Earnings Targets, Strategic Patent Sales, and Patent Trolls*

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Abstract

Innovative public firms sell significantly more patents in the last month of their fiscal year relative to the first half of the year. Consistent with reporting incentives driving these sales, they are more pronounced among firms with strong incentives to meet earnings expectations. Patents sold in the last month are litigated more frequently because they are disproportionately sold to "patent trolls", who opportunistically acquire patents to engage in litigation. We find anti-troll laws reduce opportunistic acquisition among trolls. We highlight a novel consequence of corporate reporting incentives: its contribution to strategic patent sales, which in turn impacts the market for innovation and litigation.

Keywords: market for innovation; patent litigation; earnings pressure; real earnings management

JEL codes: D23, M40, M41, O30, O31, O32, O34, O39

Data Availability: Patent sales data and the related data compilation appendix is available at https://github.com/kristengvalentine/PatentSales.

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1. INTRODUCTION

Patent protection is a societal grand bargain, where an inventor receives temporary exclusivity rights in exchange for disclosure. An important, but often overlooked, fact about patents is that they are frequently bought and sold, and the market for patents is economically important. Industry reports suggest that the total asking price for patents on the market was about $40 billion in 2022 and prior research finds that 29% of granted patents are ultimately sold at least once (Richardson, Oliver, and Costa (2023); Kim and Valentine (2023)). Given the economic significance of these transactions, understanding the motivations for when, why, and to what extent firms sell their patents is central to academic research as well as in designing optimal policy. We posit that an important, but underexplored, factor motivating firms to sell their patents is the incentive to boost reported profits to meet earnings expectations. Patent sales can temporarily increase reported profits but could be suboptimal in terms of value creation. Our primary goal is to examine whether firms engage in strategic patent sales, and if so, the implications of these sales for the innovation environment more broadly.

To investigate whether firms use patent sales to manage earnings upward, we draw on two key observations. First, we expect selling patents to manage earnings has "real option value" (Oyer (1998); Kerstein and Rai (2007); Das et al. (2011); Beardsley et al. (2021); Ertan (2022); Gong et al. (2023)) such that firms motivated by earnings targets wait until the end of a fiscal year to exercise the option to sell patents only if it becomes necessary to achieve their goals. Second, U.S. GAAP requirements can make selling patents an effective tool to manage reported earnings. Under GAAP, firms record a gain on the sale of patents when the proceeds from the sale exceed the patents' book value. However, GAAP does not allow firms to capitalize the significant costs of

scientists' salaries and other R&D expenditures for internally developed patents. Thus, selling these patents likely results in greater gain recognition that boosts reported earnings.[1]

However, strategic patent sales could represent suboptimal use of the firm's innovative portfolio, whether via holding in reserve patents the firm already intended to sell, or selling patents that could be more profitably developed in house. If the potential costs are sufficiently high, a manager may not be willing to strategically sell patents. If so, any elevated patent sales in the final month could be due to alternative explanations. For example, it is possible that firms sell patents at the end of the fiscal year as part of a routine innovative portfolio rebalancing, for tax-motivated reasons, or due to financial constraints. Our empirical strategy is to first document the timing of patent sales within a firm's fiscal year and then examine whether patent sales timing varies predictably with incentives to meet short-term earnings expectations or varies for other reasons.

We create a novel database of public firms' patent sales provided by the U.S. Patent and Trademark Office ("USPTO") Patent Assignment data. The database allows us to observe the identity of the entities involved in a patent sale (e.g., public firms vs. "patent trolls") and when the patent transaction takes place.[2] Using this database, we construct a sample of firm-months from 1985 to 2021. Our primary research design regresses the number of patent sales on indicators for the months leading up to the firm's fiscal year end.[3] After including firm-year and month fixed

[1] Anecdotal evidence suggests patent sales can be used to achieve earnings targets. Unova, Inc., an industrial technology company, reported that it sold approximately 150 wireless local-area networking patents to Broadcom Corporation on December 24, 2002, for $24 million, resulting in a gain which the firm said, "will positively impact UNOVA's 4th quarter and full-year 2002 earnings". Prior to year-end, analysts expected Unova to have a net loss per share of $1.14. Unova's actual net loss was only $0.82 per share. While the total reported gain recognized was likely somewhat less than the full $24 million selling price, the selling price per share accounts for $0.41, suggesting that this patent sale in the last month of their fiscal year likely moved the firm from missing to beating analyst expectations.
[2] "Patent trolls" are a pejorative term for entities termed non-practicing entities ("NPEs") or patent assertion entities. These entities do not conduct R&D or invent new products, but rather purchase patents and initiate patent infringement lawsuits against operating companies. We use the phrase patent troll following the colloquial usage by politicians and firm managers or alternatively NPE interchangeably throughout the paper. See further discussion in Section 2.2.
[3] While the USPTO assignment data is a rich data source, it does not include the transaction price. Accordingly, we are unable to use the dollar amount of patent sales to examine our research question and instead rely on the number of patent sales as our primary measure.

effects, the indicator for the final month of a firm's fiscal year can be interpreted as the amount of "abnormal" patent sales occurring in the last month of the fiscal year ("month *M*") incremental to the firm's patents sold during the first six months of the year ("benchmark months").

Descriptively, we first examine the characteristics of patents sold in the final month of a public firm's fiscal year and compare those to the characteristics of patents sold at other times during the year. We find patents sold in the last month of the year are more valuable, as proxied by forward citations, number of claims, and patent generality (Hall, Jaffe and Trajtenberg (2001)). Despite patents sold in month *M* being more valuable, they are significantly *less likely* to have an associated 8-K disclosure (18.9%) relative to patents sold in other months (31.5%). This goes against the notion that 8-Ks are disclosed when an event is more economically material such as selling valuable patents. The significantly lower rate of 8-K filings for month *M* patent sales, despite the patents' higher value, is more consistent with the narrative that the patent sales in month *M* are likely strategic, and firms exercise their disclosure discretion to potentially conceal their strategic intentions at the time of sale.[4] While these statistics provide univariate support for strategic disclosure, we proceed to our multivariate and cross-sectional tests to provide further evidence.

In our main empirical specification, we find abnormal patent sales in month *M* are approximately 1.1% greater on a per *month* basis, or 13.2% annualized, which is economically material. This translates into roughly 2,600 more aggregate patent sales over our sample period.

[4] As we discuss in Section 4.1.2, a firm's discretion in determining the materiality threshold likely explains why we do not observe an 8-K filing for every patent sale. Our primary interest is in identifying the significantly lower rate of 8-K filings for month *M* patent sales relative to other months, *ceteris paribus*, which would be consistent with patent sales in month *M* being strategic. Also, investors are unlikely to observe patent sales via patent office disclosure in a timely matter. For a patent sale to be valid in court, the parties must record the patent assignment with the U.S. Patent and Trademark Office ("USPTO") (Serrano (2010)). The USPTO maintains a patent assignment dataset that details the execution date for each patent sale as well as the date the transaction is reported to the patent office. Marco et al. (2015) report that on average, there is a lag of 182 days between the transaction's execution date and recording date. As researchers, we observe the execution date with hindsight, but investors at the time of patent sale may not be able to observe the sale in the USPTO data for months after the transaction.

This is consistent with firms strategically delaying the sale of patents, illustrating the real option value of patent sales. In contrast, the effects in the months leading up to month *M* are generally no different from the sales relative to the benchmark months.

To examine whether patent sales at fiscal year-end are likely motivated by earnings management, we conduct three tests. First, we exploit the asymmetric accounting treatment between internally developed and externally acquired intangible assets. U.S. GAAP does not allow firms to capitalize the full fair value of internally developed patents but does allow firms to capitalize the fair value of purchased patents. Thus, the reported gain on sale is likely greater for internally developed patents and strategic motivations are most likely if firms sell more internally developed than purchased patents at year end. Consistent with strategic motivations, we find public firms sell 13.9% more internally developed patents than externally acquired patents in month *M*.

Second, we exploit variation in a firm's incentive to meet or beat earnings expectations. Firms that *just* meet or beat earnings targets likely represent those with strong earnings management incentives (e.g., Bartov et al. (2002); Dhaliwal et al. (2004); Bhojraj et al. (2009); Dechow et al. (2010); Quinn (2018); Johnson et al. (2020)). We find that the abnormal patent sales effect in month *M* is 1.4 to 1.6% higher per month in periods where a firm just meets or beats earnings expectations by 1 cent. Additionally, we plot histograms of patent sales across different bins of earnings surprises (Burgstahler and Dichev (1997)) and find a stark discontinuous jump in the number of firms just above the threshold of meeting earnings targets versus the number of firms just below, consistent with strategic incentives motivating firms' patent sales.[5]

[5] To triangulate whether strategic patent sales have the potential to meaningfully impact a firm's reported EPS numbers, we hand collect the transaction amounts from eight identifiable examples where patent transaction values were disclosed in an 8-K. Across these examples, the median value per patent was $876,190 and the median total transaction value was $4,600,000, with approximately 5 patents trading in a given transaction. Using the average common shares used to calculate earnings per share of 103.95 million shares, we infer that patent sales can move EPS by four to five cents per share on average ($4,600,000/103,950,000 shares).

Third, we exploit variation in the extent to which an executive's compensation incentivizes meeting earnings expectations. We document that the month *M* patent sales effect is 1.8% to 3.9% higher per month in periods when the CEO's equity compensation is in the highest quartile or when the CEO has more equity vesting in a given year (Bergstresser and Philippon (2006); Edmans, Fang, and Lewellen (2017); Edmans, Fang and Huang (2022)). The collective results from these three tests are consistent with managers strategically selling patents for earnings-motivated reasons.

We also examine the importance of alternative explanations, such as firms rebalancing their patent portfolio at year end, tax incentives, and financial constraints, in explaining the abnormal patent selling activity in month *M*. The results from these tests do not support these alternatives explaining our findings.[6] Finally, our results are robust to excluding December year-end firms, alternative fixed effect structures, employing various scalars to the dependent variable, and using a Poisson model. Taken together, our findings are most consistent with firms strategically selling patents in response to earnings pressure and are less consistent with alternative explanations.

We then explore the consequences of strategically motivated patent sales for the broader patent system. One important entity in the patent system are NPEs. If patents sold to NPEs happened evenly throughout the year, approximately 8% of sales (= 1/12 months) would happen in the last month of the fiscal year. However, in our sample 55% of sales made to NPEs occur in the last fiscal month, suggesting patent trolls play an important role in facilitating month *M* patent transactions. Motivated by this observation, we examine and find patents sold in month *M* are more

[6] Specifically, we perform three tests. First, we find private firms are significantly less likely to sell patents in the final month of the year than public firms. This differential effect for private versus public firms suggests that our findings are incremental to institutional features that are common to both public and private firms (such as portfolio rebalancing or tax motivations). Second, we more directly measure public firms' incentives to sell patents for tax reasons and find these firms have no greater selling activity in month *M* than other firms. Specifically, public firms with greater deferred tax assets are not more likely to sell patents in the last month compared to firms with lower deferred tax assets. Third, firm years with financial constraints do not have more pronounced patent selling activity than other firm years, inconsistent with financial distress as an underlying mechanism of our findings.

likely to be litigated than patents sold at other times of the year. This is likely because the number of patents sold to NPEs also significantly increases in month *M*. That is, the *proportion* of total patent buyers that NPEs represent increases when a patent is sold in month *M*, relative to when sold in the benchmark months. Furthermore, conditional on a patent being litigated, the likelihood that an NPE is the party suing for infringement increases for patents sold in month *M*.

We next examine the demand side of the patent market by investigating changes in NPE purchasing activity. Using the staggered adoption of anti-troll laws in 34 US states, we find that patent trolls reduce their patent purchases from firms in affected states. Consequently, firms headquartered in states adopting anti-troll laws see a 1.6% to 1.8% per month reduction in patent sales in month *M*, corroborating the inference that patent trolls provide liquidity to firms strategically selling patents in month *M*. Taken together, these findings suggest that strategic patent sales could have a negative impact on the market for innovation through increasing costly litigation in general and facilitating frivolous NPE litigation. Furthermore, the results highlight that NPEs are key liquidity providers for firms looking to sell patents strategically even though corporations frequently lobby against patent trolls.

We speak to the literature on the real effects of financial reporting (Leuz and Wysocki (2016)) by demonstrating that financial reporting incentives can distort the market for innovation and prompt patent sales to potentially unproductive users. Furthermore, the finding that firms sell more internally generated patents suggests that reporting rules that preclude firms from capitalizing the full cost of internally developed patents make selling patents an attractive earnings management tool and can have the unintended consequence of facilitating sales to patent trolls. We also contribute to the emerging literature at the intersection of accounting and innovation (e.g., Glaeser

(2018); Kim and Valentine (2021); Glaeser and Lang (2023)) by expanding our understanding of the forces that shape the underexplored secondary patent market.

Our findings are also relevant to the literature on the market for patents, innovation, and NPEs. Serrano (2010) documents the determinants of patent transfers and finds that small-innovators and private inventors are the parties most likely to sell their patents. We complement this evidence by providing a dataset that links patent sales to public firms and shows conditions under which public firms are more likely to sell patents (i.e., in the presence of financial reporting incentives). Hochberg, Serrano, and Ziedonis (2018) find that the patent market can facilitate lending to start-up firms given it provides lenders a liquidation option for patents pledged as collateral. Importantly, we provide evidence that strategic patent selling, driven by financial reporting incentives, can facilitate NPE litigation, which can be detrimental to welfare (Cohen, Gurun and Kominers (2019)).

2. BACKGROUND AND HYPOTHESIS DEVELOPMENT

2.1 Patent Market Background

Since 2013, the cumulative patent market has an estimated total asking price of about $40 billion, with the average asking price per patent of $210,000 over the last five years (Richardson, Oliver, and Costa (2023)). While the best use of the patent market should be to reallocate intellectual property to the most productive user (Galasso, Schankerman, and Serrano (2013)), in practice, the patent market has been disaggregated and opaque. Historically, there has not been a central exchange with transparent pricing, and even with recent online marketplaces, almost 40% of all patent assets listed for sale do not include even pricing information (Richardson, Oliver, and Costa (2023)). The lack of a transparent, centralized exchange makes it difficult for a firm's investors to know if the firm has offered patents for sale. Investors are thus unlikely to be able to "see through" the use of patent sales as an earnings management strategy.

Due diligence for a patent purchase can be a lengthy process, at times taking months. The process involves narrowing down the set of patents available for sale based on the purchaser's criteria (Richardson et al. (2019); Kim and Valentine (2023)). However, there are potentially more expedient options for sellers hoping to transact quickly. Between 25% and 55% of patent purchases were made by NPEs in the last five years (Richardson, Oliver, and Costa (2023)). NPEs may be more likely to serve as liquidity buyers and purchase a group of patents with fewer due diligence requirements in the hope that even one patent will pay off in their litigation strategy.

Patent brokers are another key facilitator of patent sales. Brokers "sell, buy, market, negotiate, evangelize, and promote patents in the market" (Richardson, Oliver, and Costa (2023)). If a seller needs to make a patent sale in a timely manner, they could sell patents directly to a broker familiar with the market. Finally, a seller could list a set of patents with a broker well in advance of their fiscal year end to have the option to sell a patent if necessary to meet earnings targets and lower the asking price to expedite the timing of sales as yearend approaches. Discounts on patent asking prices can approach 75% and tend to increase the longer a patent stays on the market (Richardson et al. (2023)). In sum, sellers in the patent market can use NPEs, patent brokers, or discounts to time their patent transactions.

2.2 Non-practicing Entities

Non-practicing entities employ a business model of acquiring patents for the purpose of suing firms ostensibly infringing on those patent rights without engaging in other operating activities such as R&D. Though NPEs are often criticized, they can potentially play a positive role in the economy by providing economies of scale to small companies and inventors without the resources to sue large, well-resourced firms for infringement. Former Federal Trade Commission Chairwoman, Edith Ramirez, has said "the economics of asserting patents has traditionally

weighed against enforcement by small companies. Large companies may be slow to respond to demand letters, and the cost of a lawsuit may be prohibitive for small patent holders facing an uncertain payoff" (Ramirez (2013)). Furthermore, NPEs can provide liquidity in the secondary patent market, which could increase funding for innovators. Consistent with this notion, Hochberg, Serrano, and Ziedonis (2018) find that a liquid patent market can facilitate lending to start-up firms given that such a market provides lenders a liquidation option for patents pledged as collateral.

Corporations lobby politicians for laws that hamper the ability of NPEs to initiate and win patent infringement lawsuits. The Obama administration released a 2013 report on the costs of patent trolls on the economy and innovation. The report notes that in 2011, litigation payments to NPEs totaled $29 billion, a 400% increase from 2005, not including any loss in shareholder value. High-tech firms can spend more on patent acquisition and litigation than they do on R&D for new innovations. Gene Sperling, the former director of the National Economic Council, said, "It's clear that the abuse of the patent system is stifling innovation and putting a drag on our economy. The trolling has gotten out of control" (Sperling (2013)). While in aggregate, innovating firms are harmed by costly patent litigation initiated by trolls, the marginal benefit of selling patents to an NPE for a given firm can exceed the marginal cost, especially when the cost of litigation is borne by another party. Thus, selling to trolls to meet earnings targets can produce negative externalities.

2.3 Real Earnings Management through Patent Sales

Investors make capital allocation decisions based on comparable and reliable firm performance information. While earnings forecasts can provide an important signal, practitioners and academics alike argue that an excessive focus on meeting earnings targets can induce managers to behave sub optimally (e.g., Dechow and Sloan (1991); Klein (2002); Liu and Ryan (2006); Barton (2011); Barton and Wiseman (2014); Dou et al. (2016); Fu et al. (2020)). This suboptimal behavior can

manifest as managers making short-term decisions that boost reported earnings but do not represent the best use of the firm's resources for the long term.

Prior research suggests firms can make suboptimal operating decisions to achieve earnings targets, termed real earnings management. For example, cuts to discretionary expenses, relaxing credit terms, and overproduction of inventory are methods firms can use to boost short-term earnings at the expense of future profitability (Roychowdhury (2006); Cohen et al. (2008); Cohen and Zarowin (2010); Zang (2012); Kothari et al. (2016)). Bushee (1998) finds that firms with greater transient institutional investors cut R&D expenditures to avoid earnings declines. Bereskin, Hsu, and Rotenberg (2018) find that abnormal cuts to R&D are associated with lower future innovation, as proxied by the number of patents and patent citations. Terry, Whited, and Zakolyukina (2023) use a structural model to examine the tradeoff between regulating earnings information and investment choices and find that lower earnings informativeness through earnings management can raise the cost of capital and reduce firm value. Collectively, these studies suggest that making suboptimal investment choices in response to short-term earnings pressure can be costly to the firm in the long run. While some prior work on real earnings management uses patents as an output measure to assess the future performance costs of real earnings management (Bereskin et al. (2018); Fu et al. (2020)), we add to the literature by examining whether patent sales can be a method firms use to manage earnings.

Despite the potential costs, Graham, Harvey, and Rajgopal (2005) surveyed over four hundred managers and found that executives were more willing to decrease discretionary spending or delay starting a new project in order to meet earnings targets than change accounting estimates. A firm's growth critically depends on innovation pursuits. Thus, earnings management tools related to innovation can have a significant impact on a firm's growth potential. While extant research has

identified abnormal cuts to R&D as a potential earnings management tool, we expect that firms could also use patent sales to boost earnings to meet or beat earnings targets. Graham, Harvey, and Rajgopal (2005) provide examples of real decisions managers make to achieve financial reporting goals, with one notable example in our context:

> *"Another example pertains to a company that would sell an internally developed patent to outsiders and recognize revenue or return to meet an earnings target, rather than develop the patent later in-house, even if the expected cash flows associated with in-house development exceed the sale proceeds of the patent."*

This interview provides anecdotal evidence that managers are willing to sell patents to meet or beat earnings expectations. Selling patents the firm could have developed profitably in-house is one form of real earnings management. Another is to strategically time the sale of a "cookie jar reserve" of patents that managers intend to sell anyway to meet earnings targets.

Managers receive internal information on a firm's performance throughout a fiscal year before financial statements are created and communicated to investors. Before taking a suboptimal real action, a manager must first assess the firm's expected performance through the end of the fiscal year relative to the earnings target. Managers would only engage in real earnings management if it is likely the firm would miss the target without the costly real action. Accordingly, we expect patent sales motivated by real earnings management are more likely to take place in the final month of a firm's fiscal year than at other times. In essence, delaying a patent sale until the last month of the year allows managers to have the flexibility and option value to avoid a suboptimal patent sale or preserve its cookie jar reserve for future use if firm performance improves by the end of a fiscal year. Given the preceding discussion, we state our hypothesis as follows:

Hypothesis: *Public firms with incentives to meet or beat earnings expectations sell more patents in the final month of the fiscal year than at other periods during the year.*

Nevertheless, there are reasons why we might not observe our predicted outcome. First, if investors can see through the earnings management and discount the value of strategic firms accordingly, firms might not have incentives to manage earnings *ex-ante*. Second, the sale of patents could be prohibitively costly for some firms and may not be a feasible strategy to pursue.[7]

3. DATA AND RESEARCH DESIGN

3.1 Data Sources and Sample Selection

We obtain information on patent sales from the USPTO patent assignment data, patent characteristics from PatentsView, firm characteristics from Compustat and CRSP, and analyst forecasts from I/B/E/S. The USPTO patent assignment dataset includes information such as the buyers' and sellers' names, the number of patents included in the sales, the sale execution dates, and a brief description of the reason for the patent trade (see Kim and Valentine (2023); Armstrong, Glaeser, Park, and Timmermans (2024)). The PatentsView data allow us to observe patent information such as tech class, the number of figures included in the patent filings, and forward citations received.

We combine the above databases to create a final sample with a firm-month unit of observation. We include firm-months between January 1985 and December 2021 (6,436,358 firm-months). We define the event month as the last month in a firm's fiscal year. We exclude firm months with missing data on total assets, stock prices, and other control variables (leaving 1,633,632 firm-months). Consistent with studies examining real earnings management, we exclude firms in

[7] We also recognize the possibility that firms could license their patents to generate income rather than sell them outright if selling patents is too costly. However, whether a firm can recognize revenue at the start of the licensing period depends on the specifics of intellectual property being transferred and the nature of the contract. If the license agreement allows the licensee access to the IP over a period of time and functionality of the IP could significantly change over the period (e.g., through a software update), then revenue will be recognized over time (ASC 606-10-55-62). In those circumstances, managers will unlikely be able to significantly boost *current period* earnings through licensing, making it an unattractive earnings management tool. If managers can successfully structure a licensing contract to allow the recognition of revenue up front, we expect that to bias against us finding a result via patent sales.

regulated industries (SIC codes between 4400 and 5000), banks, and financial institutions (SIC codes between 6000 and 6500), leaving a sample of 1,333,284 firm-month observations. We then require firms to have at least one patent in their patent stock each month (leaving 1,294,278 the total number of net patent purchases over the past 20 years (i.e., the total number of purchased patents minus the total number of patents sold) updated each month. We use a 20-year period to approximate the length of time a patent right is in force, which is 20 years from the patent filing date (35 U.S.C. 154). We apply this requirement because we want to examine the set of firms that have the option to sell a patent during each month. Finally, we require non-missing data for control variables, resulting in a final sample of 1,221,216 firm-month observations.

3.2 Variable Measurement

3.2.1 Key Dependent Variable: No. Patent Sales

We define our measure of patent trades, *No. Patent Sales*, as the total number of patents sold by a firm in a given month and apply the inverse hyperbolic sine (IHS) transformation. Specifically, we remove a change in patent ownership due to employer assignments, administrative events such as a correction or name change, and security interest where a patent may be pledged as collateral in a loan agreement (Graham, Marco and Myers (2018)). Thus, *No. Patent Sales* identifies a transfer of patent ownership due to trading among entities.

Furthermore, we differentiate between internally developed patents and externally acquired patents, classifying a patent in a transaction as internally generated if the seller is the same entity on the patent grant (i.e., the patent has not been previously sold). Under current GAAP, most expenditures associated with developing patents are fully expensed, whereas acquired patents are valued at the purchase price on the balance sheet and amortized. As a result, we anticipate that our findings will primarily be concentrated among internally generated patents, which likely allow

firms to report larger gains on the income statement due to the asymmetric treatment of acquired and internally developed patents under U.S. GAAP. For presentation purposes, *No. Patent Sales* (and other related patent sales measures) are multiplied by 100 unless otherwise noted.

3.2.2 Key Independent Variables: M, M-1, M-2, …, M-5

To evaluate the timing of the patent sales, we define *M* as an indicator variable that takes on a value of one when it is the last month of a firm's fiscal year. Additionally, we define a set of indicator variables, *M-n* (where n ranges from 1 through 5), that take on a value of one when it is n^{th} month preceding the final month of the fiscal year. In our sample, 62% of firms have a December fiscal year end. Consistent with the idea that managers are particularly concerned about fiscal year-end earnings, we expect that strategic patent sales are more likely to occur near the end of the fiscal year in month *M* (Collins et al. (1984); Kerstein and Rai (2007); Das et al. (2009)).[8]

3.3 Research Design

To test the hypothesis that firms' strategic patent sales are concentrated at the fiscal year-end, we estimate the following regression:

$$No.\,Patent\ Sales_{c,t} = \beta M_{c,t} + \beta_1 M-1_{c,t} + \beta_2 M-2_{c,t} + \cdots + \beta_5 M-5_{c,t} + \gamma X_{c,t} + \delta_c + \Lambda_t + u_{c,t} \quad (1)$$

The unit of observation is at the firm *c* and month *t. No. Patent Sales* is the IHS-transformed number of patent sales made by firm *c* in month *t* and *M, M-1, M-2, …, M-5* capture the timing of sales relative to the firm's fiscal year end. We cluster standard errors at the firm level. A positive coefficient on β suggests that patent sales are concentrated in the final month of the fiscal year.

[8] It is also possible that managers face incentives to manage earnings at the end of each fiscal quarter. To explore this possibility, we create an indicator for whether a month represents a fiscal quarter end (including Q4 at year end) as an alternative independent variable and find our result persists (untabulated). Additionally, while our main results only separate the effect for the six months leading up to fiscal year end, our results are not sensitive to including indicators for months *M-10, M-9…, M-1, M* and using *M-11* as the comparison month (untabulated).

X represents a vector of time-varying control variables for firm characteristics that may impact patent market trading unrelated to the timing of sales relative to the fiscal year-end. Specifically, we control for firm characteristics using market capitalization (*Market Cap*) and stock returns (*Monthly Returns*). And we also include the stock of patents (*Patent Stock*) and the number of granted patents (*No. Patent Granted*) at month *t.* We include these controls to account for the possibility that firms with many patents mechanically have more patent sales. Importantly, the stock of patents includes not only the granted or filed patents, but also previously purchased patents. We measure our control variables in month *t*. Finally, we include fixed effects for the firm-year (δ) and month (Λ) to control for any firm effects specific to a fiscal year, or factors specific to a given month of the year. Taken together, our design exploits *within firm-year* variation in patent sales *timing*, after controlling for any variation in the size of a firm's patent portfolio or the firm's visibility, raising the bar for alternative explanations.

4. RESULTS

4.1.1 Descriptive Statistics

In Figure 1 Panel A, we present a bar graph of the total number of patent sales by month, relative to the firm's final month in the fiscal year (month *M*). Across our sample period, sample firms sell in aggregate approximately 20,000 patents per month in the months leading up to fiscal year end. For context, the sample firms had over two million patents granted during the sample period. In the final month of the fiscal year, the number of patents sold jumps to over 27,000 in aggregate. Figure 1 Panel B scales patent sales by the number of patent grants to adjust for patent portfolio size and the discontinuity at fiscal year-end becomes even more pronounced. These figures provide univariate evidence of increased patent sales among our sample firms in the final month of their fiscal year.

We tabulate descriptive statistics for the firm-months in our sample in Table 1. Panel A presents distributional statistics for the key variables used in our analyses. On average, sample firms sell approximately one-fifth of a patent per month (0.19 after dividing by 100), though the untransformed variable is highly skewed, justifying our use of inverse hyperbolic sine transformed number of patent sales as our primary dependent variable of interest (*No. Patent Sales*). This transformation has the advantage of mitigating the influence of outliers while still being defined for firm-months with zero patent sales (Koudijs and Salisbury's (2020); Glaeser and Omartian's (2022)). Approximately 93% of patents are internally developed, while 7% are externally acquired (untabulated), which translates into the proportional excess of internally developed patents over acquired patents of 0.83. On average, sample firms have 1.67 patents granted per month and a patent stock of 529 patents, demonstrating firms in our sample are active innovators that regularly employ patent protection.

Table 1 Panel B presents univariate correlations between *No. Patent Sales* and the months leading up to fiscal year end as well as key control variables. There is a significantly positive correlation between *No. Patent Sales* and month *M*, statistically corroborating the trend of higher patent sales in the last month of the fiscal year shown in Figure 1. Interestingly, there is a significantly *negative* correlation between *No. Patent Sales* and month *M-1*, perhaps due to firms holding back on potential patent sales in the period leading up to year end. Intuitively, market capitalization and patenting activity (*Patent Stock* and *No. Patent Granted*) are positively linked to *No. Patent Sales*. These results provide univariate support for our hypothesis.

4.1.2 Decision on What Patents to Sell and Disclose

We next provide descriptive statistics on the characteristics of patents sold in the final month of the fiscal year relative to other patents sold in Table 1 Panel C. We find that patents sold in the

final month of a firm's fiscal year are of greater value than patents sold in other months of the year (non-month *M*), using forward citations, patent claims, and patent generality to proxy for patent value. Patents sold in the final fiscal month are also 10 months older, on average, than patents sold in other months of the year, perhaps because more mature patents have a longer proven history that facilitates a timelier sale. Though descriptive in nature, this suggests that firms are not selling patents of little value to rebalance their innovative portfolio prior to the end of the year.

Despite patents sold in month *M* being more valuable, they are significantly *less likely* to have an associated 8-K disclosure (18.9%) relative to patents sold in other months (31.5%).[9] The SEC has required firms to disclose significant events within four business days via an 8-K filing since late 2004 (Christensen et al. (2017); Noh et al. (2019); He and Plumlee (2020)). Patent sales would likely fall under Item 1.01 related to material contracts, which are defined as any contracts "not made in the ordinary course of business" or ordinary business contracts "upon which the registrant's business is substantially dependent" (17 CFR 229.601(b)(10)). The discretion involved in determining the materiality threshold, whether the patent sale is made outside of the ordinary course of business, or if the sale relates to patents on which the firm's business "substantially" depends likely explains why we do not observe an 8-K filing for every patent sale. However, the significantly lower rate of 8-K filings for month *M* patent sales *relative* to other months of the year, supports the narrative that the patent sales in month *M* are likely strategic, and firms exercise their discretion to potentially conceal their strategic intentions at the time of sale.

[9] To identify patent-related 8-K disclosures, we examine 8-K filings made within five business days of the patent sale execution date that contain the keyword "patent". While the SEC allows firms four business days to file an 8-K after an event, to be conservative, we use five business days to allow for a one-day lag between the firm filing on the EDGAR platform and the 8-K's appearance on the website. For this test, we limit our sample to 2005-2021 as the list of required 8-K disclosures changed in late 2004.

For additional context, Table 1 Panel C also includes patent values for the patents that firms chose not to sell (*Unsold Patents*). We find that patents sold in month *M* are relatively *less valuable* than patents that are not sold, suggesting that even strategically motivated patent sales are not necessarily the firm's most important patents. Taken together, the descriptive statistics are consistent with firms selling valuable patents in month *M* to facilitate a sale. However, firms retain patents that are *most* valuable to the firm, likely those central to the business' core operations.

4.2 Regression Results

Our hypothesis is that in the presence of earnings pressure firms can sell patents to recognize reported gains and that such earnings-motivated sales are most likely to occur in the final month of the firm's fiscal year. Multivariate regression results are presented in Table 2. Column (1) regresses *No. Patent Sales* on *M-5, M-4, …, M-1, M* without controls and after including firm and year fixed effects. Column (2) incrementally adds time varying, firm-level control variables as in Equation (1). Column (3) includes the same time varying controls as in Column (2) but employs firm-year and month fixed effects. We find a significantly positive relation between *M* and *No. Patent Sales* in all three columns (coefficient=1.101, t-stat=8.12 for Column (1); coefficient=1.073, t-stat=8.03 for Column (2); coefficient= 0.715, t-stat=5.79 for Column (3)). This finding supports our hypothesis that patent sales are elevated in the final month of a firm's fiscal year. In economic terms, the per month abnormal sales effect ranges from 0.7% to 1.1% depending on the specification.[10] This translates into roughly 2,600 more aggregate patent sales over our sample period (total average patent sales per year of 6,384 (untabulated) x 1.1% x 37-year sample period = 2,598 patents). Figure 2 graphically shows the regression coefficients from Table 2 Column (3).

[10] Note that the inverse hyperbolic sine transformation results in coefficients that can be approximately interpreted as percentage changes (see, e.g., and Koudijs and Salisbury (2020) and Glaeser and Omartian (2022)). Thus, reported coefficients in Table 3 indicate by what percent *No. Patent Sales* are higher in month *M* compared to non-month *M*.

Though we do not make predictions for the coefficients on the months leading up to event month *M*, results indicate that firms sell significantly fewer patents in month *M-1* relative to other months of the year (in Columns (1) and (2)) and that the remaining months' sales are generally not statistically distinguishable from the benchmark period. Fewer sales in month *M-1* could be consistent with managers holding back on potential patent sales until month *M*, the firm's final opportunity to recognize a gain prior to fiscal year end. However, we do not observe a statistically significant holding back effect when we employ firm-year and month fixed effects (Column (3)).

While the univariate and multivariate results thus far demonstrate that firms sell more patents in the final month of a firm's fiscal year, the results do not rule out the possibility of other motivations for patent sales that coincide with a firm's fiscal year end. To investigate whether managers sell patents motivated by a desire to achieve earnings targets, we expect that managers are more likely to sell internally developed patents with a smaller book value than externally acquired patents with a larger book value. The cash a seller receives from a patent sale does not fundamentally depend on whether the invention was developed in-house or externally acquired, and thus if firms sell patents at year end simply for liquidity reasons, we would not expect to observe a difference in the patent's source.[11] In Table 3, we present the results of regressing *Diff in Internally Generated and Externally Acquired Patent Sales* on *M-5, M-4, …, M-1, M.* The dependent variable is calculated as the difference between the number of internally generated patent sales and externally acquired patent sales, scaled by total patent sales (see Appendix A for more detailed variables definitions).

[11] However, we do acknowledge that firms may be less likely to sell a previously purchased patent given that the purchase was made with a purpose, whereas some internally developed patents may be serendipitous discoveries. For this reason, we use the *difference* in internally generated versus externally acquired patent sales as our dependent variable. Absent earnings management motivations, it is more difficult to argue that firms sell *relatively* more internally developed patents precisely at a firm's fiscal year end.

We find that both without and with controls (Columns (1) and (2), respectively) there is a significantly positive coefficient on *M* (coefficient=0.064; t-stat=3.03 for Column (1); coefficient=0.066; t-stat=3.14 for Column (2)). This finding is consistent with managers selling disproportionately more internally generated patents in month *M* than in other months of the year. In fact, the coefficients on *M-5, M-4, …, M-1* suggest managers are no more likely to sell internally generated patents over externally acquired patents in the months leading up to the event month than at other points during the year. In economic terms, internally generated patent sales in month *M* are 13.9% higher than internally generated patent sales during other months of the year, relative to baseline averages.[12] Taken together, the results in Tables 2 and 3 support our hypothesis and point towards an earnings management motivation for abnormal patent sales.

4.3 Cross-sectional Analyses

We next examine two cross-sectional tests to examine whether patent sales in month *M* are likely to be motivated by earnings management incentives. First, if we observe that final month patent sales are more pronounced in years where a firm either meets or just beats earnings expectations, these patent sales are more likely motivated by earnings pressure. We modify Equation (1) to include an interaction between *M, M-1, M-2, …, M-5* and *Meet or Just Beat* that takes on the value of one when the difference between realized earnings per share and expected earnings per share is between 0 and 1 cent and zero otherwise (see detailed variable definitions in Appendix A). If patent sales in the final month of the fiscal year are indicative of earnings management, we expect the coefficient on *M * Meet or Just Beat* to be significantly positive.

[12] We evaluate the economic effects of our regression coefficient by using the coefficient value (e.g., 0.064 in Column (1) of Table 3) to estimate the implied change in our dependent variable - *Diff in Internally Generated and Externally Acquired Patent Sales* relative to its mean value of the benchmark period M-6 through M-11 (i.e. 0.46). We derive this change using the equation: 0.064 = 0.46*(1+r)-0.46, where r represents the economic effect of our regression coefficient relative to the mean value of our dependent variable. By solving for r in this equation, we find that r = 13.9%. This represents the economic magnitude derived from the regression coefficient of 0.064 in Column (1) of Table 3.

Table 4 Column (1) shows that the positive link between patent sales and month M is amplified for meet or beat firms (coefficient=1.352; t-stat=3.48). In Column (1) we use the most recent analyst consensus forecast for the year, where available, as the market's earnings expectation. However, the most recent analyst consensus forecast for the year could be measured after a firm's fiscal year ends, but before the earnings announcement date.

Real activities management through patent sales requires the manager to finalize a transaction prior to yearend for any associated gain to be recognized in the accounting period. Thus, we also use the market's expected earnings at the time a manager must decide to sell a patent, which we proxy for using the consensus analyst forecast as of the second month of the last fiscal quarter of the year, e.g., November for a December 31st year end firm (Bhojraj, Hribar, Picconi and McInnis (2009)). We present these results in Table 4 Column (2) and find qualitatively similar results (coefficient=1.582; t-stat=3.75). Taken together, we find that the per month abnormal patent sales effect in month *M* is 1.4% to 1.6% higher in years where a firm just meets or beats earnings expectations by 1 cent. We do find a significantly positive coefficient on *M*, suggesting elevated patent selling activity in the final month of the fiscal year on average, perhaps due to institutional, tax, or other reasons.

Figure 3 provides graphical evidence corroborating the inferences from Table 4. Panels A and B are histograms of the average *No. of Patent Sales* by *Earnings Forecast Surprise* range (i.e., the difference between actual earnings and market expectations) for patent sales in month *M* and non-month *M*, respectively. Panel A shows that patent sales in the final month of the fiscal year are over three times as common (approximately 0.26/0.07) in years where a firm meets or beats an earnings expectation by one cent than in years where a firm misses expectations by one cent. Importantly, there is no such discontinuity for patent sales made during other months of the year,

even when a firm is within one cent of meeting expectations (Panel B). We also present similar graphs using a regression framework that includes our vector of controls as well as firm-year and month fixed effects and do so separately for sales made in month *M* (Panel C) and non-month *M* (Panel D). In this multivariate framework, we observe statistically significant, elevated final month patent sales for periods in which a firm just meets or exceeds earnings targets and observe no such effect for patent sales made at other times during the year.

In our second cross-sectional test, we use executive equity incentives as another proxy for whether managers have strong incentives to meet or beat earnings expectations. Executives believe that issuing earnings targets puts downward pressure on a firm's stock price (Graham, Harvey and Rajgopal (2005)), and thus the more closely tied an executive's compensation is to stock price, the more likely a manager is to use earnings management techniques such as selling patents for a gain. We regress *No. Patent Sales* on the interaction between *M, M-1, M-2, …, M-5* and *High Executive Incentives.* We first proxy for high executive incentives using the *Incentive Ratio* that takes on the value of one for firms whose managers' share of equity-based compensation to total compensation is in the highest quartile of firms and zero otherwise. This measure of executive equity incentives is similar to those used by Bergstresser and Philippon (2006) (see Appendix A for more detailed variables definitions).

While executive equity compensation is endogenously determined and could potentially covary with other factors that are also associated with the timing of patent sales, Edmans, Fang and Lewellen (2022) argue that the timing of when equity awards vest is less endogenous as it is based off prior equity grants. Accordingly, we also proxy for *High Executive Incentives* using *Vesting Equity*, that takes on the value of one when the standardized executive vesting equity is in the highest quartile and zero otherwise (see Appendix A). A significantly positive coefficient on

*M * High Executive Incentives* indicates that firms with greater equity incentives for executives sell incrementally more patents in the final month of the firm's fiscal year end. The sample size for these cross-sectional tests is reduced due to the need to have Execucomp database coverage when using the incentive ratio as a proxy and further reduced due to the additional need for CRSP coverage when calculating vesting equity.

The results are presented in Table 5. In Column (1), we find firms whose executives' equity-based compensation relative to total compensation are in the highest quartile sell significantly more patents in month *M* (coefficient=3.921; t-stat=4.40). In economic terms, *No. Patent Sales* the per month abnormal patent sales are 3.9% greater in month *M* for firms when *Incentive Ratio* is in the highest quartile, relative to firms whose executives receive proportionally less equity compensation. In Table 5 Column (2), we also find evidence of more pronounced month *M* patent sales for firm-years in the highest quartile of equity award vesting (coefficient=1.811; t-stat=2.86).[13] In economic terms, the per month abnormal patent sale effect is 1.8% greater in the last month of the fiscal year for firms when *Vesting Equity* is in the highest, relative to firms not in the highest quartile of *Vesting Equity*. Taken together, our cross-sectional results point to abnormally high patent sales in the final fiscal month being strategic patent sales; the firms who sell the greatest number of patents in month *M* are those with high incentives to manage earnings and choose to sell the patents most likely to generate significant reported gains.[14]

[13] Edmans, Fang, and Lewellen (2022) also include additional controls specific to equity vesting. When we incrementally include total salary, bonus amount, executive age, the CEO's tenure, an indicator for whether the CEO is new, and firm age as additional controls to the specification in Table 5 Column (2), we find our results continue to hold and at a similar magnitude (untabulated).

[14] When we exclude the month fixed effects, we find the main effect of *High Executive Equity Incentives* (either for *Incentive Ratio* or *Vesting Equity*) is insignificant in both specifications, suggesting that the average number of patent sales is not different for high versus low equity incentive firms.

4.4 Alternative Channels

While cross-sectional results discussed in Section 4.3 demonstrate that final fiscal month patent sales are greater for firms and in time periods with greater incentives to manage earnings, to raise the bar for alternative explanations, we also test three alternative channels. First, prior research indicates that private firms are less likely to have financial pressure distort their operating decisions (Asker, Farre-Mensa, and Ljungqvist (2015)). If so, we expect that patent sales in the last month of a firm's fiscal year end are lower for private firms than public firms, which are subject to the scrutiny of the public equity markets. We modify Equation (1) to include the interaction between *M, M-1*, *M-2, …, M-5* and *Private Firm. Private Firm* is an indicator variable that takes on the value of one for private firms and zero for publicly traded firms. We identify private firms in the patent assignment data as those that PatentsView identifies as a corporation but that are not included as public firms in the updated Kogan et al. (2017) dataset. We use the PatentsView assignee_id variable as a private firm's unique identifier. Because controls such as market capitalization and returns are unavailable for private firms, we omit control variables in this analysis, though we continue to employ firm-year and month fixed effects.[15] We further assume all private firms have a December fiscal month end, consistent with the majority of public firms in our sample.

Table 6 Panel A presents the results. We find that private firms are less likely than public firms to sell patents in the last month of the fiscal year, consistent with these firms having less incentive to manage earnings. This is true if we compare the last month of the fiscal year to all other months of the year (Column (1)) or if we map out patent sales in the months leading up to fiscal year end (Column (2)) (i.e., coefficient=-1.367; t-stat=-8.73 for Column (1) and coefficient=-1.347; t-stat=-

[15] Note that the inclusion of firm-year fixed effects subsumes the main effect of *Private Firm* in the regression.

-8.51 for Column (2)). In terms of economic significance, per month patent sales are 1.4% lower for private firms in the last month of the fiscal year than public firms.

The total effect of patent sales in month *M* for private firms is still significantly positive (p-value <0.01), suggesting that there are some institutional features other than earnings pressure that could contribute to patent sales clustering at year end. However, our results consistently find *incrementally* more patent sales in the final month of the fiscal year for firms with financial reporting incentives and incrementally fewer patent sales in the last month of the fiscal year for firms without those reporting incentives.

Our second alternative channel test examines whether our results are attributable solely to firms that have tax reasons for selling patents. In general, firms' tax incentives are to accelerate the recognition of expenses and losses, thereby reducing taxable income, and defer revenues and gains to future periods. Accordingly, we would not expect firms typically to sell patents for a gain for tax reasons. However, a particular case where firms may want to recognize the gain from a patent sale for tax purposes is to offset capital losses. If firms have capital losses, they can only deduct capital losses from capital gains and cannot deduct capital losses from operating income. If firms have more capital gains than capital losses in a year, they can deduct all their capital losses to offset their capital gains when calculating their tax burden. But if firms have more capital losses than capital gains in a year, firms can carry back the excess capital losses to offset capital gains from the prior three years or carry forward capital losses to offset any future capital gains for the next five years. However, after five years the capital losses expire, and firms cannot realize any tax benefit from those losses. Therefore, a firm may sell a patent to recognize a capital gain and enable the firm to realize the tax benefit from their capital loss carryforwards.

Capital loss carryforwards are included in the financial statements in the deferred tax asset account; thus, we identify firms in the top quartile of the deferred tax asset balance (*High DTA*) as those most likely to sell patents for tax purposes. Given that capital loss carryforward expire after five years, we use deferred tax asset balance over the prior five years to identify tax-motivated firms and interact *High DTA* with *M, M-1, … M-5*. If our results are attributable to firms' tax motivated patent sales, we would expect to see a positive coefficient on the interaction of *M * High DTA* and an insignificant coefficient on *M*. The results in Table 6 Panel B indicate that firms with high levels of DTA in the preceding five years do not sell patents at a different rate than other firms, suggesting that tax motivated patent sales do not explain our results (coefficient=0.674; t-stat=1.22 for Column (1) without controls and coefficient=0.814; t-stat=1.48 for Column (2) with controls). Furthermore, the coefficient on *M* remains positive and statistically significant.[16]

As a third alternative channel test, we examine whether financially distressed firms exhibit more pronounced patent selling behavior at year end than other firms. We measure financially constrained firms using the KZ-Index over the past five years (Kaplan and Zingales (1997); Lamont et al. (2001)) and create an indicator variable, High KZ-Index that takes on the value of one if the historical KZ-index is in the top quartile and zero otherwise. If financially constrained firms sell more patents in month *M* simply for liquidity rather than earnings pressure, we should observe a positive coefficient on *M * High KZ-Index*. The results, presented in Table 6 Panel C are inconsistent with this alternative motivation as the interaction term is insignificant (coefficient=0.093; t-stat=0.21 for Column (1) without controls and coefficient=0.119; t-stat=0.27 for Column (2) with controls).[17] In sum, all three of the alternative channel tests fail to find

[16] The Tax Cut and Jobs Act changed the tax rules for capital loss carryforwards in 2018. If we instead limit our sample to employ years from 1985 to 2018, our inferences in Table 6 Panel B are unchanged.

[17] As an alternative proxy for financial constraints, we employ the text-based measures from Hoberg and Maksimovic (2015). Consistent with our tabulated results using the KZ-index, we fail to find a differential impact for financially

evidence that our main results are attributable solely to institutional factors, tax motivation, or financial constraints.

4.6 Economic Consequences

4.6.1 Firm Performance

To investigate the implications of firms' abnormal patent sales in month *M*, we examine whether selling patents in month *M* is linked to future performance. We modify Equation (1) to a firm-year unit of analysis and employ future ROA or cash flows as dependent variables (either using year *t+1* or the average future performance for years *t+1* to *t+3*). We also replace the month indicator variables with *High No. Patent Sales in M*, defined as firm-years in the highest quartile of *No. Patent Sales* in month *M*. Given the change in units, we present descriptive statistics at the firm-year level in Table 7 Panel A. The regression results are presented in Table 7 Panel B.

We find firms with an abnormal amount of patent sales in month *M* have lower future ROA and cash flows.[18] Specifically, Columns (1) and (2) show a negative link between *High Patent Sales* in *M* and future ROA ((coefficient=-0.015; t-stat=-2.98 for Column (1) and coef.= -0.012; t-stat=-2.34 for Column (2)).[19] Columns (3) and (4) show a negative link between *High Patent Sales*

constrained firms using the Hoberg and Maksimovic (2015) general measure of financial constraints or any of their three other measures specific to equity, debt, or private placement financing.

[18] If instead we use a modified version of Roychowdhury's 2006 models to identify industry-year expectations for the abnormal portion of patent sales in month *M*, we continue to find a negative association between patent sales at *M* and future performance (untabulated). Specifically, we alternatively define *High Abnormal Proportion Patent Sales in M* to be a dummy variable dummy variable equal to one when the residual of *Proportion* (No. Patent Sales at M/Total No. Patent Sales at M-1~M-11) is in the highest quartile and zero otherwise. Specifically, the residual is deviations from the predicted values from two-digit SIC-year regressions, as follows:

$$\frac{Proportion_t}{Asset_{(t-1)}} = \alpha_0 + \alpha_1 \frac{1}{Asset_{t-1}} + \beta \frac{Sales_{t-1}}{Asset_{t-1}} + \epsilon_t$$

[19] Gains or losses on the sale of finite lived intangible assets are reported on the income statement as a component of income from continuing operations (Hanlon et al. (2023)). If a firm sells patents in year *t* to manage earnings upward, then it is possible that earnings from continuing operations is lower in year *t+1* and years *t+1* to *t+3* not due to a decline in future performance but simply because of reversion to the mean. To avoid this alternative interpretation, we use operating income before depreciation (i.e., a subtotal of income that does not include gains on patent sales) as our proxy for future performance. Furthermore, we also employ cash flow from operations as a proxy for future performance, which does not include cash flows from patent sales, and find consistent results. While prior research has shown that investors weight income statement line items differently (McVay (2006); Bradshaw and Sloan (2002)),

in *M* and future cash flows (coefficient=-0.012; t-stat=-3.40 for Column (1) and coef.= -0.006; t-stat=-2.12 for Column (2)). These estimates translate into a -10.9% to -13.7% effect on ROA, and a -7.5% to -17.1% effect on cash flows for firms with abnormally high patent sales, compared to their respective sample median values. These findings are consistent with the interpretation that firms who engage in strategic patent sales experience future performance costs or that firms in decline both sell more patents and have lower future performance.

4.6.2 Implications for the Market for Innovation: Patent Trolls as Strategic Liquidity Providers

4.6.2.1 Baseline Results

Next, we examine the ways in which patents sold in month *M* impact the market for innovation more broadly. We find that NPEs play an important role in facilitating patent transactions specifically in month *M*. In our sample, 55% of sales made to NPEs occur in the last fiscal month (untabulated). Motivated by this observation, we examine NPEs as purchasers of month *M* patents and the attendant implications for the litigation environment. We then exploit the staggered adoption of anti-troll laws to provide causal estimates of NPEs' impact on month *M* patent sales.

We begin by regressing *Probability of Litigation of Sold Patents* on *M, M-1, M-2, …, M-5* and controls and present the results in Table 8. We find the proportion of sold patents that are subsequently involved in a lawsuit increases if the patents are sold in the final month of the fiscal year relative to patent sales that occur other times of the year (Column (1)) (coef.=0.014; t-stat=2.01). Next, Table 8 Column (2) indicates that the number of patents sold to NPE buyers is greater when the patent is sold in month *M* (*No. Patents Sold to NPE Buyers* (coef.=0.045; t-

the extant literature also confirms that investors fixate on bottom-line earnings (i.e., income before extraordinary items) (Sloan (1996); Bradshaw et al. (2001); Richardson et al. (2005); Shi and Zhang (2012)). Thus, managers still have an incentive to manage earnings via patent sales whose gains are included in income from continuing operations.

stat=2.81)). However, given that we find a greater number of patents sold in month *M* in general, it is perhaps unsurprising that the number of NPE buyers increases.

Accordingly, we next investigate whether NPEs represent a greater *proportion* of month *M* buyers. In Column (3) of Table 8, we find a significantly positive association between patents sold in month *M* and *Proportion of NPE Buyers* (coefficient=0.070; t-stat=3.12), suggesting that a patent sold in the last month of the fiscal year is more likely to be purchased by an NPE than if the patent is sold at another point during the year. Finally, we examine whether NPEs are involved in subsequent litigation involving month *M* patent sales. In Column (4) of Table 8 we find that conditional on a patent being litigated, the probability that the patent asserter is an NPE increases significantly if the patent was sold in the last month of a firm's fiscal year end.

4.6.2.2 Demand Side Analysis Based on Staggered Adoption of Anti-Troll Laws

Our results thus far have focused on the supply side of patent sales and suggest that NPEs can play an important role as liquidity buyers in the secondary patent market. We complement these findings by examining constraints on the demand side of the patent market. Specifically, we use the staggered adoption of anti-troll laws in 34 U.S. states as a plausibly exogenous shock to NPE purchasing activities. Since 2013, beginning with Vermont, 34 states have implemented anti-troll legislation to protect geographically local businesses from demand letters and frivolous infringement claims initiated by NPEs (see Table 9 Panel A for the full staggered adoption schedule; Appel et al. (2019)). This legislation effectively reduced the ability of NPEs to profit from patent acquisitions in treated states.

Our assumption is that the anti-troll legislation diminished NPEs ability to use acquired patents for litigation purposes in affected states, thereby reducing NPEs incentives to purchase patents in month *M*. Implicit in this assumption is the notion that NPEs intend to assert newly acquired

patents in the same state as the selling firm. Given that the development of technologies clusters by geography as evidenced by related prior research, this assumption is reasonable (e.g., Audretsch and Feldman (1996); Jaffe and de Rassenfosse (2019)). As validation, we find the anti-troll legislation leads to a significant reduction in NPE buying in general (results untabulated).

We use a difference-in-differences identification strategy to empirically identify the effects of anti-troll legislation on month *M* patent sales. Using a sample of firm months from 12 months before the first treatment month (May 2013) to 12 months after the last treatment month (May 2017), we interact *M*, *M-1*, *M-2*, ..., *M-5* with *Treat* and *Post. Treat* is an indicator variable equal to one if a firm's headquarter state adopts the anti-troll legislation, and zero otherwise. *Post* is equal to one for firm-months after the month of anti-troll law adoption, and zero otherwise. Hence, the coefficients on *M*Treat*Post* capture the impact of implementing anti-troll laws on patent sales in month *M*.

Table 9 Panel B shows that the adoption of anti-troll legislation leads to a significant decrease in patent sales in month *M* with a coefficient of -1.794 (t-stat = -2.27) in Column (1) without controls and a coefficient of -1.615 (t-stat = -2.05) in Column (2) with controls. In economic terms, firms headquartered in a state that implemented anti-troll law experience a 1.6 to 1.8% decline per month in patent sales in month *M*, relative to baseline estimates. In Figure 4, we plot the coefficient estimates in event-time to validate the parallel trends assumption and to test for effect dynamics. The figure plots the point estimates from quarter $t - 4$ to quarter $t + 4$ with 90% confidence interval bands, where for each treated state, quarter *t* is the quarter when the anti-troll law is signed into law. Consistent with the parallel-trends assumption, we find no significant difference in the patent sales at month *M* between treated and control states before the legislation (see Figure 4).

Taken together, the results of Tables 8 and 9 are consistent with the interpretation that when patent sales are motivated by earnings management, they are more likely to be sold to parties who will litigate the patent and involve NPEs.[20] Even as executives of publicly traded firms denounce patent trolls, their firms still appear to sell patents to NPEs when under earnings pressure, perhaps as an expedient buyer of last resort. To the extent that patent litigation is costly and NPE lawsuits are socially undesirable (Cohen, Gurun, and Kominers (2019)), an implication of our results is that financial reporting incentives could have the unintended consequence of firms selling patents to parties that in turn create deadweight loss.

4.7 Additional Analyses

4.7.1 Robustness

Finally, we examine the robustness of our main result to various measurement alternatives and present the results in Table 10. First, we exclude the approximately 60% of firms in our sample that have December fiscal year ends and find our results continue to hold (Column (1)) (coef.=0.551; t-stat=3.88). This suggests that there is not a specific institutional feature of the patent market related solely to the month of December that would explain our results. Second, our inferences remain unchanged if we alter the fixed effect structure to employ industry by year fixed effects (Column (2)) (coef.=1.090; t-stat=8.09); or firm and industry by year fixed effects (Column (3)) (coef.=1.079; t-stat=8.01). Third, we scale the dependent variable, *No. Patent Sales*, by total assets or patent stock in Columns (4) and (5), respectively and find consistent results (coef.=0.015; t-stat=2.18 for Column (4), coef.=0.045; t-stat=3.92 for column (5). Finally, instead of using IHS transformed patent sales as our dependent variable, we use the simple count of the number of

[20] In legal studies, whether a patent is litigated is also interpreted as a measure of patent value (Bessen and Meurer 2005). The argument is that enforcing patent rights is costly and firms will only litigate patents whose value warrants the litigation costs. Under this interpretation, our results in Table 8 Column (1) also corroborate those in Table 1 Panel C that patents sold in month *M* are more valuable patents, on average.

patent sales in a Poisson regression as recommended by Cohn, Liu, and Wardlaw (2022) in Column (6) ((coefficient=0.131; t-stat=4.89) and find our inferences are unchanged.

4.7.2 Sources of Endogeneity

Endogeneity can result from reverse causality, correlated omitted variables, or mismeasurement, which can contribute to the non-random assignment of the treatment variable. In our setting, the treatment variable of interest is the month indicator relative to the firm's fiscal year end. While firms do choose their fiscal year ends, that choice is a multifaceted decision that is quite steady within a firm (i.e., only around 5% of our sample firms change fiscal year ends). Therefore, it is unlikely that the firms' patent sales determined the firm's choice of fiscal year end (i.e., reverse causality) or that the determinants of the choice of fiscal year end made in prior periods also dictate patent sales in the current year (i.e., a correlated omitted variable). Thus, these traditional endogeneity threats are less likely to operate in our setting given our research design.

However, at the construct level, the treatment of interest is managers' fixation on meeting earnings targets. In our sample we only include publicly traded firms, and our cross-sectional tests discussed in Section 4.3 exploit variation in incentives to meet targets within that sample. As an alternative approach, we also employ a "shock" to going public utilized by Bernstein (2015) to better approach the random assignment of our treatment variable at the construct level. Specifically, we use changes in NASDAQ returns during firms' book-building phase prior to going public as an instrument for whether firms complete their IPOs or withdraw them. Between 1985 and 2021, we match a total of 6,693 IPOs on the SDC Platform to our sample firms, of which 6,151 were successfully completed and 542 were withdrawn.

In untabulated results, we find that the first stage regression of IPO likelihood on two-month NASDAQ returns calculated from the day of the IPO filing has a significantly positive association

and the F-statistic on the instrument is 14.43. In the second stage, we find that using instrumented likelihood of IPO completion (i.e., an indicator equal to the predicted value of stage 1 if the year is after the IPO and zero otherwise) interacted with *M-5* to *M* continues to show a significantly positive association between the number of patent sales and pressure to meet earnings targets as proxied for by successful IPOs. These results corroborate our main inferences that firms subject to earnings pressure are more likely to sell patents to meet targets. We caution the reader when interpreting these results. We find that this instrument is valid in the pre-2003 period (consistent with Bernstein (2015)'s sample period), but that the instrument appears to be significantly weaker in more recent years of our sample.

5. CONCLUSION

In sum, we find an abnormal level of patent sales in the last month of public firms' fiscal years. These patent sales appear to be a result of firms engaging in earnings management rather than institutional features of the patent market or for tax reasons. Taken together, our results are most consistent with the interpretation that capital market pressure to meet earnings targets can result in firms using patent sales to boost reported earnings. Our findings indicate that reporting rules for internally developed intangible assets such as patents could have the unintended consequence of making patent sales more attractive to firms under earnings pressure.

Importantly, patents sold in the final month of the fiscal year are more likely to be litigated in general, to be sold to "patent trolls", and are more likely to be involved in subsequent patent troll litigation, suggesting that strategic patent sales can have socially costly consequences. These results should be of interest to academics interested in patent assignments and litigation, to regulators considering optimal disclosure regulation around intangible assets, and to policymakers examining short-term incentives in public markets.

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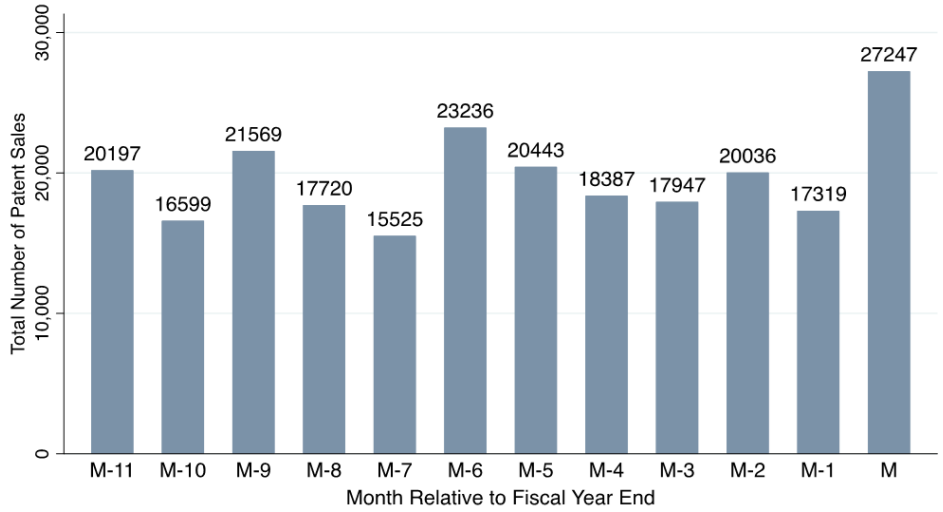
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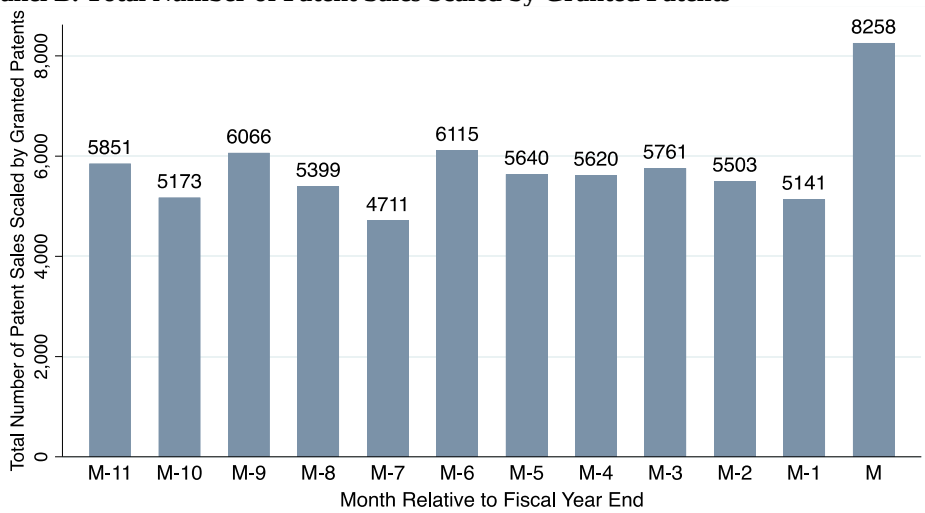
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Figure 1. Number of Patent Sales by Event Month

Panel A. Total Number of Patent Sales

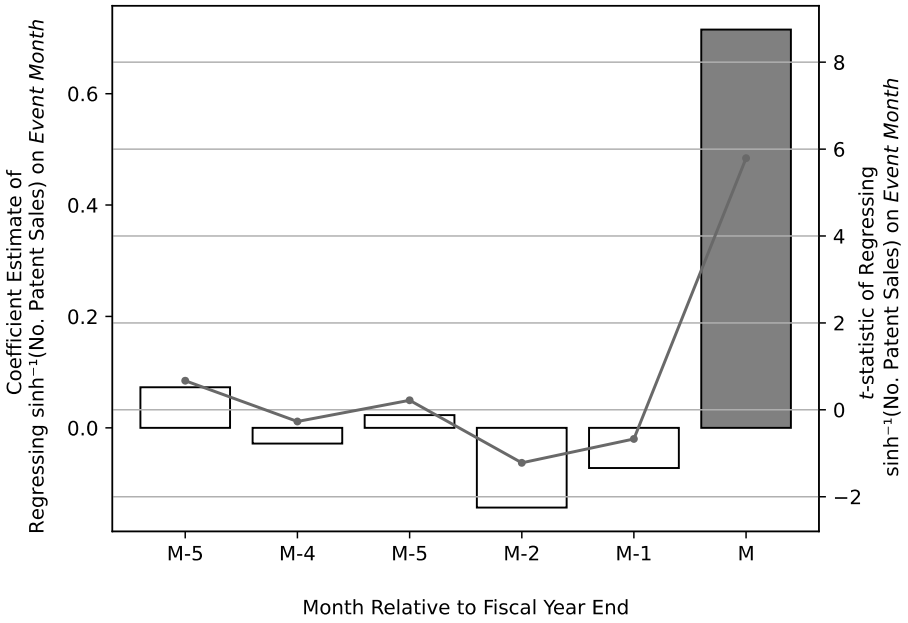


Panel B. Total Number of Patent Sales Scaled by Granted Patents



Notes: Panel A graphs the aggregate number of patent sales by month relative to a firm'fiscal year end from 1985 to 2021. Panel B graphs the aggregate number of patent sales scaled by the firm's patents granted in that month relative to the firm's fiscal year end from 1985 to 2021. Detailed definitions of all variables are provided in Appendix A.

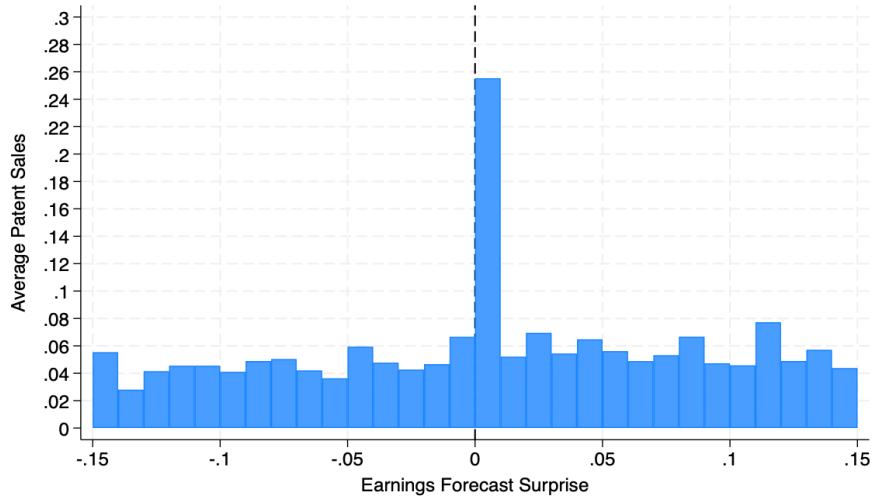
Figure 2. Patent Sales Relative to Public Firms' Fiscal Year End



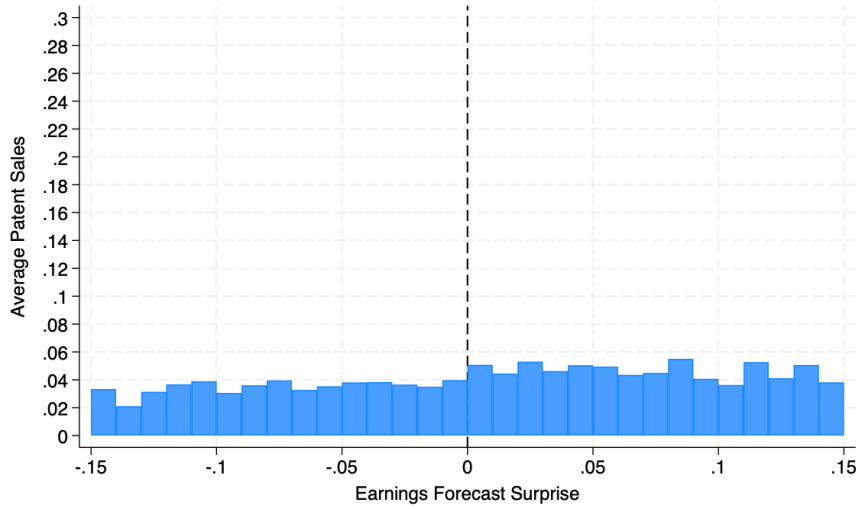
Notes: This figure displays the coefficient estimate obtained by regressing *No. Patent Sales* on *M, M-1, M-2, M-3, M-4, M-5* (represented by the bar graph) along with the corresponding t-statistics (shown in the line graph). The shaded bars signify that the coefficient is significant at the 5% level. Detailed definitions of all variables are provided in Appendix A.

Figure 3. Earnings Forecast Surprise

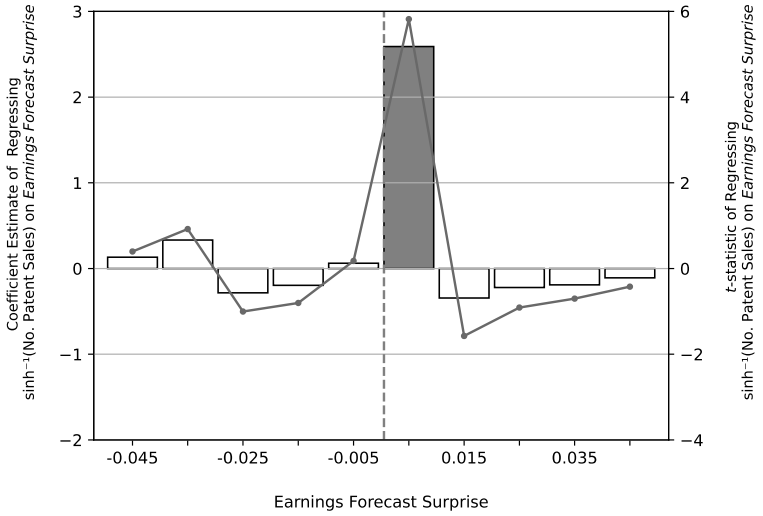
Panel A. Average Patent Sales for Month *M*



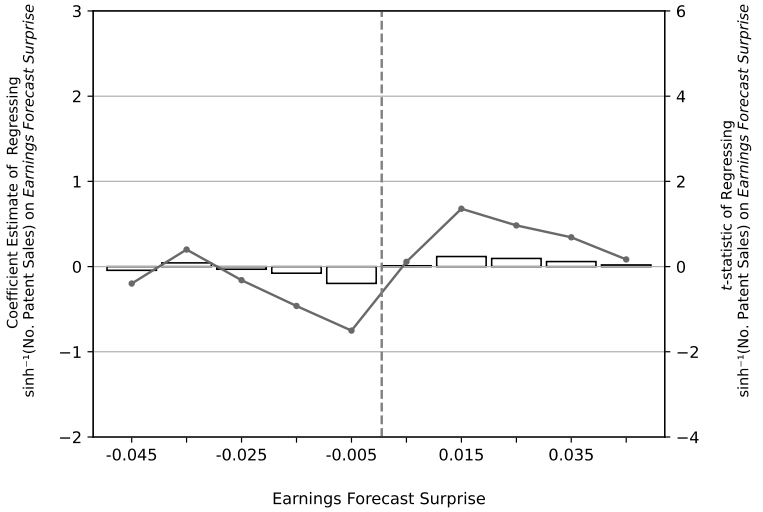
Panel B. Average Patent Sales for Non-Month *M*



Panel C. Coefficient Estimates (Month *M*)

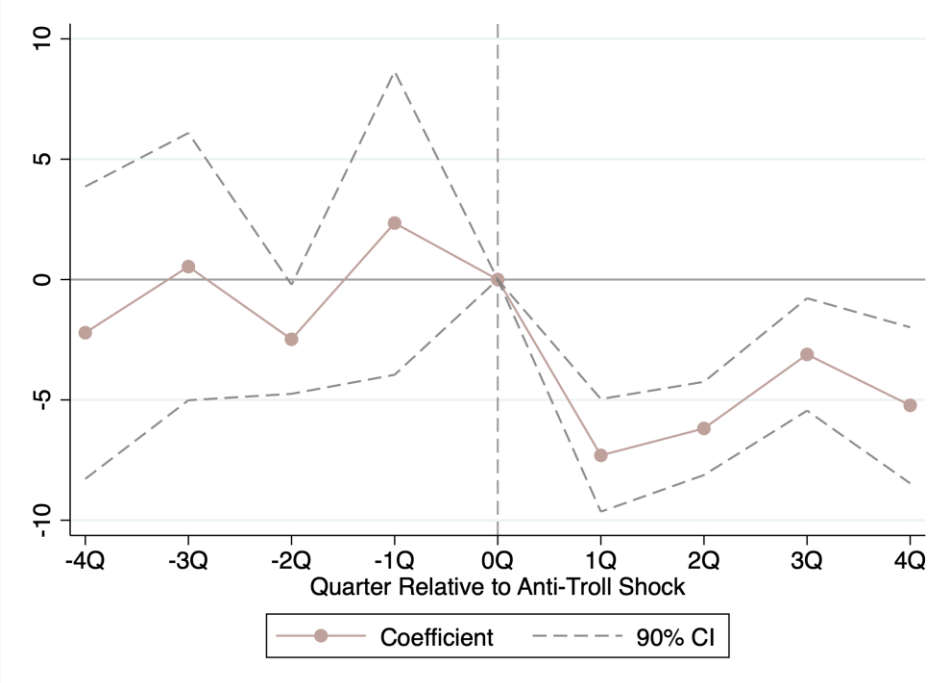


Panel D. Coefficient Estimates (Non-Month *M*)



Notes: Panel A and Panel B graphs the average patent sales by earnings forecast surprise range from 1985 to 2021, Panel A shows the average patent sales of month *M* and Panel B shows the average patent sales for other months of the year (Non-Month *M*). Panel C displays the coefficient estimates obtained by regressing *No. Patent Sales* in month *M* on *groups of Earnings Forecast Surprise* (represented by the bar graph), our vector of controls, and fixed effects along with the corresponding t-statistics (shown in the line graph). Panel D displays the coefficient estimates obtained by regressing *No. Patent Sales* in Non-Month *M* on *groups of Earnings Forecast Surprise* (represented by the bar graph), our vector of controls, and fixed effects along with the corresponding t-statistics (shown in the line graph). The shaded bars signify that the coefficient is significant at the 5% level. Detailed definitions of all variables are provided in Appendix A.

Figure 4. Anti-Troll Law Staggered Adoption: Parallel Trends



Notes: This figure presents the regression coefficients and 90% confidence intervals, in event time, from the regression of *No. Patent Sales* on M, M-1, M-2, …, M-5 * Event Quarter with controls, firm fixed effects, and year fixed effects. Event Quarter is defined as the event quarter relative to the adoption of anti-troll law. Detailed definitions of all variables are provided in Appendix A.

Table 1. Descriptive Statistics of Sample

Panel A. Statistics of Key Variables

	Obs.	*Mean*	*SD*	*P25*	*Median*	*P75*
Variables of Interest						
No. Patent Sales (untransformed)	1,221,216	19.34	504.92	0.00	0.00	0.00
No. Patent Sales	1,221,216	4.16	33.15	0.00	0.00	0.00
Diff in Internally Generated and Externally Acquired Patent Sales	1,221,216	0.83	9.26	0.00	0.00	0.00
Proportion of Patents Litigated	1,221,216	0.04	1.63	0.00	0.00	0.00
No. Patents Sold to NPE Buyers	1,221,216	0.84	64.13	0.00	0.00	0.00
Proportion of NPE Buyers	1,221,216	0.88	6.45	0.00	0.00	0.00
Probability of NPE Litigation | Litigation	1,221,216	0.03	1.71	0.00	0.00	0.00
Control Variables						
Market Cap (untransformed)	1,221,216	3441.09	23651.81	48.43	219.34	1123.50
Patent Stock (untransformed)	1,221,216	529.43	3907.92	0.00	9.00	71.00
No. Patent Granted (untransformed)	1,221,216	1.67	13.46	0.00	0.00	0.00
Market Cap	1,221,216	6.20	2.23	4.57	6.08	7.72
Monthly Returns	1,221,216	0.02	0.59	-0.08	0.00	0.08
Patent Stock	1,221,216	3.05	2.74	0.00	2.89	4.96
No. Patent Granted	1,221,216	0.32	0.86	0.00	0.00	0.00
Cross-Sectional Variables						
Meet or Just Beat Firms	1,221,216	0.09	0.28	0.00	0.00	0.00
Meet or Just Beat Firms (JF)	1,221,216	0.10	0.30	0.00	0.00	0.00
High Executive Incentive Ratio	412,896	0.25	0.43	0.00	0.00	0.50
Executive Incentive Ratio	412,896	0.22	0.19	0.08	0.16	0.31
High Executive Vesting Equity	382,008	0.24	0.43	0.00	0.00	0.00
Executive Vesting Equity (Standardized by Year)	382,008	0.00	1.00	-0.17	-0.14	-0.12
High DTA	520,800	0.25	0.43	0.00	0.00	0.50
Average DTA in the Past 5 yrs	520,800	155.60	817.84	1.60	11.19	52.65
High KZ-Index	558,576	0.25	0.43	0.00	0.00	0.50
KZ-Index (Standardized by Industry)	558,576	-0.00	1.00	-0.02	0.19	0.33
Characteristics of Sold Patents						
Forward Citations	463,290	12.18	36.63	0.00	1.00	10.00
Scaled Citations	463,290	0.97	2.52	0.00	0.34	1.03
Number of Claims	463,290	15.15	12.83	7.00	14.00	20.00
Patent Generality	463,290	0.30	0.30	0.00	0.24	0.57
Patent Age at Time of Sale	463,290	43.86	71.19	0.00	29.00	88.00

Table 1. [Continued]

Panel B. Correlations

	No. Patent Sales
M	0.0094***
M-1	-0.0025***
M-2	-0.0011
M-3	-0.0003
M-4	-0.0016*
M-5	-0.0002
Market Cap	0.1437***
Monthly Returns	-0.0006
Patent Stock	0.2278***
No. Patent Granted	0.2993***

Panel C. Patent Characteristics by Month of Sale

	Patents Sold in Month M (N=52,441)	**Patents Sold in Non-Month M (N=410,849)**	**Unsold Patents (N=1,677,508)**	**Diff. Patents Sold in M vs. Non-M (1)-(2)**		**Diff. Patents Sold in M vs. Unsold (1)-(3)**	
	(1)	(2)	(3)	**Diff**	**t-stat**	**Diff**	**t-stat**
Forward Citations	14.500	11.879	16.267	2.620***	(13.40)	-1.768***	(-9.28)
Scaled Citations	1.057	0.956	1.089	0.101***	(8.56)	-0.032**	(-2.85)
Number of Claims	15.564	15.103	17.506	0.461***	(7.36)	-1.942***	(-32.30)
Patent Generality	0.316	0.293	0.368	0.023***	(16.44)	-0.053***	(-39.45)
Patent Age at Time of Sale	52.521	42.758		9.763***	(28.47)		
%Patents Sold with 8-Ks	18.96%	31.45%		-0.085***	(-45.78)		

Notes: Panel A presents descriptive statistics for the variables used in our analyses, including the mean, standard deviation, and percentile values for our sample of 1,221,216 firm-month observations. We multiply our dependent variables by 100 for presentation purposes. Panel B presents the correlations among *No. Patent Sales* and other variables of interest. Panel C presents the mean and standard deviation for various measures of patent value separately for patents sold in month M and patents sold in other months of the year and presenting the mean of patents filed between 1984 through 2013, which were unsold until 2021. The unit of observation is at the patent level. ***, ***, * indicates statistical significance at 1%, 5%, and 10%, respectively (two-tailed). Detailed definitions of all variables are provided in Appendix A.

Table 2. No. Patent Sales over Event Month

	No. Patent Sales		
	(1)	(2)	(3)
M	1.101***	1.073***	0.715***
	(8.12)	(8.03)	(5.79)
M-1	-0.206**	-0.264**	-0.072
	(-1.98)	(-2.56)	(-0.67)
M-2	-0.057	-0.102	-0.143
	(-0.57)	(-1.01)	(-1.22)
M-3	0.034	-0.003	0.023
	(0.35)	(-0.03)	(0.22)
M-4	-0.109	-0.163*	-0.028
	(-1.26)	(-1.88)	(-0.27)
M-5	0.048	0.037	0.073
	(0.55)	(0.43)	(0.67)
Market Cap		-0.033	0.123
		(-0.28)	(1.31)
Monthly Returns		0.056*	0.036
		(1.68)	(1.03)
Patent Stock		0.967***	10.210***
		(6.80)	(18.61)
No. Patent Granted		3.033***	0.268*
		(8.28)	(1.93)
Obs.	1,221,216	1,221,216	1,221,216
Adj. R2	0.183	0.185	0.271
Firm FE	Yes	Yes	No
Year FE	Yes	Yes	No
Firm-Year FE	No	No	Yes
Month FE	No	No	Yes

Notes: This table presents regression results from the regressing *No. Patent Sales* on *M, M-1, M-2, …, M-5*. Column (1) includes the baseline regression with a vector of control variables and firm and year fixed effects. Column (2) expands the vector of control variables. Column (3) uses firm-year and month fixed effects. The unit of observation is at the firm-month level. T- statistics, based on standard errors clustered at the firm and year-month level, are reported below the coefficient estimates in parenthesis. ***, ***, * indicates statistical significance at 1%, 5%, and 10%, respectively (two-tailed). Detailed definitions of all variables are provided in Appendix A.

Table 3. Internally Generated Patents and Externally Acquired Patents

	Diff in Internally Generated and Externally Acquired Patent Sales	
	(1)	(2)
M	0.064***	0.066***
	(3.03)	(3.14)
M-1	-0.025	-0.019
	(-1.22)	(-0.92)
M-2	-0.019	-0.014
	(-0.87)	(-0.61)
M-3	-0.004	-0.002
	(-0.17)	(-0.11)
M-4	0.002	0.004
	(0.11)	(0.21)
M-5	0.000	0.002
	(0.01)	(0.11)
Market Cap		-0.006
		(-0.30)
Monthly Stock Return		0.008
		(1.42)
Patent Stock		1.515***
		(16.72)
No. Patent Granted		0.042
		(1.20)
Obs.	1,221,216	1,221,216
Adj. R2	0.222	0.223
Firm-Year FE	Yes	Yes
Month FE	Yes	Yes

Notes: This table presents regression results from regressing of the *Diff in Internally Generated and Externally Acquired Patent Sales* on *M, M-1, M-2, …, M-5*. Column (1) includes the baseline regression with a vector of control variables and firm-year and month fixed effects. Column (2) expands the vector of control variables. The unit of observation is at the firm-month level. T- statistics, based on standard errors clustered at the firm and year-month level, are reported below the coefficient estimates in parenthesis. ***, ***, * indicates statistical significance at 1%, 5%, and 10%, respectively (two-tailed). Detailed definitions of all variables are provided in Appendix A.

Table 4. Patent Sales for Meet or Just Beat Firm-years

	No. Patent Sales	
	Consensus Forecast	*2 Months Prior Consensus Forecast*
	(1)	(2)
*M * Meet or Just Beat*	1.352***	1.582***
	(3.48)	(3.75)
M	0.393***	0.376***
	(5.17)	(4.91)
*M-1 * Meet or Just Beat*	-0.185	-0.453**
	(-0.73)	(-2.04)
*M-2 * Meet or Just Beat*	-0.254	0.124
	(-1.08)	(0.57)
*M-3 * Meet or Just Beat*	-0.009	0.054
	(-0.03)	(0.25)
*M-4 * Meet or Just Beat*	-0.235	0.130
	(-1.01)	(0.65)
*M-5 * Meet or Just Beat*	-0.364	-0.111
	(-1.63)	(-0.56)
M-1	-0.017	0.015
	(-0.24)	(0.22)
M-2	-0.006	-0.045
	(-0.08)	(-0.59)
M-3	0.056	0.046
	(0.77)	(0.64)
M-4	0.038	0.005
	(0.56)	(0.07)
M-5	0.113	0.090
	(1.46)	(1.20)
Market Cap	0.041	0.038
	(0.66)	(0.60)
Monthly Returns	0.027	0.027
	(1.35)	(1.34)
Patent Stock	6.175***	6.169***
	(19.58)	(19.58)
No. Patents Granted	0.149	0.138
	(1.62)	(1.51)
Obs.	1,221,216	1,221,216
Adj. R2	0.276	0.275
Firm-Year FE	Yes	Yes
Month FE	Yes	Yes

Notes: This table presents regression results from regressing *No. Patent Sales* on *Meet or Just Beat * M, M-1, M-2, …, M-5* to examine the moderating effect of firms consistently meeting or beating analyst forecast on the relation between fiscal month and patent sales. We define *Meet or Just Beat* as an indicator that takes on a value of one when *Earnings Forecast Surprise* is between 0 and 1 cent. Columns (1) defines *Earnings Forecast Surprise* as (actual EPS – analyst forecast EPS). Columns (2) defines *Earnings Forecast Surprise* as (actual EPS – analyst forecast EPS 2 months prior to yearend) following the Bhojraj et al. (2009). In both columns, if a firm does not have analyst coverage, we employ prior year's earnings as the benchmark. The unit of observation is at the firm-month level. T-statistics, based on standard errors clustered at the firm and year-month level, are reported below the coefficient estimates in parenthesis. ***, ***, * indicates statistical significance at 1%, 5%, and 10%, respectively (two-tailed). Detailed definitions of all variables are provided in Appendix A.

Table 5. Executive Incentives

	No. Patent Sales	
	Incentive Ratio	*Vesting Equity*
	(1)	(2)
*M * High Executive Incentives*	3.921***	1.811***
	(4.40)	(2.86)
M	0.451**	0.791***
	(2.19)	(2.66)
*M-1 * High Executive Incentives*	-0.446	-0.162
	(-1.33)	(-0.28)
*M-2 * High Executive Incentives*	-0.013	-0.988*
	(-0.04)	(-1.74)
*M-3 * High Executive Incentives*	0.011	-1.889***
	(0.03)	(-3.34)
*M-4 * High Executive Incentives*	-0.320	-0.829*
	(-0.87)	(-1.67)
*M-5 * High Executive Incentives*	0.136	-0.001
	(0.40)	(-0.00)
M-1	0.079	-0.057
	(0.42)	(-0.18)
M-2	-0.054	-0.075
	(-0.28)	(-0.24)
M-3	-0.170	0.220
	(-0.98)	(0.63)
M-4	-0.025	0.073
	(-0.14)	(0.25)
M-5	0.078	-0.051
	(0.45)	(-0.17)
Market Cap	0.019	0.412
	(0.11)	(1.61)
Monthly Returns	0.036	0.062
	(0.98)	(0.90)
Patent Stock	8.561***	16.875***
	(13.03)	(13.36)
No. Patent Granted	0.109	0.332
	(0.73)	(1.41)
Obs.	412,896	382,008
Adj. R2	0.276	0.270
Firm-Year FE	Yes	Yes
Month FE	Yes	Yes

Notes: This table presents regression results from regressing *No. Patent Sales* on *High Executive Incentives * M, M-1, M-2, …, M-5* to examine the moderating effect of high CEO incentives and patent sales. Column (1) uses *Incentive Ratio* to proxy for *High Executive Incentives*, which is an indicator variable that takes on a value of one when the *Incentive Ratio* (Bergstresser and Philippon (2006)) is in the highest quartile and zero otherwise. Column (2) uses *Vesting Equity* to proxy for *High Executive Incentives*, which is an indicator variable that takes on a value of one when the standardized *Vesting Equity* (Edmans, Fang and Lewellen (2022)) is in the highest quartile and zero otherwise. The unit of observation is at the firm-month level. T-statistics, based on standard errors clustered at the firm and year-month level, are reported below the coefficient estimates in parenthesis. ***, ***, * indicates statistical significance at 1%, 5%, and 10%, respectively (two-tailed). Detailed definitions of all variables are provided in Appendix A.

Table 6. Tests for Alternative Channels

Panel A. Private Firms

	No. Patent Sales	
	(1)	(2)
*M * Private Firm*	-1.367***	-1.347***
	(-8.73)	(-8.51)
M	0.766***	0.746***
	(6.37)	(6.18)
*M-1 * Private Firm*		0.229*
		(1.91)
*M-2 * Private Firm*		-0.061
		(-0.54)
*M-3 * Private Firm*		0.017
		(0.15)
*M-4 * Private Firm*		0.086
		(0.80)
*M-5 * Private Firm*		-0.063
		(-0.60)
M-1		-0.159
		(-1.54)
M-2		-0.197*
		(-1.74)
M-3		0.060
		(0.58)
M-4		-0.086
		(-0.86)
M-5		0.038
		(0.36)
Obs.	12,879,604	12,879,604
Adj. R2	0.195	0.195
Firm-Year FE	Yes	Yes
Month FE	Yes	Yes

Table 6. [Continued]

Panel B. Tax Incentives

	No. Patent Sales	
	(1)	(2)
*M * High DTA*	0.674	0.814
	(1.22)	(1.48)
M	0.952***	0.927***
	(3.39)	(3.29)
*M-1 * High DTA*	0.652	0.772*
	(1.58)	(1.88)
*M-2 * High DTA*	1.485***	1.569***
	(3.71)	(3.92)
*M-3 * High DTA*	0.054	0.142
	(0.12)	(0.31)
*M-4 * High DTA*	0.648	0.700
	(1.45)	(1.56)
*M-5 * High DTA*	0.569	0.602
	(1.20)	(1.27)
M-1	-0.311	-0.280
	(-1.26)	(-1.15)
M-2	-0.780***	-0.761***
	(-3.21)	(-3.12)
M-3	-0.320	-0.345
	(-1.35)	(-1.45)
M-4	-0.301	-0.306
	(-1.19)	(-1.21)
M-5	-0.169	-0.162
	(-0.64)	(-0.61)
Market Cap		0.186
		(0.94)
Monthly Returns		0.032
		(0.94)
Patent Stock		14.294***
		(12.33)
No. Patent Granted		0.357*
		(1.70)
Obs.	520,800	520,800
Adj. R2	0.317	0.318
Firm-Year FE	Yes	Yes
Month FE	Yes	Yes

Table 6. [Continued]

Panel C. Financial Constraints

	No. Patent Sales	
	(1)	(2)
*M * High KZ-Index*	0.093	0.119
	(0.21)	(0.27)
M	0.869***	0.861***
	(3.42)	(3.37)
*M-1 * High KZ-Index*	0.499	0.513
	(1.47)	(1.53)
*M-2 * High KZ-Index*	0.189	0.206
	(0.52)	(0.56)
*M-3 * High KZ-Index*	-0.107	-0.071
	(-0.32)	(-0.21)
*M-4 * High KZ-Index*	0.437	0.441
	(1.25)	(1.26)
*M-5 * High KZ-Index*	-0.060	-0.052
	(-0.17)	(-0.14)
M-1	-0.232	-0.190
	(-0.90)	(-0.74)
M-2	-0.426*	-0.402*
	(-1.90)	(-1.78)
M-3	-0.191	-0.212
	(-0.72)	(-0.80)
M-4	-0.218	-0.222
	(-0.91)	(-0.93)
M-5	-0.071	-0.072
	(-0.28)	(-0.28)
Market Cap		0.255
		(1.56)
Monthly Returns		0.012
		(0.28)
Patent Stock		15.033***
		(13.59)
No. Patents Granted		0.327
		(1.63)
Obs.	558,576	558,576
Adj. R2	0.316	0.318
Firm-Year FE	Yes	Yes
Month FE	Yes	Yes

Notes: Panel A presents regression results from regressing *No. Patent Sales* on *Private Firm * M, M-1, M-2, …, M-5* to examine the moderating effect of private firm preceding the fiscal year end and patent sales. We define *Private Firm* as a dummy variable that takes on a value of one when the firm is a non-public firm and zero otherwise. In Panel B, we define *High DTA* as a dummy variable that takes on a value of one when the firm's average deferred tax asset in the past 5 years is in the highest quartile, otherwise zero. In Panel C, we define *High KZ-Index* as a dummy variable that takes on a value of one when the firm's average KZ-index in the past 5 years is at the highest quartile, otherwise zero. Column (1) includes the baseline regression. Column (2) augments the vector of control variables. The unit of observation is at the firm-month level. T-statistics, based on standard errors clustered at the firm and year-month level, are reported below the coefficient estimates in parenthesis. ***, ***, * indicates statistical significance at 1%, 5%, and 10%, respectively (two-tailed). Detailed definitions of all variables are provided in Appendix A.

Table 7. Firm Consequences

Panel A. Future Performance Consequences, Descriptives

	Obs.	*Mean*	*SD*	*P25*	*Median*	*P75*
Dependent Variables						
ROA (t+1)	93,081	0.07	1.55	0.02	0.11	0.18
ROA (avg, t+1~t+3)	78,732	0.08	1.55	0.04	0.11	0.18
Cash Flow/Asset (t+1)	87,896	0.02	0.37	-0.00	0.07	0.14
Cash Flow/Asset (avg, t+1~t+3)	74,086	0.03	0.29	0.02	0.08	0.13
Independent Variables						
No. Patent Sales at M	93,081	0.28	4.40	0.00	0.00	0.00
Control Variables						
Market Cap	93,081	6.22	2.22	1.69	4.60	6.10
Stock Return	93,081	0.24	4.68	-0.84	-0.27	0.00
Patent Stock	93,081	3.09	2.74	0.00	0.00	3.00
No. Patent Granted	93,081	1.09	1.67	0.00	0.00	0.00

Table 7. [Continued]

Panel B. Future Performance Consequences, Regressions

	ROA (t+1)	*ROA (avg, t+1~t+3)*	*Cash Flow/Asset (t+1)*	*Cash Flow/Asset (avg, t+1~t+3)*
	(1)	(2)	(3)	(4)
High Patent Sales in M	-0.015***	-0.012**	-0.012***	-0.006**
	(-2.98)	(-2.34)	(-3.40)	(-2.12)
Market Cap	0.032***	0.022**	0.020***	0.012***
	(4.41)	(2.05)	(11.20)	(6.11)
Stock Return	0.001	0.001	0.001*	0.000
	(1.61)	(1.51)	(1.77)	(1.56)
Patent Stock	-0.021	-0.024	0.003	0.002
	(-1.25)	(-1.19)	(1.39)	(0.98)
No. Patent Granted	-0.004**	-0.004	-0.005***	-0.006***
	(-2.09)	(-1.34)	(-3.08)	(-3.11)
Obs.	93,081	78,732	87,896	74,086
Adj. R2	0.252	0.319	0.362	0.608
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

Notes: Panel A presents descriptive statistics at the firm-year level for the regression variables used in Table 7 Panel B. Panel B presents regression results from the regressing measures of future performance on *High No. Patent Sales at M*. The unit of observation is at the firm-year level. T- statistics, based on standard errors clustered at the firm level, are reported below the coefficient estimates in parenthesis. ***, ***, * indicates statistical significance at 1%, 5%, and 10%, respectively (two-tailed). Detailed definitions of all variables are provided in Appendix A.

Table 8. Characteristics and Subsequent Events for Patents Sold in Month M

	Probability of Litigation of Sold Patents	*No. Patents Sold to NPE Buyers*	*Proportion of NPE Buyers*	*Probability of NPE Litigation | Litigation*
	(1)	(2)	(3)	(4)
M	0.014**	0.045**	0.070***	0.023***
	(2.01)	(2.81)	(3.12)	(2.75)
M-1	-0.004	-0.027	-0.020	0.003
	(-0.73)	(-1.75)	(-0.93)	(0.44)
M-2	0.004	0.009	0.001	0.001
	(0.58)	(0.39)	(0.06)	(0.15)
M-3	0.009	0.018	0.014	0.003
	(1.41)	(1.22)	(0.64)	(0.58)
M-4	-0.008	-0.014	0.005	-0.007
	(-1.31)	(-0.86)	(0.22)	(-1.17)
M-5	0.005	0.022	0.017	-0.002
	(0.88)	(1.20)	(0.74)	(-0.23)
Market Cap	-0.000	0.018**	-0.001	-0.005
	(-0.10)	(2.91)	(-0.07)	(-0.84)
Monthly Returns	-0.000	0.001	0.006	-0.000
	(-0.56)	(0.33)	(1.39)	(-0.46)
Patent Stock	0.123***	0.127***	1.200***	0.089***
	(6.48)	(9.94)	(16.55)	(3.43)
No. Patent Granted	0.007	0.307***	0.027	0.000
	(1.02)	(8.75)	(0.90)	(0.06)
Obs.	1,221,216	1,221,216	1,221,216	1,221,216
Adj. R2	0.019	0.060	0.220	0.050
Firm-Year FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes

Notes: This table presents regression results from regressing the *Proportion of Patents Litigated* on *M, M-1, M-2, ..., M-5* in Column (1), regressing the *No. Patents Sold to NPE Buyers* on *M, M-1, M-2, ..., M-5* in Column (2), regressing the *Proportion of NPE Buyers* on *M, M-1, M-2, ..., M-5* in Column (3), and regressing the *Probability of NPE Litigation | Litigation* on *M, M-1, M-2, ..., M-5* in Column (4). All results include the baseline regression with a vector of control variables and firm-year and month fixed effects. The unit of observation is at the firm-year level. T- statistics, based on standard errors clustered at the firm and year-month level, are reported below the coefficient estimates in parenthesis. ***, ***, * indicates statistical significance at 1%, 5%, and 10%, respectively (two-tailed). Detailed definitions of all variables are provided in Appendix A.

Table 9. Anti-Troll Law Staggered Adoption: Diff-in-Diff Estimates

Panel A. Anti-Troll Law Staggered Adoption Schedule

state	effective date
AL	4/2/14
AZ	3/24/16
CO	6/5/15
FL	6/2/15
GA	4/15/14
ID	3/26/14
IL	8/26/14
IN	5/5/15
KS	5/20/15
LA	5/28/14
ME	4/14/14
MD	5/5/14
MN	4/29/16
MS	3/28/15
MO	7/8/14
MT	4/2/15
NH	7/11/14
NC	8/6/14
ND	3/26/15
OK	5/16/14
OR	3/3/14
RI	6/4/16
SC	6/9/16
SD	3/26/14
TN	5/1/14
TX	6/17/15
UT	4/1/14
VT	5/22/13 (first adoption)
VA	5/23/14
WA	4/25/15
WI	4/24/14
WY	3/11/16
MI	1/6/17
CT	5/8/17 (last adoption)

Notes: This table presents the staggered adoption schedule of the 34 states implementing the state anti-troll legislation, from 2013 to 2017. The list was compiled by Appel et al. (2019).

Table 9. [Continued]

Panel B. Diff-in-Diff Estimates based on Staggered Anti-Troll Law Adoptions

	No. Patent Sales	
	(1)	(2)
*M * Treat * Post*	-1.794**	-1.615**
	(-2.27)	(-2.05)
M	1.809***	1.743***
	(3.91)	(3.76)
*M-1 * Treat * Post*	-0.121	0.061
	(-0.30)	(0.15)
*M-2 * Treat * Post*	-0.108	0.020
	(-0.29)	(0.05)
*M-3 * Treat * Post*	0.097	0.201
	(0.20)	(0.41)
*M-4 * Treat * Post*	0.018	0.115
	(0.04)	(0.26)
*M-5 * Treat * Post*	-0.570	-0.491
	(-1.21)	(-1.05)
*Treat * Post*	-0.374	-0.402
	(-0.94)	(-1.02)
M-1	-0.058	-0.123
	(-0.16)	(-0.35)
M-2	-0.106	-0.168
	(-0.45)	(-0.70)
M-3	-0.126	-0.199
	(-0.37)	(-0.58)
M-4	-0.072	-0.139
	(-0.21)	(-0.40)
M-5	0.533	0.487
	(1.30)	(1.19)
Market Cap		-0.329
		(-1.31)
Monthly Returns		-0.043
		(-0.78)
Patent Stock		11.469***
		(7.54)
No. Patent Granted		0.642**
		(2.49)
Obs.	163,880	163,880
Adj. R2	0.332	0.333
Firm-Year FE	Yes	Yes
Month FE	Yes	Yes

Notes: This table presents regression results from the regressing *No. Patent Sales* on Treat * Post * M, M-1, M-2, …, M-5 to examine the effect of staggered adoption of anti-troll law on month M patent sales. The sample starts 12 months before the first treatment month (May 2013) and ends 12 months after the last treatment month (May 2017). *Treat* equals 1 if the firm is headquartered at a treatment state and 0, otherwise. *Post* equals 1 if the firm-month is on or after the month of the event (i.e., adoption of the anti-troll law) and 0, otherwise. Column (1) includes the baseline regression with a vector of control variables and firm-year and month fixed effects. Column (2) expands the vector of control variables. The unit of observation is at the firm-month level. T- statistics, based on standard errors clustered at the firm and year-month level, are reported below the coefficient estimates in parenthesis. ***, ***, * indicates statistical significance at 1%, 5%, and 10%, respectively (two-tailed).

Table 10. Robustness

	No. Patent Sales	*No. Patent Sales*	*No. Patent Sales*	*No. Patent Sales (scaled by Assets)*	*No. Patent Sales (scaled by Patent Stock)*	*Untransformed No. Patent Sales (Poisson)*
	(1)	(2)	(3)	(4)	(5)	(6)
M	0.551***	1.090***	1.079***	0.015**	0.045***	0.131***
	(3.88)	(8.09)	(8.01)	(2.18)	(3.92)	(4.89)
M-1	-0.015	-0.314***	-0.253**	0.006	0.002	0.011
	(-0.12)	(-3.16)	(-2.48)	(0.85)	(0.30)	(0.36)
M-2	0.026	-0.137	-0.093	0.000	0.016**	-0.018
	(0.19)	(-1.39)	(-0.93)	(0.02)	(2.05)	(-0.59)
M-3	0.131	-0.027	0.006	0.009	0.012	0.015
	(0.93)	(-0.30)	(0.06)	(1.27)	(1.50)	(0.56)
M-4	-0.113	-0.236***	-0.151*	0.003	0.006	0.002
	(-0.91)	(-2.76)	(-1.78)	(0.57)	(0.86)	(0.07)
M-5	0.128	0.036	0.041	-0.015***	-0.004	0.016
	(0.84)	(0.43)	(0.48)	(-2.68)	(-0.41)	(0.53)
Market Cap	0.128	0.229**	-0.084	-0.005	-0.007	-0.009
	(0.91)	(2.20)	(-0.75)	(-0.49)	(-0.74)	(-0.29)
Monthly Returns	0.075	0.057*	0.060*	-0.004	-0.001	0.016
	(1.48)	(1.69)	(1.79)	(-0.51)	(-0.59)	(1.16)
Patent Stock	9.461***	0.926***	0.727***	0.653***	1.962***	3.356***
	(13.62)	(14.41)	(3.55)	(12.07)	(13.34)	(13.35)
No. Patent Granted	0.461**	9.041***	2.465***	0.003	0.019***	0.011
	(1.97)	(10.86)	(8.42)	(0.51)	(3.67)	(0.75)
Obs.	464,580	1,221,216	1,221,216	1,221,216	1,120,089	1,221,216
Adj./Pseudo R2	0.293	0.119	0.198	0.019	0.026	0.566
Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Sample	No Dec. Fis. End	Full Sample	Full Sample	Full Sample	Full Sample	Full Sample
Firm FE	No	No	Yes	No	No	No
Firm-Year FE	Yes	No	No	Yes	Yes	Yes
Month FE	Yes	No	No	Yes	Yes	Yes
Industry by Year FE	No	Yes	Yes	No	No	No

Notes: This table presents robustness tests using alternative sample composition, fixed effect structures, or dependent variable measurement. The unit of observation is at the firm-month level. T- statistics, based on standard errors clustered at the firm and year-month level, are reported below the coefficient estimates in parenthesis. ***, ***, * indicates statistical significance at 1%, 5%, and 10%, respectively (two-tailed). Detailed definitions of all variables are provided in Appendix A

Appendix A. Variables Definitions

Variable	Definition	Source
Dependent Variables		
No. Patent Sales	The IHS-transformed number of patents sold in a firm-month. The value is multiplied by 100 for presentation purposes.	Patent Assignment Data
Diff in Internally Generated and Externally Acquired Patent Sales	(*No. Internally Generated Patent Sales - No. Externally Acquired Patent Sales*) / (1 + *No. Internally Generated Patent Sales + No. Externally Acquired Patent Sales*)	Patent Assignment Data
No. Internally Generated Patent Sales	Number of internally generated patents sold in a firm-month. For a patent to be considered internally generated in a transaction, we verify that all sellers in this transaction have not previously been one of the buyers in any past transactions involving this patent.	Patent Assignment Data
No. Externally Acquired Patent Sales	Number of externally acquired patents sold in a firm-month. For a patent to be considered externally acquired in a transaction, we verify that one of the sellers in this transaction was one of the buyers in the most recent sale of the patent.	Patent Assignment Data
Probability of Litigation of Sold Patents	The IHS-transformed number of sold patents that is litigated divided by the number of patents sold in a firm-month.	Patent Assignment Data, NPE Litigation Dataset
No. Patents Sold to NPE Buyers	The IHS-transformed number of patents sold to NPE buyers.	Patent Assignment Data, NPE Litigation Dataset
Proportion of NPE Buyers	The IHS-transformed number of patents sold to NPE buyers divided by the number of patents sold.	Patent Assignment Data, NPE Litigation Dataset
Probability of NPE Litigation | Litigation	The IHS-transformed number of sold patents that is litigated by NPE asserters divided by the number of sold patents that is litigated.	Patent Assignment Data, NPE Litigation Dataset
No. Patent Sales (scaled by Assets)	The IHS-transformed number of patents sold divided by total assets in a firm-month.	Patent Assignment Data, Compustat
No. Patent Sales (scaled by patent stock)	The IHS-transformed number of patents sold divided by patent stock of the previous fiscal year-end month.	Patent Assignment Data, Patents View, Kogan et al. (2017)
Forward Citations	The number of forward citations a patent receives.	Patent Assignment Data, PatentsView
Scaled Citations	*Forward Citations* scaled by the average number of forward citations received by all patents granted in the same tech class-year.	Patent Assignment Data, PatentsView
Number of Claims	The number of claims in the patent.	Patent Assignment Data, PatentsView
Patent Generality	The concentration of forward citations received across technology classes, calculated as $Generality_i = 1 - \Sigma_j^{n_i} s_{ij}^2$, where s_{ij} represents the fraction of citations patent *i* receives from patent class *j* out of n_i patent classes.	Patent Assignment Data, PatentsView
Patent Age at Time of Sale	The number of months between when a patent is filed and when it is sold.	Patent Assignment Data, PatentsView
%Patents Sold with 8-Ks	The percentage of patent sales that have at least one 8K disclosure containing the keywords "patent," "patents," or "patenting" within 5 business days after the patent transaction date.	Patent Assignment Data, PatentsView, SEC Edgar
ROA(t+1)	The ratio of operating income before depreciation to assets in year t+1.	Compustat
ROA(avg, t+1~t+3)	The average ratio of operating income before depreciation to assets from years t+1 to t+3.	Compustat
Cash Flow/Asset (t+1)	The ratio of operating activities net cash flow to assets in year t+1.	Compustat
Cash Flow/Asset(avg, t+1~t+3)	The ratio of operating activities net cash flow to assets from years t+1 to t+3.	Compustat
Independent Variables		
M	An indicator that takes on a value of one for the last month of a fiscal year (e.g., December for a 12/31 yearend firm).	Compustat
M-1	An indicator that takes on a value of one for one month prior to the last month of a fiscal year (e.g., November for a 12/31 yearend firm).	Compustat
M-2	An indicator that takes on a value of one for two months prior to the last month of a fiscal year (e.g., October for a 12/31 yearend firm).	Compustat

M-3	An indicator that takes on a value of one for three months prior to the last month of a fiscal year (e.g., September for a 12/31 yearend firm).	Compustat
M-4	An indicator that takes on a value of one for four months prior to the last month of a fiscal year (e.g., August for a 12/31 yearend firm).	Compustat
M-5	An indicator that takes on a value of one for five months prior to the last month of a fiscal year (e.g., July for a 12/31 yearend firm).	Compustat
Market Cap	The IHS-transformed market capitalization (number of outstanding stocks * stock price) in a firm-month	Compustat; CRSP
Monthly Returns	The buy-and-hold returns of the stock in a firm-month.	Compustat; CRSP
Patent Stock	The IHS-transformed total number of patents filed in the past twenty years plus the total number of net patent purchases over the past twenty years (i.e., the total number of purchased patents minus the total number of patents sold).	Patent Assignment Data; Kogan et al. (2017)
No. Patent Granted	The IHS-transformed number of patents granted in a firm-month.	Kogan et al. (2017)
High Patent Sales in M	A dummy variable takes on a value of one when No. Patent Sales at month M is in the highest quartile and zero otherwise.	Patent Assignment Data
Cross-Sectional Variables		
Earnings Forecast Surprise	The difference between actual earnings and market expectations. Market expectations is measured as either the analyst consensus forecast if available or prior year's earnings if the firm does not have analyst coverage.	Compustat; I/B/E/S
Meet or Just Beat (Consensus Forecast)	An indicator variable that takes on a value of one when *Earnings Forecast Surprise* is between 0 and 1 cent.	Compustat; I/B/E/S
Meet or Just Beat (2 Months Prior Forecast)	An indicator variable that takes on a value of one when the difference between actual earnings and market expectation is between 0 and 1 cent. Market expectations is the consensus analyst forecast as of the second month of the last quarter of each fiscal year, following the Bhojraj et al. (2009).	Compustat; I/B/E/S
Incentive Ratio	One percent of the stock price multiplied by the total number of shares and options held by a firm's executives in a firm-year. $OnePercent_{c,t} = 0.01 * Stock\ Price_{c,y} * (No.Shares_{c,y} + No.Options_{c,y})$ *OnePercent* divided by *OnePercent* plus salaries and bonus of a firm's executives in a firm-year. $Incentive\ Ratio_{c,y} = OnePercent_{c,y}/(OnePercent_{c,y} + Salary_{c,y} + Bonus_{c,y})$	Compustat; Execucomp
Vesting Equity	The dollar change in the value of vesting equity in year t for a 100% change in the stock price; The dollar change in the value of vesting equity is calculated as vesting stock (the number of vesting shares in year t× stock price at the end of year t–1) plus vesting option (aggregated delta of vesting options in year t× stock price at the end of year t–1). The delta of an option is calculated using the Black-Scholes formula. For options that vest in year t, the dividend yield is the 3-year average from Execucomp executive compensation; volatility is the standard deviation of the firm's stock returns over the past three years using the CRSP daily files; the risk-free rate using the Treasury Constant Maturity Rate with the closest term to a given option. See Edmans, Fang and Lewellen (2022).	Compustat; CRSP; Execucomp; Federal Reserve Board
Private Firm	A dummy variable takes on a value of one if the firm is a private firm and zero otherwise.	Patent Assignment Data
High DTA	A dummy variable equals 1 if Average Deferred Tax Asset in the past 5 years is in the highest quartile, otherwise 0.	Compustat
High KZ-Index	A dummy variable equals one when the average KZ-index in the past 5 years is at the highest quartile, otherwise 0. KZ Index = -1.001909 x Cash Flows / K + 0.2826389 x Q + 3.139193 x Debt / Total Capital + -39.3678 x Dividends / K + -1.314759 x Cash / K Cash Flows = (Income before extraordinary items + Total depreciation and amortization); K = Property, Plant, and Equipment-1; Q = (Market capitalization + Total shareholder's equity- Book value of common equity- Deferred tax assets) / Total shareholder's equity; Debt = Total long-term debt+ Notes payable+ Current portion of long-term debt; Dividends = Total cash dividends paid (common and preferred) Cash = Cash and short-term Investments	Compustat

Notes: All continuous variables are winsorized at 1% and 99% to reduce the influence of outliers.