah and Moon (2020). The indifference condition of this marginal bunching firm implies that the annual regulatory costs associated with losing EGC benefits are around \$0.87 million per year. The present value of these annual regulatory costs, based on a local discount rate of 9%, represents 1.16% of the marginal bunching firm's public float.

To further facilitate the interpretation of the magnitude of our estimated regulatory costs, we benchmark these costs against the total assets and profits of the marginal bunching firm. Table 4 reports the results. For the marginal firm that bunches for the \$25m threshold, annual enhanced disclosure costs around 0.15% of its total assets. For the marginal firm bunching for the \$75m threshold, annual SOX 404 compliance and accelerated filing cost 0.1% of its total assets, 1.2% of EBITDA, and 3.1% of net income. Finally, for the newly public marginal firm bunching for the \$700m threshold, the annual cost of losing all EGC benefits (a combination of disclosure and internal control reliefs) amounts to 0.15% of its total assets, 2.5% of EBITDA, and 14.1% of net income. These results suggest that small firms as well as newly public firms face particularly high regulatory costs as a percentage of their size and profit.

4.2. Heterogeneity

So far, we estimate the regulatory costs for the marginal firm in the full sample. A natural question is whether the regulatory costs vary across subsamples of firms with different characteristics. To this end, we consider eight covariates that may influence regulatory compliance costs: Tobin's Q, ROA, tangibility, cash ratio, asset turnover, Hoberg-Phillips industry competition, and two indicators for manufacturing and financial/utilities industries, respectively. Because these characteristics may correlate with each other, we orthogonalize them against each other and public float to capture their incremental effects. We then split our estimation samples by each characteristic at the median and re-estimate the regulatory costs for each subsample.

Panel A of Table 5 reports the results. Three findings emerge: 1) Firms facing higher competition bear higher regulatory costs than those facing lower competition, consistent with competition increasing the proprietary cost of disclosure, as well as limited benefits of internal governance when external governance is strong (Giroud and Mueller, 2010). 2) High-Tobin's Q, low-tangibility, or non-manufacturing firms generally face higher regulatory costs than other firms, consistent with regulatory compliance being more distortionary for high-growth firms with more intangible assets. 3) Financial and utility firms face slightly lower regulatory costs than firms in other industries. One possible explanation is that these firms, being subject to additional industry-specific regulations, find compliance with SEC regulations relatively easier compared with other firms

Our baseline estimates are the average regulatory costs facing the marginal firm over the estimation sample period. It is, however, possible that changes in actual or perceived enforcement may lead to changes in perceived regulatory costs over time. To this end, we conduct a subsample analysis by splitting each of our estimation samples into two equal halves. We do this for each of the three thresholds and split both the bunching period (i.e., "treatment" sample) and the non-bunching period (i.e., "control" sample) by the corresponding mid-year. This generates separate estimates for earlier versus later years. The bottom two rows of Panel A, Table 5 show the results. We find that the regulatory costs are in fact relatively stable over time: earlier period estimates are similar to those for later periods.

4.3. Extrapolation

Our baseline estimation provides an estimate of the regulatory costs facing a hypothetical marginal firm that has a size of $\overline{e}$. In this section, we extrapolate these estimates to firms of other sizes. The extrapolation exploits the extent to which the regulatory costs are variable (i.e., proportional to size) versus fixed. If the regulatory costs are all fixed costs, then all firms have the same regulatory costs as the marginal firm regardless of firm size. However, if the regulatory costs are all variable, then the regulatory costs should scale proportionally with firm size. Formally, we define κ_0 as the sensitivity of the regulatory costs to firm size. The incremental regulatory costs of a firm of size z_i relative to the marginal firm of size $\overline{e}$ is $\kappa_0(\ln z_i - \ln \overline{e})$.

We estimate the sensitivity of regulatory cost to firm size, κ_0, using two sets of data. First, we use surveyed SOX 404 compliance costs from the SEC study (SEC, 2011) to estimate their relationship with firms' public float.[19] Note that we do not require firms to truthfully report compliance costs in the survey data – the self-reported costs could be biased. We simply require that firms do not bias the variable and fixed components differentially, which is a much weaker assumption. We also do not require the survey to capture all cost components – it could omit indirect costs or the benefits of compliance. We simply require that these omitted costs have similar fixed-vs-variable decomposition as the reported costs. Second, we use the relationship between pre-SOX audit fees from Audit Analytics and firms' public float to estimate the cost structure of disclosure compliance. Pre-SOX audit fees mainly capture financial reporting costs and do not include internal control costs. Last, we use the relationship between post-SOX audit fees, which capture both disclosure and internal control costs, and firms' public float to estimate the cost structure of EGC benefits. In both cases, we exclude from Audit Analytics data firm-years that are exempted from the relevant regulation.

[19] The SEC study only reports the average itemized compliance costs by public float interval and time period. We treat each float interval-period as one observation and weight the observations by the number of responding firms.

Table 5
Heterogeneity and extrapolation.

Panel A: Heterogeneity

	$25 mil	$75 mil	$700 mil	$25 mil	$75 mil	$700 mil
	Regulatory costs (k) ($m)			PV(regulatory costs)/Public float (%)		
Baseline	0.022	0.132	0.873	1.205	1.841	1.164
Low Tobin's Q	0.016	0.143	0.602	0.873	1.968	0.826
High Tobin's Q	0.040	0.149	0.940	2.175	2.045	1.245
Low tangibility	0.029	0.187	0.943	1.580	2.495	1.249
High tangibility	0.033	0.093	0.819	1.793	1.340	1.097
Low HP competition	0.018	0.142	0.769	0.987	1.959	1.036
High HP competition	0.044	0.142	0.951	2.373	1.960	1.258
Non-manufac.	0.053	0.186	0.939	2.835	2.476	1.244
Manufac.	0.011	0.094	0.812	0.606	1.363	1.089
Non-fin. or utility	0.032	0.172	0.937	1.750	2.314	1.242
Fin & utility	0.029	0.130	0.836	1.598	1.812	1.119
Low ROA	0.015	0.165	0.791	0.869	2.241	1.063
High ROA	0.040	0.088	0.934	2.146	1.283	1.237
Low cash ratio	0.035	0.133	0.933	1.898	1.848	1.237
High cash ratio	0.021	0.154	0.729	1.165	2.103	0.986
Low turnover	0.046	0.130	0.803	2.467	1.817	1.078
High turnover	0.025	0.150	0.945	1.405	2.054	1.251
Early sample period	0.023	0.113	0.889	1.257	1.596	1.183
Late sample period	0.019	0.156	0.948	1.050	2.130	1.254

Panel B: Extrapolation Parameters

	κ_n (Extrapolation coefficient)			$\overline{x}_n$ (Covariate value for marginal firms)		
	$25m	$75m	$700m	$25m	$75m	$700m
Ln(public float)	0.412	0.456	0.423	17.106	18.364	20.541
	[0.027]	[0.028]	[0.019]			
Tobin's Q	0.052	0.008	0.077	2.719	1.683	3.571
	[0.043]	[0.066]	[0.071]			
Tangibility	0.442	-2.538	-0.440	0.056	0.089	0.039
	[2.694]	[2.749]	[2.155]			
HP competition	0.032	0.000	0.009	2.522	3.078	4.221
	[0.031]	[0.016]	[0.013]			
Manufacturing	-2.275	-0.943	-0.190	0.376	0.391	0.364
	[0.872]	[0.832]	[0.357]			
Fin. & utility	-0.245	-0.706	-0.216	0.315	0.248	0.152
	[1.790]	[1.454]	[0.934]			
ROA	0.874	-1.585	0.466	-0.063	0.013	0.022
	[0.683]	[1.736]	[2.020]			
Cash ratio	-1.329	0.480	-0.577	0.133	0.104	0.422
	[1.575]	[1.420]	[1.215]			
Asset turnover	-0.576	0.145	0.208	0.114	0.520	0.393
	[0.716]	[0.449]	[0.828]			

Panel A shows the heterogeneity of our baseline estimates in Table 3 across different cuts. The first row shows our baseline results. The other rows show heterogeneity (split at median except for indicators) along Tobin's Q, tangibility, Hoberg-Phillips product market competition, tangibility, manufacturing indicator, financial and utility indicator, ROA, cash ratio, and asset turnover. The last two rows show subsample results by earlier or later sample periods. *Regulatory costs* are the estimated annual costs of regulation k in $ million. *PV/Public float* is present value of future regulatory costs as a percentage of public float discounted at local discount rates. Panel B shows the parameters for our multivariate extrapolation. κ_n is the sensitivity of log regulatory costs to covariates estimated from sub-sample analysis in Panel A. The bootstrapped standard errors for κ_n are reported in brackets (see Appendix Section A.4.2 for details on boostrapping). $\overline{x}_n$ is the value of the covariate for the marginal firm estimated by averaging across firms around the float of the marginal firm.

To guide our extrapolation, we first plot the non-parametric relationship between regulatory costs and public float to learn about the function form. Figure A.4 shows binned scatter plots and local polynomial smoothing plots of ln(float) and ln(audit fees). We see a near-linear relationship.[20] Based on this, we estimate the following parametric relationship between reported regulatory costs and firms' public float:

$$\ln(\text{compliance costs}_{i,t}) = \kappa \ln(\text{public float}_{i,t}) + \delta_t + \epsilon_{i,t}. \tag{8}$$

Table A.5 reports the estimates based on equation (8). Panel A reports the results for surveyed SOX 404 compliance costs. Column 1 estimates the elasticity of 404(b) audit fees to public float to be 0.432. We obtain an estimate of 0.456 when looking at the total SOX 404 compliance costs in column 5, which we use as our estimate of κ_0. Columns 1 and 2 of Panel B report the relationship between pre-SOX audit fees and public float. Based on the coefficient for audit fees in column 1, we estimate the elasticity of disclosure cost to public float to be 0.412. Although we do not have data on reported values of EGC benefits, we can approximate its cost structure using post-SOX audit fees, which capture both disclosure and internal control costs. Column 2 of Panel B reports the relationship between post-SOX audit fees and public float. The coefficient estimate implies an elasticity of combined disclosure and internal control cost to public float of 0.423, which reassuringly lies between the elasticities for disclosure costs and internal control costs.

Regulatory costs can also vary with firm characteristics other than size. We can project regulatory costs conditional on firm characteristics based on the estimates in the subsamples sorted by firm characteristics, as shown in Panel A of Table 5. Specifically, we calculate the sensitivity

[20] The red line plots the parametric relationship estimated from equation (8), which closely tracks the non-parametric plots.

of regulatory costs to each characteristic using $\kappa_n = \Delta \ln k_n / \Delta x_n$, where $\Delta \ln k_n$ and Δx_n are the difference in the estimated log regulatory costs and difference in the n'th firm characteristic across the two subsamples, respectively. To capture incremental effects in a multivariate extrapolation, we orthogonalize x_n against each other as well as ln(public float) before computing κ_n.[21] Then, for a firm i whose n'th covariate is $x_{n,i}$, the incremental regulatory costs relative to the marginal firm are given by $\kappa_n(x_{n,i} - \overline{x}_n)$, where $\overline{x}_n$ is the value of that covariate for the marginal firm.

Taking things together, we can estimate the regulatory costs for firm i using the following equation:

$$\ln k_i = \ln \overline{k} + \kappa_0(\ln z_i - \ln \overline{e}) + \sum_{n=1}^{N} \kappa_n(x_{n,i} - \overline{x}_n), \tag{9}$$

where $\overline{k}$ is the regulatory costs estimated for the marginal firm in Table 3, κ_0 is the sensitivity of log regulatory costs to public float (capturing the degree to which regulatory costs are variable), z_i and $\overline{e}$ are the public float of firm i and the marginal firm, respectively, κ_n is the sensitivity of log regulatory costs to the n'th orthogonalized covariate, $x_{n,i}$ and $\overline{x}_n$ are the value of the n'th covariate for firm i and the marginal firm, respectively. The estimated sensitivities (κ_n) and covariate values for marginal firms ($\overline{x}_n$) are reported in Panel B of Table 5. Appendix A.4.1 summarizes the detailed steps of our multivariate extrapolation.

The extrapolation requires more assumptions than those of the baseline bunching estimation. First, since the decomposition of variable versus fixed costs is estimated using data that largely reflect direct rather than indirect compliance costs and omit compliance benefits, we implicitly assume that the benefit of compliance (or indirect costs) has the same fixed-vs-variable decomposition as the direct cost. Second, we assume that the relationship between regulatory costs and firm characteristics is largely stable across firm sizes. While the extrapolation exercise allows us to make broader points, it faces the trade-off between external validity and clean identification. To address the concern that our estimates are driven by a particular assumption, in the next section, we also provide a range of estimates based on alternative assumptions.

4.4. Regulatory costs across firms and over time

Using the above extrapolation, we can compute the regulatory costs for companies of any public float in any year in our data. For the median-sized US public firm with a \$102m float, it faces annual enhanced disclosure costs of \$0.036m, SOX 404 compliance costs of \$0.129m, and combined costs of disclosure and internal governance captured by EGC benefits of \$0.361m. These costs are 0.25%, 0.88%, and 2.46% of the median firm's EBITDA, respectively. Based on an 8.25% local discount rate, the combined annual disclosure and internal governance costs of \$0.361m translate to 4.3% of the median firm's public float on a present value basis, with a 95th confidence interval of $[2.60\%, 7.77\%]$ based on bootstrapped standard errors.[22] These regulatory costs are therefore economically meaningful for a median US public company.[23] The estimate is robust to several alternative estimations of the cost structure parameter, including a non-parametric estimator, adjusting for potential omitted variables, and exploiting plausibly exogenous variations from M&As. We can also extrapolate based on float alone or orthogonalize dummy covariates using Logit with little change in results. We summarize these robustness estimates in Table A.6 and discuss the details in Section 6.7.

The extrapolation also allows a comparison of the cost estimates across the three thresholds. For example, we can extrapolate the values of scaled disclosure and SOX 404 exemption from the corresponding thresholds to the marginal firm bunching for \$700m for EGC benefits. This yields a combined value of \$0.58m for the marginal EGC bunching firm. This value is lower than the estimated total EGC benefits of \$0.87m. Such a difference can be attributed to the fact that EGC benefits include not only scaled disclosure, 404(b) exemption, and delayed filing, but also shorter financial history disclosure in the registration statement, delayed compliance with new accounting rules, and the ability to use test-the-waters communications with investors when issuing securities. Our estimates suggest that these latter benefits could be highly valuable for newly public firms.

We next examine the variations of the estimated regulatory costs across firms and over time. We first sum up all regulatory costs identified above to the firm-year level based on a firm's public float and the regulations in place in that year. Table A.7 summarizes this aggregation, which is derived from Table 1. We then use a heatmap to illustrate the variation of the present value of total regulatory costs as a percentage of firm's public float, by public float and year. Fig. 5 shows the result. The vertical axis represents public float, while the horizontal axis indicates year. Each cell on the graph represents firms of a specific size in a particular year. The warmth of the color indicates the magnitude of the regulatory costs. We find that smaller firms face heavier regulatory burden than larger firms in the early sample period. For example, at the beginning of our sample period, firms with \$10m float spend 10% of their public float on regulatory costs. In contrast, firms around \$1 billion float spend 0.8% of their public float on regulatory costs. After SOX in 2002, medium-sized firms (\$75m–\$700m) experienced a large jump in regulatory costs relative to their size and profit. The regulatory burden on medium and small firms were greatly lifted by the 2012 JOBS Act.[24]

Last, we aggregate our identified regulatory costs across all public firms in the U.S. and plot out the aggregate trends. Fig. 6 shows the time series for aggregate annual regulatory costs in dollars and as a percentage of aggregate EBITDA. The variation in aggregate regulatory costs primarily stems from changes in regulations over the years, shifts in firm size distributions, and to a lesser extent, adjustments in other firm characteristics. We find that the aggregate regulatory costs increased from less than \$3 billion in late 1990s to almost \$5 billion in 2018. There is a substantial jump after SOX, followed by a dip during financial crisis. Regulatory costs as a percentage of EBITDA increased from 0.21% before SOX to 0.29% after SOX. Since 2005, there has been a steady decline. Interestingly, JOBS Act did not lead to a noticeable decline in aggregate regulatory costs, likely because it only affects a small number of newly public firms. By 2018, regulatory costs relative to EBITDA have dropped to their pre-SOX levels.

4.5. Comparing with existing estimates

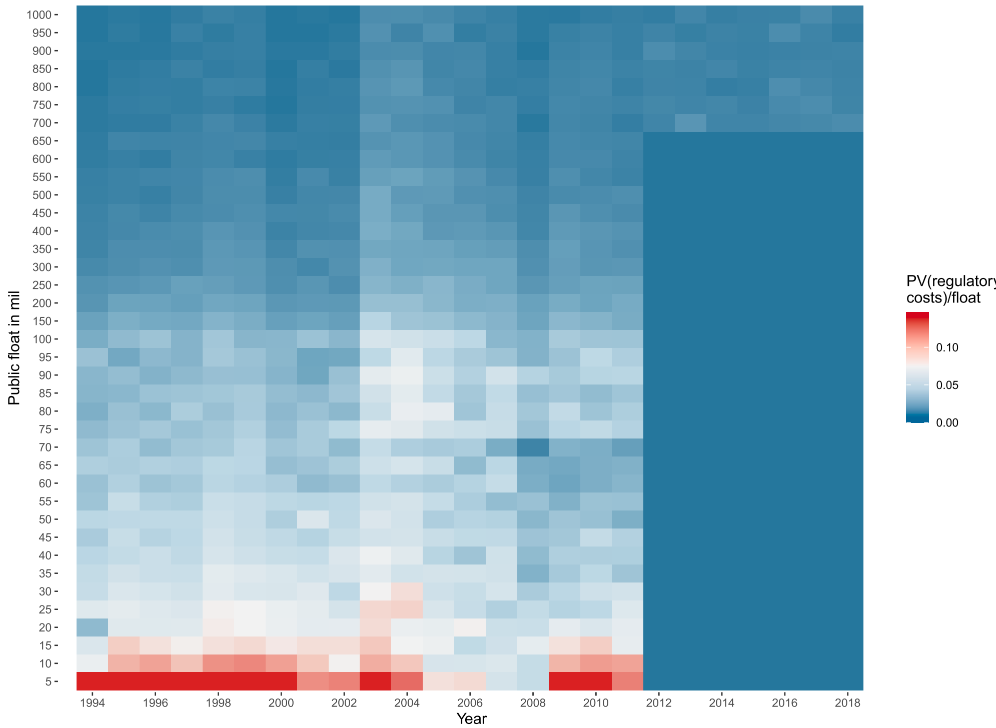
How do our estimates compare with existing estimates from surveys and previous research? We note a few caveats before any such comparison. First, existing evidence is limited due to the challenge of accurately identifying regulatory costs, so it is often difficult to find an exact counterpart for our estimate. Second, some existing evidence is based on

[21] We orthogonalize covariates in the full sample of firms rather than local samples close to thresholds because the extrapolation is across thresholds over all firms. Our results are similar if we orthogonalize the two industry dummies using logit rather than linear probability model (see Table A.6).

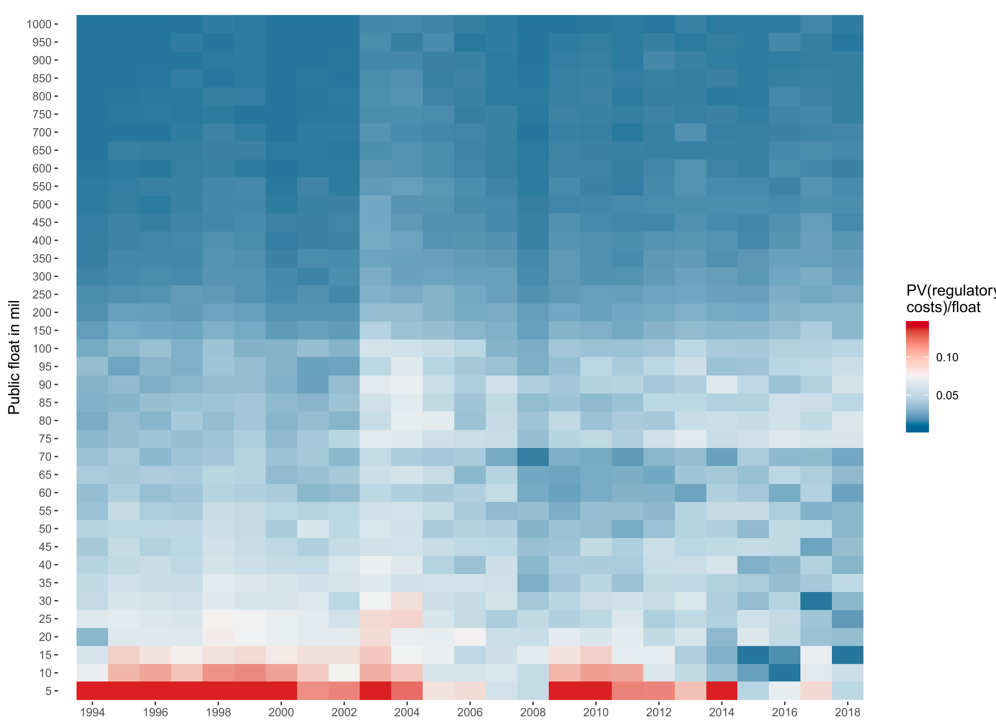
[22] While it might be tempting to sum up these three costs to calculate the total costs confronting the median public firm, this approach would be incorrect. The reason is that the third estimate already encompasses the first two as discussed in Section 4.1. Appendix Section A.4.2 details our bootstrapping method.

[23] If the extrapolation is based on the estimates in Table A.18 where the share of non-optimizing agents is assumed to be zero, the total regulatory costs for a median U.S. public firm would be 2.3%.

[24] Figure A.5 plots the relationship between public float and the present value of regulatory costs scaled by float for each of three periods: pre-SOX, post-SOX & pre-JOBS, and post-JOBS. Figure A.6 shows the heatmap for the raw, unscaled regulatory costs.



(a) Firms with public age<=5



(b) Firms with public age>5

Fig. 5. Estimated Present Value of Regulatory Costs Scaled by Public Float. These figures show, by public float and year, the estimated present value of total annual regulatory costs scaled by firms' public float. Panel A shows it for firms that went public less than 5 years ago (hence JOBS Act would apply after 2012). Panel B shows it for firms that went public more than 5 years ago. We estimate present values by discounting a constant perpetuity of annual costs at the cost of equity faced by firms of a particular public float.

surveys on firms or CEOs. As shown by Parker (2018) and Alvero et al. (2023), firms may have incentives to over-report their compliance costs in surveys in order to seek regulatory relief. Third, our bunching estimator estimates the *net* costs of regulation (i.e., compliance costs minus the benefits of compliance due to lower costs of capital). In contrast, existing databases or research often report gross compliance costs. Last, our estimates incorporate the indirect costs of compliance in addition to direct costs, while most existing estimates only capture direct

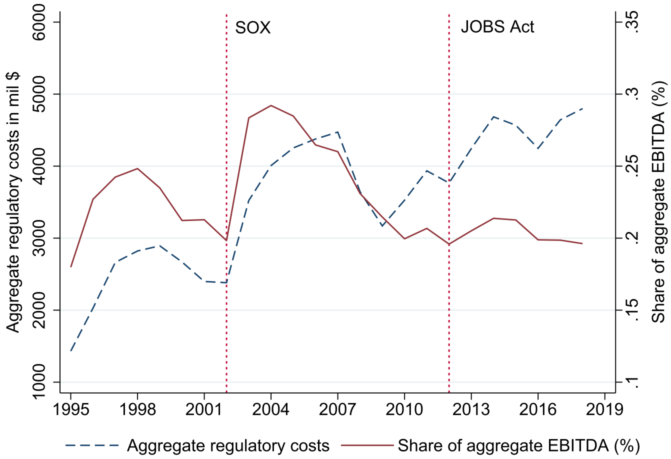


Fig. 6. Estimated Aggregate Regulatory Costs. This figure shows the estimated aggregate regulatory costs over time for all public firms with a non-zero public float. The dashed line shows the dollar costs in millions of USD. The solid line shows the percentage share of aggregate regulatory costs relative to aggregate EBITDA.

costs. With these caveats in mind, Section A.3 in the Appendix provides several comparisons to alternative methods of regulatory cost estimation. Overall, our results compare as expected given the differences in regulations, data inputs, and modeling assumptions.

4.6. How regulators can use our estimates

Our estimates are of interest to regulators, who routinely conduct cost-benefit analysis on existing regulations. For example, regulators can compare our net cost estimate with the social benefits of a regulation to gauge its optimality. Our bunching approach complements existing methods to estimate regulatory costs, such as firm surveys or reduced-form regression analysis of firms' financial data. Because the bunching approach estimates regulatory costs from firms' revealed preference, it is not prone to misreporting concerns in surveys; it also captures all net costs relevant to firms, including indirect costs. Furthermore, the bunching approach applies to settings in which reduced-form regressions may be biased by firms' strategic responses to regulations. Our estimates can also inform the rule-making of new regulatory proposals when the new rules bear similarity to existing ones, or when regulators conduct pilot experiments on a subset of firms. That said, for brand new regulations without precedents or any reference data from experiments, the bunching approach cannot be used for ex-ante cost-benefit analysis.

5. Regulatory costs and disappearing public firms

In this section, we examine how much our estimated regulatory costs can explain the disappearing public firms puzzle. We explore both the entry to and exit from public market. Doidge et al. (2017) show that each margin accounts for roughly half of the disappearing public firms since the 1990s.

5.1. Regulatory costs and IPO volume

We model the probability that firm i goes public in year t using a logit model:

$$\Pr(\text{IPO})_{i,t} = \frac{\exp\left(\beta \ln k_{i,t} + \gamma X_{i,t}\right)}{1 + \exp\left(\beta \ln k_{i,t} + \gamma X_{i,t}\right)}. \tag{10}$$

where $k_{i,t}$ is the regulatory costs borne by firm i in year t if it chooses to go public. The vector $X_{i,t}$ contains firm characteristics that affect the net benefits of IPO. The model is based on Chemmanur et al. (2010), except that we add regulatory costs as an additional explanatory variable.

We estimate the above logit model using maximum likelihood on a panel of 21,066 U.S. venture capital(VC)-backed firms from 1992 to 2018, of which 1,956 went public. Such firms are an important pipeline of IPOs, representing half of the IPO firms in our sample period (e.g., Ritter, 2020; Ewens and Farre-Mensa, 2020) To ensure a clean risk-set of private firm-years that face going public decisions, we track startups from their first VC round until exit or failure. We estimate public float upon IPO from last round valuation using the following equation: $\textit{Public Float}_{i,t} = \textit{Last valuation}_{i,t} \times \text{Avg}(\frac{\textit{Primary shares} \times \textit{Share price}}{\textit{Pre-money valuation}})_t \times \text{Avg}(\frac{\textit{Secondary shares+Primary shares}}{\textit{Primary shares}})_t$. We obtain the average ratio of raised amount to pre-money valuation from VentureSource and the average ratio of tradable shares (i.e., primary plus secondary) to primary shares from SDC. Both ratios are estimated at the yearly level. If a startup's valuation is missing in a given year, we linearly extrapolate using two known valuations. Startups with no reported valuations are excluded from the sample. We control for total financing raised, years since first VC round, and dummies for firms' headquarter state. We also include industry-year fixed effects to absorb sectoral shocks and changes in regulations that apply uniformly to all firms.

Given that we control for public float and the imputed regulatory cost depends on public float, our identifying variation comes from discontinuous changes in regulatory costs over time for a given firm size and across size thresholds for a given year, as induced by regulatory changes. This allows us to exploit the more exogenous variations in regulatory costs. Different from prior papers that study a particular reform, we use all regulatory changes to estimate the elasticity of IPO to the *dollar cost* of regulations, rather than to a regulatory change itself. Our use of *imputed* public float also makes sure that our regression is not subject to the endogeneity concern from float manipulation.

Table 6 presents the estimated results. Column 1 shows the logit coefficients and column 2 shows the marginal effects on percentage-point likelihood of going public. We find that a one-standard-deviation increase in our estimated regulatory costs is associated with a 7% decrease in the probability of a VC-backed firm going public in a year. We also find that years since first round negatively predicts IPO likelihood.

Table 6
Regulatory costs and IPOs.

	IPO	
	(1) Coefficients	(2) Marginal Effects
Regulatory costs (ln)	-0.055***	-0.021***
	[0.016]	[0.006]
Imputed public float (ln)	0.242***	0.090***
	[0.025]	[0.011]
Total funding raised (ln)	0.877***	0.327***
	[0.031]	[0.015]
Years since founding	-0.066***	-0.025***
	[0.008]	[0.003]
Industry-year FE	Yes	Yes
State FE	Yes	Yes
Observations	110,666	110,666

This table estimates a logit model of the IPO decision on a panel of VC-backed private firms. Column 1 reports the logit coefficients and column 2 reports the marginal effects on percentage-point likelihood of going public. The sample is a panel of 21,066 VC-backed firms from first VC round to the year before exit or failure from 1992 to 2018. *Regulatory costs* are the compliance costs estimated from Table 3 and extrapolated to all firm sizes. *Imputed public float* is the imputed public float upon IPO based on the most recent round of VC valuation (see Section 5.1 for details on imputation). *Total funding raised* is the cumulative sum of funding raised from VC. We control for state and industry-year fixed effects. Standard errors are clustered by firm.

Table 7
Counterfactual simulation of regulatory costs and IPOs.

	Actual regulation (1)	Actual regulation (2)	No SOX (3)	No JOBS Act (4)	Zero regulation (5)
	Pre-2000	Post-2000			
Regulatory costs ($m)	0.082	0.100	0.061	0.152	0.000
Regulatory costs / Public float (%)	0.485	0.256	0.242	0.455	0.000
IPO probability (%)	6.933	0.954	0.963	0.747	1.391
Yearly no. of IPOs	141.4	50.2	50.6	37.7	70.2
Total no. of IPOs	1044.0	912.0	921.0	714.3	1329.6
Total IPO public float ($b)	105.6	340.9	352.9	315.5	574.1

Column 1 shows the actual IPO outcomes before 2000 and columns 2 to 5 show counterfactual IPO outcomes under different regulatory scenarios after 2000. *Actual regulation* is the baseline scenario based on actual regulations. *No SOX* estimates are based on regulatory costs without SOX (see Panel A of Table A.8). *No JOBS Act* estimates are based on regulatory costs without JOBS Act (see Panel B of Table A.8). *Zero regulation* estimates are based on zero regulatory costs after 2000. *Regulatory costs* are the average annual regulatory costs facing potential IPO firms (i.e., VC-backed firms) in the corresponding period. *Regulatory costs / Public Float* is the average ratio of annual regulatory costs relative to public float for a potential IPO firm in the corresponding period. *IPO probability* is the average predicted probability that a potential IPO candidate will go public in the corresponding period. *Yearly no. of IPOs* is the average yearly predicted total number of IPOs, obtained by summing up predicted IPO probabilities in each year and take the yearly average over the corresponding period. *Total no. of IPOs* is the predicted total number of IPOs, obtained by summing up predicted IPO probabilities across the sample in the corresponding period. *Total IPO public float* is the predicted aggregate public float of IPO firms over the corresponding period, obtained by weighted summing the public float of potential IPO firms weighted by IPO probabilities.

The result that regulatory costs significantly impact private firms' decision to go public echoes the findings in Lowry et al. (2017), Aghamolla and Thakor (2019), and Breuer (2021). However, this is the first sensitivity estimation of the IPO decision to the *dollar value* of regulatory costs, rather than its response to a specific regulatory reform.

Using the estimated model, we conduct a set of counterfactual analyses of IPO outcomes by varying the regulatory costs $k_{i,t}$ after 2000, the period that witnessed dramatically lower numbers of IPOs. Columns 1 and 2 of Table 7 present the IPO outcomes before and after 2000 in the data. Columns 3 to 5 present the IPO outcomes after 2000 in three counterfactual scenarios. First, we consider a counterfactual scenario without SOX. Panel B of Table A.8 summarizes the regulatory burden borne by firms in different size group under this scenario. Column 3 shows that there is a slight increase in the probability of IPO and IPO volumes. In particular, removing SOX only increases average annual IPO likelihood post 2000 from 0.95% to 0.96% and leads to 9 more IPOs. The result may appear surprising given that the costs of SOX 404 are substantial. However, further investigation reveals that, in our sample, 82% of VC-backed firm would have a public float below SOX 404 exemption threshold upon IPO, which suggests that most VC-backed firms would be exempted from SOX 404 if going public. This finding is also consistent with Gao et al. (2013) and Doidge et al. (2013), who argue that the decline in IPOs is unlikely to be driven by SOX.

Prior research such as Dambra et al. (2015) finds that the IPO market partially recovered after 2012 passage of the JOBS Act. We examine how much of the recovery in IPOs can be explained by the reduction in the regulatory costs. To this end, we consider a scenario where the JOBS Act is absent in column 4 of Table 7. We show that, had JOBS Act not passed, the average annual IPO likelihood among VC-backed firms after 2000 would decrease from 0.95% to 0.75%. Further, the total number of VC-backed IPOs after 2000 would drop from 912 to 714, and the aggregate public float of these IPO firms decrease from $341b to $316b. The decline in the number of IPOs translates to an average 28.2 fewer IPOs per year over the period of 2012 to 2018, when JOBS Act was in effect. This estimate is somewhat larger than that of Dambra et al. (2015), who show that JOBS Act has led to 21 additional IPOs per year using a very different empirical methodology.

Finally, column 5 of Table 7 considers a scenario where all regulatory costs in Table 3 are zero post-2000. Removing these regulatory costs would increase post-2000 IPO likelihood among VC-backed firms from 0.95% to 1.4%. The average yearly number of VC-backed IPOs over 2000–2018 would increase from 50.2 to 70.2. While the effects are substantial, they would not offset the dramatic decrease in IPO volume after 2000. Removing all identified regulations increases average annual IPO likelihood post 2000 by 0.437%, which, compared with the 6% drop in IPO likelihood from before to after 2000, explains only 7.3% of the decline in IPO likelihood. Similarly, removing all regulatory costs after 2000 increases the average yearly number of IPOs over this period by 20, which offsets only 22% of the decrease in yearly IPO volume from pre-2000 to post-2000.

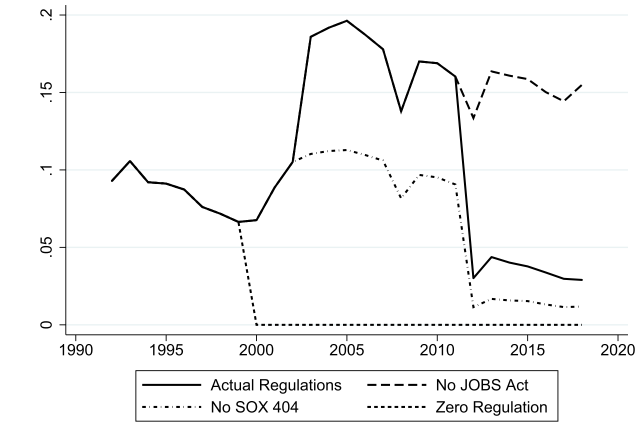
Fig. 7 shows our yearly counterfactual estimates for average regulatory costs facing potential IPO firms, annual IPO probability, and yearly number of IPOs. They confirm the limited role played by SOX and the significant impact of JOBS Act on IPO volumes after 2012. Further, Panels B and C of Fig. 7 demonstrate that even removing all identifiable post-2000 regulatory costs does not remove the strong declining trend in IPO likelihood and volume. Thus, regulatory cost itself is unlikely to explain the full magnitude of IPO declines in the U.S. over the past two decades. Non-regulatory factors, such as decline in business dynamism (Decker et al., 2016), shifting investment to intangibles (Kahle and Stulz, 2017; Doidge et al., 2018), abundant private equity financing (Ewens and Farre-Mensa, 2020), changing economies of scale and scope (Gao et al., 2013), and changing acquisition behavior (Gao et al., 2013; Eckbo and Lithell, 2021) are likely to play a more important role.

5.2. Regulatory costs and going private transactions

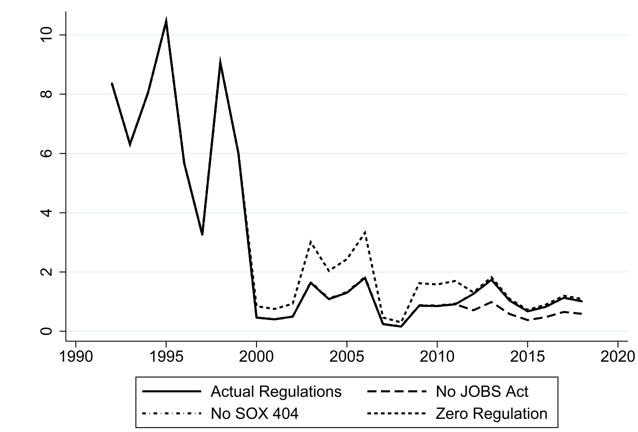
We also estimate the effect of regulatory costs on public firms' decision to go private. We model the probability of going private using the following logit specification, following Lehn and Poulsen (1989) and Engel et al. (2007):

$$\Pr(\text{GoingPrivate})_{i,t} = \frac{\exp\left(\beta \ln k_{i,t} + \gamma X_{i,t}\right)}{1 + \exp\left(\beta \ln k_{i,t} + \gamma X_{i,t}\right)}. \tag{11}$$

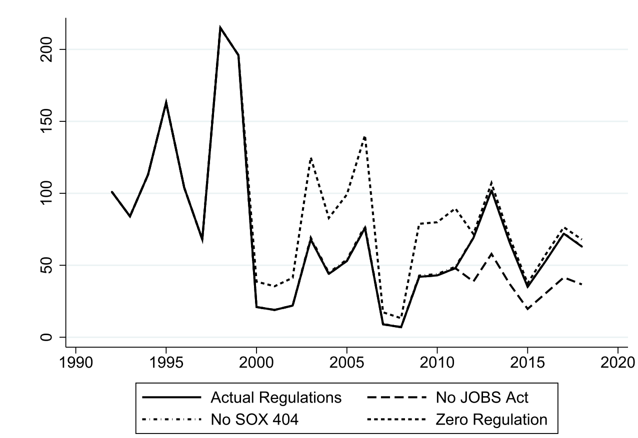
where $k_{i,t}$ is the regulatory costs borne by firm i in year t if it stays public. The vector $X_{i,t}$ contains lagged firm characteristics that affect the net benefits of going private, including log public float, book leverage, log total assets, ROA, investment-to-asset ratio, log sales growth, market-to-book ratio, annual stock return, log number of analysts, and institutional ownership. We also include state fixed effects as well as industry-year fixed effects to absorb industry-level shocks and non-threshold-based regulatory changes that apply to all firms.



(a) Regulatory costs for potential IPO firms ($m)



(b) IPO likelihood



(c) Yearly no. of IPOs

Fig. 7. IPO Counterfactual Simulations. These figures show counterfactual regulatory costs facing potential IPO firms (Panel A), annual IPO likelihood (Panel B), and the annual number of IPOs (Panel C) for four regulatory scenarios after 2000: 1) actual, 2) no JOBS Act, 3) no SOX 404, and 4) zero regulation costs. Estimations are based on the model in Table 6 and counterfactual regulation costs in Tables A.7 and A.8.

We estimate the above logit model of going private decisions on a panel of 4,195 U.S. public firms from 1995 to 2017. Following Bharath and Dittmar (2010), we identify going private transactions using 13e-3 filings. Sample inclusion requires that these filings are followed by a filing of Form 15 or Form 25 within the next two years to ensure that the security was indeed de-registered. This yields 949 going private transactions, out of which 676 can be matched to Compustat firms with non-missing control variables.

Table 8 presents the logit regression results. Consistent with the prior literature, lower market cap, growth, valuation, stock return, analyst coverage, and institution ownership predict higher probability of going private, while lower leverage and profitability predict the opposite. However, we do not find regulatory costs to be a significant factor in public firms' going private decisions. Instead, the sign of the coefficient is the opposite: higher regulatory costs slightly reduce the probability of going private. This null result echoes the mixed findings in prior literature on the effect of SOX on going private transactions (Engel et al., 2007; Leuz, 2007; Leuz et al., 2008; Bartlett, 2009), and could be explained by the fact that some of the regulatory costs are upfront and irreversible (e.g., setting up internal control system). Hence, these costs will be sunk costs for public firms' going private decisions but will enter into private firms' going public decisions. Further, many PE deals are motivated by financial or operational engineering reasons (Kaplan, 1989; Guo et al., 2011; Bernstein and Sheen, 2016), rather than avoidance of regulatory costs.

Table 8
Regulatory costs and going private transactions.

	Going Private	
	(1) Coefficients	(2) Marginal Effects
Regulatory costs (ln)	-0.013	-0.010
	[0.012]	[0.008]
Public float (ln)	-0.180***	-0.125***
	[0.015]	[0.013]
Leverage	0.257**	0.177**
	[0.114]	[0.079]
Ln(total assets)	0.080***	0.056***
	[0.028]	[0.020]
Tangibility	0.332	0.229
	[0.218]	[0.152]
Investment-to-assets	-0.082	-0.056
	[0.570]	[0.394]
Sales growth	-0.298***	-0.206***
	[0.086]	[0.061]
M/B	-0.010**	-0.007**
	[0.005]	[0.003]
Stock return	-0.204***	-0.141***
	[0.063]	[0.044]
No. of analysts (ln)	-0.232***	-0.161***
	[0.082]	[0.057]
Institutional ownership	-1.013***	-0.700***
	[0.249]	[0.170]
Industry-year FE	Yes	Yes
State FE	Yes	Yes
Observations	43,464	43,464

This table estimates a logit model of going private decisions on a panel of public firms from 1995 to 2017. Column 1 reports the logit coefficients and column 2 reports the marginal effects on percentage-point likelihood of going private. The sample includes 674 firms that went private during our sample period and 3,543 firms that were public as of 2018. The dependent variable is a dummy equal to one if a firm goes private in the next year. Columns 1 and 2 present the logit coefficients and the marginal effects, respectively. *Regulatory costs* are the compliance costs estimated from Table 3 and extrapolated to all firm sizes. We control for industry (SIC 1-digit)-year fixed effects and state fixed effects. Standard errors are clustered by firm.

5.3. Summary

Overall, our estimated regulatory costs affect firms' public-vs-private choice mainly through their going public rather than going private decisions. However, regulatory costs only explain a small fraction of the disappeared IPOs, in contrast to the popular claim by practitioners. Instead, our results are consistent with the view of Gao et al. (2013) and Doidge et al. (2013), who suggest that the regulatory changes in the early 2000s did not cause the disappearance of public firms.

These results come with several caveats. First, our results concern the effects of threshold-based regulations identifiable in our bunching estimation. Our counterfactual analysis leaves out regulations that are not threshold-based as reviewed in Table A.3. Nevertheless, our analysis covers the major regulatory changes that are often attributed to the decline in public firms, such as SOX. Second, the counterfactual analysis offers useful comparative statics on the partial-equilibrium relation between regulatory costs and IPO volumes. However, these regulations may generate social benefits to the overall public market. Firms' compliance and listing choices may also impose externalities on one another. Our counterfactual analysis should not be interpreted as a general equilibrium or welfare analysis of these regulations on the overall IPO market. Third, our IPO counterfactuals use a sample of VC-backed firms, which represent around 50% of all IPOs. Non-VC-backed firms may have different sensitivity to regulatory costs when making their IPO decisions. Last, in our IPO and going-private regressions, the regulatory cost control is a generated regressor. Thus, its coefficient estimate's standard errors may be understated (Chen et al., 2023). Table A.9 shows that our results are similar if we obtain standard errors by jointly bootstrapping both the bunching estimation and the IPO regression. Measurement errors from a generated regression may also lead us to underestimate the effects of regulatory costs on the probability of going public or private. Caveats aside, the counterfactual exercises provide informative results on the debate on the cause of the disappearing IPO puzzle.

6. Robustness and further analyses

In this section, we show the results are robust to a variety of alternative assumptions, sampling choice, or consideration of alternative regulations. Appendix Section A.4 provides details on each of these additional investigations.

6.1. Alternative regulations around the $75m and $700m thresholds

In addition to the regulations discussed in Section 1.2, the $75m and $700m thresholds were also associated with some benefits in security issuance in certain periods if firms are *above* these thresholds. The $75m threshold was also briefly associated with an exemption from Say-on-Pay in 2010 and 2011. Appendix Section A.4.3 shows that these alternative regulations do not significantly bias our estimates.

6.2. Alternative counterfactual distributions

One might be concerned about firms' anticipation of threshold regulations, or whether the firm size distribution in non-bunching period is a good counterfactual for the distribution in the bunching period. Appendix Section A.4.4 presents alternative tests and counterfactual distributions to address these concerns. The results are quantitatively similar.

6.3. Alternative parameter choices

Appendix Section A.4.5 demonstrates that our results are robust to alternative parameter values and alternative cost function for estimating the leverage distortion cost.

6.4. Agency issues

Our model assumes that managers choose whether to bunch to maximize firm value. One may worry that this assumption may be violated for firms with substantial agency issues. A priori, the bias from agency issues can be either positive or negative. On the one hand, entrenched managers may be averse to taking on additional debt to bunch, leading to a downward bias in our estimates. On the other hand, regulatory compliance may be more costly to managers than to shareholders, leading to an upward bias. To address this concern, we re-estimate the regulatory costs excluding firms that may have severe agency issues. In particular, we drop firms in the bottom decile of institutional ownership and firms in the bottom decile of board independence. The results are reported in Table A.16. The estimates are similar to our baseline estimates.

6.5. Time-variation in regulatory costs and enforcement

Our baseline estimation concerns the average regulatory costs in the estimation sample. One may be concerned that the regulatory costs may vary over time due to changes in regulation or variations in enforcement. We showed in Section 4.2 that our estimates are relatively stable over time. Appendix Section A.4.6 further shows that the degree of enforcement regarding accounting and auditing exhibits limited time variation.

6.6. Alternative estimation windows

Our baseline estimation uses [$23m, $29.5m] for the $25m threshold, [$67.5m, $105m] for the $75m threshold, and [$630m, $840m] for the $700m threshold. We show robustness to using different window lengths (wider or narrower by 1%, 5%, and 10%) in Appendix Table A.17.

6.7. Alternative extrapolated regulatory costs for the median US firm

We consider a few robustness for the extrapolated regulatory costs facing the median-sized US public firm in Table A.6. First, we orthogonalize the two industry dummies using logit rather than a linear probability model as in the baseline. The estimate of regulatory costs facing the median firm becomes 4.44%, which is close to the baseline estimate of 4.29%. Second, using a univariate extrapolation based on public float only, we obtain an alternative estimate of 4.27%. Third, using variation in local non-parametric relationship between ln(float) and ln(reg costs) in Figure A.4, we obtain a cost interval of [2.09%, 6.30%] for the median firm. Fourth, using the Oster (2019) test to obtain a bias-adjusted estimate of the cost structure parameter (Table A.21), we obtain a cost interval of [2.05%, 6.27%] for the median firm. Finally, using M&As as shocks to firms' public float, we estimate an alternative cost structure parameter of 0.402, which translates to a cost estimate of 4.5% for the median firm. Overall, these ranges and alternative values provide reasonable bounds on our baseline 4.3% estimate. It is reassuring that, although they reflect variations in different assumptions, they are comparable in magnitude.

6.8. Dynamic considerations in IPO analysis

In our baseline estimation, we relate the IPO decision to the immediate regulatory cost a firm faces when it goes public. We show in Appendix Section A.4.7 that our IPO results are robust to firms' dynamic expectations about future regulatory costs.

7. Conclusion

This paper studies the connection between regulatory costs and firms' public-vs-private choice by exploiting a regulatory quirk: many rules trigger when a firm's public float exceeds a threshold. We find that firms increase their leverage to move their public float below the thresholds. We estimate regulatory costs from the extent of this avoidance using a revealed preference approach. The regulatory costs of being a public firm are substantial: various disclosure and internal governance rules lead to a total compliance costs ranging from 2.1% to 6.3% of market capitalization for a median U.S. public firm (our preferred estimate is 4.3%). Regulatory costs have greater impact on private firms' IPO decisions than on public firms' going private decisions. However, heightened regulatory costs only explain a small fraction of the decline in the number of public firms over the last two decades. Our results suggest that non-regulatory factors likely played an more important role in explaining the decline in the number of U.S. public firms.

CRediT authorship contribution statement

Michael Ewens: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Kairong Xiao:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Ting Xu:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Some data is available https://github.com/michaelewens/public_float_regulation, but the VC data requires a subscription.

Replication package for paper (Original Data) (Mendeley Data).

Appendix A. Supplementary material

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jfineco.2023.103775.

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