

Are Intangible Asset Valuations in Financial Reports Useful? Historical Evidence from the Illinois Blue Sky Law

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Abstract

Under current accounting standards, internally generated intangible assets are excluded from balance sheets, and acquired intangibles are reported only in aggregate. Scholars argue that this treatment limits investors' ability to assess firm value, yet standard setters remain uncertain whether and how such assets should be recognized. We contribute to this debate by examining a historical setting: Illinois's 1919 "blue sky law," which required firms issuing securities to disclose itemized valuations of all intangible assets—without distinguishing between acquired and internally generated ones. Although our dataset spans several intangible categories, we focus on patents—the only type with measurable long-term value—to assess whether reported valuations were informative. The data also allow us to distinguish among valuation methods, including historical R&D costs, purchase prices, appraised values, and nominal valuations. We find that reported patent values are generally uncorrelated with independent measures of long-term patent importance. In contrast, the valuation method chosen by the firm is informative: certain methods are systematically associated with more valuable patents. To understand why reported valuations convey limited information, we use digit-testing tools from forensic accounting to distinguish manipulation from inherent valuation uncertainty. The evidence points to substantial uncertainty rather than misreporting. We find no evidence that the current differential treatment of acquired intangibles and internally generated intangibles is conceptually justified. Our findings indicate that firms should be given flexibility to value their intangible assets, including internally generated ones, using the method of their choice, but should disclose the method they use.

Keywords: Intangibles; Financial Disclosure; Blue Sky law; Patents; FASB

JEL Classification: G10, M41, M48

1 Introduction

Intangible capital has become a major and increasingly critical component of firms' asset base. Global investment in intangibles rose from USD 2.9 trillion in 1995 to USD 6.9 trillion in 2023, more than doubling in real terms ([World Intellectual Property Organization, 2024](#)). Given their growing significance for firm value, investors are seeking greater transparency into intangible-related investments. However, current financial reporting practices offer limited visibility, often excluding classes of intangibles or limiting how much information is provided about them because of their subjective and uncertain valuation ([Penman et al., 2021](#)).¹

In particular, in the U.S. most internally generated intangibles (IGI) expenditures are expensed immediately, while comparable acquired intangibles are capitalized. Even then, firms report only the aggregate value of acquired intangibles, without disclosing information about the specific intangible assets they own. As intangibles become increasingly central to firm value, this conservative reporting approach raises concerns about whether current standards provide a faithful and decision-useful representation of modern businesses ([Lev and Sougiannis, 1996](#); [Lev, 2008](#); [Srivastava, 2025](#)). Prior research argues that this treatment systematically understates book equity, making it more difficult for investors to evaluate firms with high intangible intensity ([Srivastava, 2014](#); [Khan et al., 2018](#); [Lev and Srivastava, 2019](#)). Despite growing demand from investors and researchers for more detailed disclosure of both acquired and internally generated intangibles, the Financial Accounting Standards Board (FASB) has struggled with this issue for decades.² The central challenge concerns recognition, measurement, and disclosure: whether internally generated intangible assets should be capitalized; how both internally generated and acquired intangibles should be measured; and whether such assets should be disclosed in the aggregate or itemized ([Monga, 2016](#)). In response, FASB has called for academic research on the usefulness of intangible disclosures and the recognition of such assets at fair or historical cost value ([Financial Accounting Standards Board, 2023](#)).

¹In this context, reliability refers to current accounting model's restriction against recognizing items that do not stem from external transactions or whose valuation is difficult to independently verify. As a result, internally generated intangibles are typically excluded because their future economic benefits are uncertain and challenging for external auditors to substantiate ([Skinner, 2008](#)).

²FASB has undertaken several initiatives in recent years, but these have largely centered on acquired intangible assets. For instance, Purchase Price Allocation (PPA) was introduced through SFAS 141 (2001), which required acquirers to allocate the purchase consideration to identifiable assets and assumed liabilities at fair value and to disclose the components of this allocation—including recognized intangible assets and the resulting goodwill. SFAS 141 represented the first comprehensive requirement for detailed, fair-value-based PPA disclosures, substantially improving transparency around acquisition economics ([Blann et al., 2025](#)).

In this paper, we examine a unique historical setting in which firms operated under reporting requirements for intangible assets that differ from modern standards. Blue sky laws emerged in the early 1900s to protect investors from fraudulent securities and formed the basis for state-level financial regulation before federal laws existed. Although specifics varied across states, most required security-issuing firms to submit financial reports to regulators. In 1919, Illinois passed a transformational blue sky law that, among other things, required firms to file detailed reports of assets and liabilities, including itemized valuations for all patents and other intangible assets and treating acquired and IGIs alike (Ashby, 1926). Crucially, while firms could adopt different approaches to assign values, they had to disclose the basis for their assessments.

In sharp contrast to modern standards, the Illinois filings provide a rare glimpse into how companies valued and disclosed these assets. This historical setting offers three major advantages for our study compared to accounting practices today: first, it allows us to investigate the usefulness of fully itemizing all intangibles owned by the firm (i.e., disclosure); second, it allows us to assess the usefulness of capitalizing IGIs (i.e., recognition); and third, the variation in valuation methods enables us to evaluate how different approaches affect the usefulness of reported values (i.e., measurement). As such, this unique dataset provides insights that have not been possible in prior empirical settings and directly informs today’s debates on the recognition and measurement of intangible assets. Using this historical setting, we examine three related questions: (1) whether itemized intangible disclosures—including reported valuations and other valuation characteristics for both acquired and internally generated intangibles—in financial statements, are useful in the sense of being predictive of future quality of the intangible asset; (2) whether firms’ manipulate their intangible asset valuations; and (3) whether firms are uncertain about these valuations.

We hand-collect and transcribe archival filings from the Illinois state archives in Springfield, IL, covering reports for 683 firms issuing securities between 1919 and 1937. Because the Illinois blue sky law excluded publicly traded firms, all firms in our sample are unlisted. To the best of our knowledge, we are the first to transcribe microdata from firm reports issued pursuant to a historical blue sky law, contributing a new source of data about a class of firms (unlisted and issuing securities) that are often not covered in other data sources during a time period of great interest to accounting, finance, and economic historians. Our analyses center on the 683 first filings—one per firm—which offer the most complete and internally consistent information. Among intangible

assets, patents provide a particularly valuable lens for examining capitalization practices due to the difficulty in objectively assessing their technical feasibility and the uncertainty surrounding their future economic benefits. Of these 683 first filings, 165 firms report at least one patent, yielding 3,697 individual patents. We use these 3,697 patents for our patent-level analyses, and rely on the full set of first filings for all other analyses.

Under the Illinois blue sky law, firms had the freedom to decide how to report values of different kinds of intangibles. We first examine whether observable characteristics can predict these decisions. We find substantial heterogeneity in whether firms itemize individual patent values: larger firms are less likely to itemize, while itemization is more common for patents in older technology classes. Patents in older technology classes and owned by older firms are less likely to have detailed information on how the patent is valued. Finally, firms rely on a wide range of valuation approaches: roughly one-quarter of patents are valued at purchase price, one-quarter by appraisal, one-quarter at cost, and about 15% at nominal amounts, with substantial variation over time.

We next examine our first research question: do reported patent disclosures (including valuations) provide useful information in the sense of accurately predicting which patents will be more important in the future. If the disclosed values capture meaningful economic information about the importance of each patent, then larger valuations should be correlated with significantly higher future importance. To test this prediction, we regress a widely-used measure of lifetime patent importance from [Kelly et al. \(2021\)](#) on the patent valuations in each firm's first filing. Contrary to this prediction, we find no meaningful relation between reported valuations and long-term patent value. Our estimates are precise enough to rule out economically meaningful correlations. The results hold for both itemized and aggregated disclosures. Moreover, valuations of acquired patents are no more informative than those of internally generated patents, providing little justification for the differential reporting treatment of IGIs. We also find that valuations are uninformative across most valuation methods. In particular, this means that historical-cost valuations are unrelated to subsequent patent quality, raising questions about the economic relevance of capitalizing such costs. Most valuation methods yield similarly null results, with one exception: appraised values are weakly but negatively associated with future patent quality, suggesting that early appraisals may have reflected strategic considerations or the difficulty of assessing patent value under high uncertainty.

While the valuations are not typically predictive, we show that other choices firms make about how to manage and report the values of their intangibles assets do contain useful information. Specifically, we find that patents that are itemized, acquired, or valued at cost or at a purchase price tend to be more important patents. In our preferred specification, this information about valuation method is about 14 times more predictive of future patent importance than is the valuation itself. This is consistent with the view that accounting communicates information through managers' choices of reporting methods and disclosure practices (Waymire and Basu, 2008), and so giving firms discretion in how to assign and report valuations provides useful information above and beyond that contained in the reported value itself. This view was championed most prominently by George O. May, a leading accounting theorist and managing partner at Price, Waterhouse & Co. in the early- to mid-twentieth century; in one famous communication, May wrote "The more practicable alternative [for financial reporting] would be to leave every corporation free to choose its own methods of accounting within the very broad limits to which reference has been made, but require disclosure of the methods employed and consistency in their application from year to year" (American Institute of Accountants and New York Stock Exchange, 1934, p. 5).³ This interpretation also aligns with recent standard-setting discussions: in its review of more than 40 comment letters on potential revisions to intangible accounting, the FASB found broad agreement that a one-size-fits-all recognition model is unlikely to be appropriate, with many respondents emphasizing that recognition should vary by intangible type, development stage, and acquisition method (Lutolf, 2025).

To explore potential reasons for the disconnect between reported patent values and their economic relevance, we apply forensic digit analysis using Benford's Law, an established technique for detecting anomalies suggestive of misreporting or manipulation.⁴ Given the subjective and

³A few paragraphs later, he wrote as an illustrative example of this principle: "Again, it is not a matter of great importance to investors whether the cost-or-market rule for stating inventories is applied to individual items or to the inventory as a whole, but it is very important to the investor that he should be advised if the test is applied to individual items at the beginning of the year and to the inventory as a whole at the close thereof" (American Institute of Accountants and New York Stock Exchange, 1934, p. 6). More broadly, May argued against the idea that the goal of financial statements was to determine one "correct" value, but that instead firms should be allowed discretion in choosing accounting methods so long as those methods are clearly disclosed and applied consistently over time (May, 1972). For more information on May's philosophy and its historical context, see Zeff et al. (2021).

⁴To the best of our knowledge, this is the first application of Benford analysis to patent valuations, and one of the few to historical financial data more broadly. See Archambault and Archambault (2011) for a rare example of using Benford's Law in a historical context. We argue that such tests are especially powerful in historical settings, since Benford's Law was not widely known at the time and thus unlikely to influence reporting behavior.

difficult-to-verify nature of patent valuations, one might expect greater susceptibility to strategic distortion, which would manifest as deviations from Benford’s expected digit distribution. However, our results show that patent valuations closely conform to Benford’s Law, and are no more likely to deviate from Benford’s Law than commonly reported tangible assets like machinery or real estate.

We further drill down into the detailed disclosures of all intangible assets to see if manipulation is likely for any subsets of intangibles. In most cases we fail to find any detectable difference between reported values and Benford’s Law. One notable exception occurs for appraised patent values, for which our digit-based analysis does find significant deviations from Benford’s Law, calling the credibility of appraised valuations into question. These digit tests do not allow us to estimate how mandatory disclosure of intangible asset values would change firm behavior; rather, they tell us that, conditional on mandating disclosure, reported values are overall unlikely to be manipulated, at least in this setting.

Given that we find little evidence of manipulation driving the disconnect between reported patent values and their economic relevance in most cases, we next examine a second potential explanation: the fundamental uncertainty inherent in valuing early-stage innovation. (Knight, 1921; Arrow, 1962; Arora and Gambardella, 2010). We find that patent valuations tend to be disproportionately rounded and show an unusually high frequency of valuations that end in zeros compared to other financial variables. These patterns are consistent with the notion that firms face inherent difficulties in quantifying the future economic importance of their intangible assets. Taken together, our findings highlight the tension at the core of intangible asset accounting: while patent valuations may be made in good faith, they often fail to capture economically relevant information due to uncertainty. This evidence suggests that concerns related to reliability may underlie the conservative approach embedded in accounting standards such as IAS 38 and U.S. GAAP, which limit the recognition of IGIs.⁵

This paper makes a novel contribution by examining a rare historical setting in which firms were required to disclose intangible assets—both acquired and internally generated—within fi-

⁵Both IAS 38 and U.S. Generally Accepted Accounting Principles (GAAP) adopt a conservative stance on intangibles due to concerns over measurement uncertainty. However, IFRS (IAS 38) allows slightly more flexibility and relevance by permitting capitalization of development costs and the revaluation model. U.S. GAAP remains stricter, expensing most IGIs and disallowing revaluation, reinforcing its emphasis on objectivity and verifiability.

nancial statements. Unlike prior studies that focus on the capitalization of more narrowly defined or technologically mature intangibles—such as internally developed software (ASC 350-40), websites (ASC 350-50), or other development costs (e.g., [Aboody and Lev, 1998](#); [Mohd, 2005](#); [Kreß et al., 2019](#); [Oswald et al., 2022a](#); [Park et al., 2023](#))—we examine the mandatory capitalization and disclosure of intangibles whose technical feasibility and commercial potential were often highly uncertain. Consistent with this uncertainty, we find that reported valuation amounts are generally uninformative about future intangible value—not because firms systematically manipulate reported figures, but because valuation uncertainty substantially limits their predictive content. Importantly, however, we show that other reporting choices are informative: patents that are itemized, acquired, or valued at purchase price or historical cost tend to be more important. These patterns are consistent with the view that accounting communicates information through managers’ choices of reporting methods and disclosure practices ([Waymire and Basu, 2008](#)). Together, these findings provide new insights into the accounting-for-uncertainty literature ([Penman et al., 2021](#)) and inform ongoing standard-setting debates at the FASB, which increasingly recognize that a one-size-fits-all recognition and measurement model for intangibles is unlikely to be appropriate.

Our results also add to a growing literature seeks to address the exclusion of IGI from financial statements by capitalizing selling, general, and administrative (SG&A)–related outlays. Existing approaches range from rule-of-thumb capitalization ([Hulten and Hao, 2008](#)), to perpetual inventory methods ([Peters and Taylor, 2017](#)), to more refined models that estimate industry–year-specific capitalization rates ([Iqbal et al., 2025](#)). Our findings suggest that even explicit recognition of IGIs may offer limited decision-useful information when underlying valuation uncertainty is high. Consistent with this view, we find that historical-cost measures such as R&D expenditures are uncorrelated with future intangible value, reinforcing prior critiques of their usefulness as valuation proxies ([Aboody and Lev, 2000](#); [Lev et al., 2005](#); [Koh and Reeb, 2015](#)).

This paper is organized as follows. Section 2 describes the Illinois blue sky law in detail and places it within the context of the history of intangible asset valuation. Section 3 describes the data and presents summary statistics from our sample. Section 4 uses observable firm and asset characteristics to predict several decisions firms make when valuing their intangible assets. Section 5 shows that patent valuations are only weakly correlated with lifetime measures of patent importance. Section 6 conducts digit tests and related exercises and finds little evidence that firms

manipulate their reported valuations of intangible assets. Section 7 presents evidence that firms are unable to value their intangible assets with precision. Section 8 concludes.

2 Institutional Background

2.1 Intangibles Accounting and Valuation Over Time

Under U.S. GAAP, internally generated intangible assets, including R&D, are expensed (SFAS 2; ASC 730), while acquired intangible assets are recognized on the balance sheet but typically reported only in aggregate.⁶ Similarly, under International Financial Reporting Standards (IFRS), most internally generated intangible assets are expensed, with the exception of development-phase R&D costs that must be capitalized once criteria related to technical feasibility and future economic benefits are met (IAS 38).

These standards largely codify reporting practices that were already common before the modern regulatory era. Prior research shows that, well before formal accounting standards were established, firms adopted diverse approaches to reporting intangible assets, often relying on expensing or minimal recognition. In the U.S., many firms were already expensing all R&D as early as the 1930s, long before the issuance of SFAS 2.

Waymire and Basu (2008) describe the economic and institutional forces behind these practices, noting, for example, that General Electric expensed R&D as early as 1907 by assigning only nominal values to its patents. Likewise, in the pre-SEC era, Ely and Waymire (1999) document that many industrial firms obscured intangible assets by aggregating them with fixed assets, while Barton and Waymire (2004) argues that such conservative reporting reflected debt-contracting incentives and information costs, yet could still support effective investor protection under voluntary disclosure regimes.

At the same time, some firms in the pre-SEC era did report valuations for intangible assets, but investors typically lacked transparency into the valuation methods employed, such as whether values reflected historical cost, purchase price, or appraisal. Importantly, appraised values in this period did not rely on modern discounted cash flow (DCF) techniques, which had not yet been standardized

⁶A limited exception applies to software development costs, which are capitalized once technological feasibility is established (SFAS 86; ASC 985-20) (Haider and Wu, 2025).

for routine valuation.⁷ Nonetheless, firms employed systematic and contemporaneously accepted approaches. Valuation practice relied on professional appraisers, engineers, and accountants who used recognized methods such as capitalization of excess earnings, comparisons to industry norms, and replacement or reproduction cost analogies (Ford, 1911; Yang, 1927).

Taken together, this historical context highlights a key limitation of pre-SEC financial reporting: while firms often followed conservative reporting practices, disclosure of intangible assets was largely voluntary, aggregated, or minimal, and valuation methods were rarely transparent to outside investors. The Illinois blue sky law responded to these limitations by requiring ex ante disclosure of valuation methods and itemization of intangible assets, but notably left firms discretion over how those assets were valued.

2.2 The 1919 Illinois Blue Sky Law

Blue sky laws were state-level statutes enacted across the United States between 1911 and 1931 to regulate the sale of securities. Concerned about the prevalence of fraudulent investment schemes, states implemented these laws to require firms wishing to issue securities to register with and obtain approval from state regulatory bodies before offering stocks or bonds to the public. Kansas pioneered the blue sky law in 1911, and by 1931, every state except Nevada had adopted some form of the legislation. (Reed and Washburn, 1921; Mahoney, 2003; Agrawal, 2013; Akkoyun and Ersahin, 2020).

The laws generally required firms issuing securities to provide details such as financial statements (including balance sheets and income statements), the names and addresses of company officers and directors, the firm’s place of incorporation, the amount of capital being raised, the intended use of the funds, and other relevant information (Ashby, 1926). These requirements varied across states. In Illinois, the blue sky law—officially known as the Illinois Securities Law—was enacted on June 11, 1919. Our dataset is derived from the applications submitted by firms seeking to issue securities in Illinois, which are preserved at the Illinois State Archives in Springfield, IL.⁸

The Illinois law was the first to introduce an elaborate classification system to group securities

⁷While prior research documents isolated applications of DCF analysis in specialized settings, such uses were uncommon and there is no evidence that DCF constituted standard appraisal practice during this period (Edwards and Warman, 1981; Brackenborough et al., 2001).

⁸We are deeply grateful to the staff of the Illinois State Archives for their invaluable assistance during our data collection.

into four classes ([Ashby, 1926](#)).⁹ While the exact information provided varied by the class of firm, in general firms seeking to issue securities had to disclose: a history of the firm, including the date and location of incorporation and the primary line of business; names and addresses of all officers and directors; a current balance sheet; income statements; analyses of surplus accounts, inventories, expenses, and other supplementary financial reports. Most firms in our sample were also required to disclose the amount and intended use of securities the firm wanted to issue; a copy of the articles of incorporation and by-laws; and a copy of a subscription blanks to be used in the sale of securities. Public firms and firms traded on large national stock exchanges (namely, the New York, Chicago, Boston, Baltimore, Philadelphia, Pittsburgh, or Detroit stock exchanges) were exempt from the law. The law classifies firms as “Class C” if they have been in operation for more than two years continuously, while “Class D” firms are regarded as speculative. Note that while the law applied only to the issuance of securities in Illinois, it applied to any qualifying firm that wanted to issue securities in the state and not only to firms headquartered or chartered in Illinois.¹⁰ These filings of firm financial reports were maintained by the Secretary of State’s office in Springfield, IL, where they could be viewed by the public; copies could be requested for a nominal fee.

Most relevant to our analysis are the financial report schedules in which firms disclosed valuations for each intangible asset they owned, including individual patents. [Foster \(1929\)](#) reproduces the specific reporting template provided by the state to firms requesting to issue securities under the Illinois law, including the sections for firms to provide detailed information on intangible assets. Line item 20 of the template instructed firms as follows:

Patent rights, copyrights, trade-marks, processes, good will or other intangibles, should be itemized as required by Schedule 7 of Regulation, and should not be carried as an asset...in amounts exceeding the actual value of said several items, and the cost and present value of such items should be separately set forth.

While the template requests that firms report both the value and cost of their intangibles, in practice firms nearly always reported either the value or historical cost. Moreover, because

⁹We also referred to the statutory text as published in [Reed and Washburn \(1921\)](#) and the analysis provided in [Angell \(1920\)](#) and [Foster \(1929\)](#) to understand the Illinois law in more detail. We would like to emphasize that the analysis in [Angell \(1920\)](#) was preliminary, as it was conducted just eight months after the law was introduced.

¹⁰Firms in the early 20th century would have seen Illinois as a very attractive venue for issuing securities. The region offered strong industrial and financial foundations, a supportive investor ecosystem, and substantial institutional capabilities to support capital raising.

discounted cash flow techniques were not yet widely used in the early twentieth century, it is unclear how “true value” or “fair value” for intangible assets was determined or how such valuations were verified in practice. Although some reports in our sample appear to have been audited, auditing was not formalized until after the Securities Act (Archambault and Archambault, 2011; Bourveau et al., 2025). Moreover, while the template provided detailed instructions on the information that had to be disclosed, it offered no guidance on how to measure fair, actual, or true value for intangibles. This ambiguity likely left considerable room for interpretation, resulting in firms employing a wide range of valuation approaches. Conservative firms, in particular, may have opted to assign nominal values to avoid overstating assets and to ensure compliance with the law.

In the analysis below, we explore the extent to which firms comply with the requirement to itemize their valuations, as well as how often they report an estimate of the intangible’s actual value versus reporting a lower, nominal value. Itemized valuations of intangible assets are not provided in modern accounting data, so scholars have little ability to observe how firms value their patents and other intangibles. This kind of disclosure is unique to the Illinois law, making this a rare opportunity to understand how firms use and value an important class of assets. Additionally, the valuations reported in Schedule 7 not only itemized the intangible assets owned by firms, but also provided details on how the firm came to own the intangible assets and how they were valued. This allows us to identify when patents and other intangibles were internally generated and acquired from another entity.¹¹

We place patents into one of five categories related to how firms determined the valuation of their patents. First, in some cases firms report the price they paid to acquire an intangible asset; we record these assets as valued at their “Purchased” value. Second, in some cases firms assign a value to the asset based on anticipated future benefits from the patent or on an estimated market price. While modern discounted cash flow techniques were not yet in use during the 1920s, firms often relied on professional accountants or appraisal services to provide such estimates. We classify these cases as patents valued at their “Appraised” value. Third, some patents are valued at the cost paid to create the patent, including things like R&D costs and legal expenditures; we record

¹¹Moreover, Schedule 7 contains not only patents owned by each firm, but also material licenses to use patents owned by others. Data on patent licensing is also not usually available in modern data. Throughout this paper, we refer to a firm as “owning a patent” if it reports a value for the patent in its Schedule 7, even if the patent is licensed from another firm instead of purchased outright.

these as patents valued “At Cost.” Fourth, in some cases firms simply assign a nominal value to their patents, usually \$1; we record these as patents valued at a “Nominal” value.¹² Finally, in some cases, and contrary to the letter of the law, firms do not provide information on how their patents were valued, which we record as “Unknown Valuation Methods.”

Note that these categories are related to how the firm decided to report each patent’s valuation; they do not necessarily depend on whether or not the patent was internally generated. So while firms report the “Purchased” value of patents only when they are acquired, patents valued at an “Appraised” value or valued “Nominally” may be either acquired or internally generated. Patents valued “At Cost” are more likely to be internally generated, but some acquired patents are also valued at the initial development costs paid by the original inventor. Also note that, while both “Purchased” and “At Cost” categories refer to costs paid obtain the patent, they have quite different economic interpretations, with the “At Cost” category measuring the cost of inputs to create the patent while the “Purchased” category reflects the acquirer’s willingness to pay for the completed patent.¹³

2.3 Comparing Intangible Asset Reporting Rules Under the Illinois Blue Sky Law to Modern Accounting Rules

The Illinois blue sky law went into effect at a time when accounting standards were less formalized than they are currently under U.S. GAAP. The Federal Reserve Board and American Institute of Accounts (precursor to the American Institute of Certified Public Accountants) published proposed accounting standards in 1917, just before the start of our sample period, and revised proposals throughout the 1920s. While these early attempts at standardization have received attention in

¹²Barton and Waymire (2004) argue that valuing intangibles at nominal amounts (e.g., \$1) allowed managers to signal the economic existence of these assets. More importantly, nominal valuations likely reflect the immediate expensing of intangible costs for financial reporting purposes, implying that earnings and net assets were less likely to be overstated. In our setting, we interpret nominal values as the historical equivalent of expensing.

¹³The state also imposed penalties for violating the Illinois Blue Sky law. Angell (1920) emphasizes that this distinguished Illinois from most other blue sky laws, where enforcement was often lax and penalties minimal. Misrepresentation of facts disclosed to the regulator were punishable by a maximum fine of \$5,000, a year in prison, or both. While a \$5,000 fine was small relative to the total assets of the firm, it was likely large relative to the compensation of any individual firm officer. The \$5,000 fine in 1919 is equivalent to \$85,639 in 2022 dollars based on the CPI, to \$163,296 in 2022 in consumption-equivalent terms, or to \$397,911 in 2022 as an equivalent relative wage for a production worker (MeasuringWorth, 2022). Attempts to sell securities and successful sales of securities when a firm was not in full compliance with the law were punished even more severely. Additionally, the law also imposed penalties on dealers who aided in the sale of securities for firms that were not in full compliance, giving multiple parties incentives to ensure that all information was correct.

the literature ([Hawkins, 1963](#); [Carey, 1969](#); [Zeff, 1972](#); [Carmichael and Winters, 1982](#)), recent work concludes that they did not alter the behavior of publicly traded firms ([Bourveau et al., 2025](#)). Financial reporting and auditing standards did not begin to become standardized until after the passage of the Securities Exchange Act in 1934.

The prior literature investigates reporting and auditing activities of publicly traded firms. Firms traded on large public exchanges were exempt from the Illinois blue sky law, however. These non-publicly listed firms are known to play an important role in the innovation process, particularly for new and exploratory technologies ([Acs and Audretsch, 1990](#); [Nicholas, 2010](#); [Lamoreaux et al., 2011](#)), but researchers typically do not have detailed data on their financial situation.¹⁴ These unlisted firms may have been even less sophisticated when it comes to the valuation and reporting of financial information than are publicly traded companies.¹⁵ The language used by these firms was often different than the language in financial reports today; as one example of this, firms typically referred to “net worth” instead of “equity.” Language also varied both over time and across firms within a given time period, for instance when referring to “quick,” “short term,” “immediate,” or “current” assets and liabilities, which appear to have been used interchangeably. While these firms’ financial statements therefore often exhibit idiosyncrasies, we do not mean to imply that these firm were completely unsophisticated or financially illiterate; many were successful businesses, after all, which necessitated a degree of organization and numeracy. Additionally, many firms documented their use of professional accounting services when preparing their financial statements.

As noted above, the Illinois blue sky law required that reported values of intangibles not exceed the “actual value.” In spite of this requirement, there were no guideline on what constituted actual value. This is in contrast to modern GAAP, which provides guideline for determining the fair value of an intangible asset (ASC 820-10-35).¹⁶ Due to this lack of concrete instructions on how intangible assets were to be valued, different firms interpreted the blue sky law regulation in different ways. The richness of the firm reports allow us to observe what methods firms used to

¹⁴[Bourveau et al. \(2025\)](#), one of the largest studies of firms in the pre-SEC of which we are aware, examines 1,517; only 6% of these are traded over the counter, while the rest are traded on public exchanges. Likewise, studies of firm patent management often must rely on data from large, publicly-traded firms ([Pakes, 1986](#); [Hall et al., 2005](#); [Kogan et al., 2017](#); [Mangipudi et al., 2017](#)).

¹⁵As some evidence of this, about 3.3% of balance sheets in our sample do not “balance;” that is, for about one out of every 25 firm reports in our sample, assets do not equal liabilities plus equity. (Or, at least, the financial information was presented so incoherently that we were unable to correctly identify the firm’s assets, liabilities, or equity.) We plot how the occurrences of these non-balancing balance sheets change over time in Appendix Figure [A9](#).

¹⁶All references to GAAP are from [Financial Accounting Standards Board \(2025\)](#).

value their intangible assets, as explained above. More broadly, under current GAAP, the only value of an IGI asset that appears on a firm’s balance sheet is the direct legal expense of obtaining the intangible (ASC 350-30-25-2), while acquired intangibles are reported at their fair value, typically the purchase price (ASC 350-30-30-1); the costs of R&D needed to develop a patent are expensed in the period they occur and are not carried on the firm’s balance sheet (ASC 730-10-25-1). The Illinois blue sky law makes no distinction between internally generated and acquired intangible assets, and so provides a unique opportunity to investigate how firms value intangibles developed in-house. Additionally, under modern GAAP firms report highly aggregated values for acquired intangible assets (ASC 350-30-45-1, 350-30-45-2), while the historical firm reports contain itemized descriptions of intangibles.

A key difference from modern accounting practice lies in how these historical reports treated depreciation and amortization, particularly for intangible assets. Depreciation and amortization were not handled in a standardized way until the mid-1930s, when a flurry of guidelines related to depreciation emerged (Bourveau et al., 2025, p. 19).¹⁷ Under GAAP, the purchase price of acquired intangible assets is to be amortized over the life of the asset (ASC 350-30-35-1). In our sample of historical firm reports, the term “amortization” virtually never appears. When referring to the decline in value of intangible assets over time (whether due to spreading out initial costs over the legal life of the asset or to a decline in expected future income stream), the terms “depreciation” or “extinguishment” are used instead, or occasionally “depletion” or “expiration.” In some cases, the firm reports provide information on how the “depreciation” was calculated; in these cases, firms almost always apply a form of straight-line amortization. But in many cases, firms do not appear to amortize or depreciate their intangible assets at all; often, if the same firm files multiple reports, they will report identical valuations of intangibles on all filings.

3 Data

3.1 Blue Sky Law Filings

We hand-collect data on a random sample of filings of firm reports from the state archives in Springfield, IL. We also oversampled firms suspected to own patents in the early years of the blue

¹⁷See Hatfield (1936) and Hilke (1986) for the evolution of depreciation and amortization in public accounting practice.

sky law and firms that filed reports around the start of the Great Depression. For each report in our sample of total filings, we transcribe the application date, firm name, incorporation date, address of the firm headquarters (if the headquarters is in another state, we also record a local Illinois address), location of incorporation, type of securities the firm is trying to issue, names and addresses of all officers and directors, names and addresses of any professional accounting services used by the firm, balance sheet information, income statement information, and all reported valuations of intangible assets included in firms' Schedule 7.

Our sample contains 1,734 filings of firm reports from 683 distinct firms. Of these, 165 firms contain information on identifiable patents, covering 3,697 patents. It is important to clarify that the 1,734 filings represent all submissions in our dataset. Of these, 683 are first filings—each firm's initial report or filing when issuing a security in Illinois for the first time. Among these 683 first filings, 165 include identifiable patents, covering 3,697 distinct patents. Later submissions—usually supplemental updates—tend to contain less detailed information, often omit itemized intangible valuations, and inconsistently report amortization. Although these subsequent filings are included in the overall count and in robustness analyses, they are not used in our main analyses. Because first filings are more complete and standardized, particularly with respect to intangible disclosures, we rely on the first filing for each firm in our baseline results. Although the state provided template for these filings [Foster \(1929\)](#), the format and details varied significantly.

Because the law did not apply to publicly traded firms, our sample consists exclusively of unlisted firms for which market prices are unavailable. Prior studies using Blue Sky-era settings draw on very different data sources and address distinct research questions, generally showing that the introduction of Blue Sky laws increased firm financing, investment, and innovation. For example, [Akkoyun and Ersahin \(2020\)](#) study 1,487 patenting firms across 25 states using detailed patent microdata, but rely on accounting information from Moody's Manuals that is available for only 155 firms. Similarly, [Agrawal \(2013\)](#) examine 152 firms (1,215 firm-year observations), primarily publicly traded mining companies with observable share prices. Importantly, these datasets do not contain itemized disclosures of intangible assets, valuation methods, or valuation amounts, which are central to our analysis.

In contrast, our data contain firm-level, itemized disclosures of intangible assets for unlisted firms, including the type of intangible, the valuation method employed, and the reported valuation

amount. In our setting, 24% of first-filing firms (165 of 683) report patents, allowing us to study not only whether firms disclose intangibles, but also how they choose to value and report them. This level of detail enables analyses that are not possible in prior Blue Sky-era datasets.

Appendix A provides additional details on the Illinois blue sky law. Appendix B provides examples for two reports collected from the Illinois State Archive that are in our sample. Appendix C provides much more information on the sample construction.

3.2 Other Patent Data

We link patents in firms’ Schedule 7s to patent data from the Comprehensive Universe of U.S. Patents (CUSP) (Berkes, 2018b). As the name implies, this is currently the most comprehensive dataset available for patents issued before 1976.¹⁸ For each patent, the CUSP data contains the patent’s filing and issue date; the name, city, state, latitude, and longitude of each inventor; the name, city, state, latitude, and longitude of each assignee; all forward and backward citations, including in-text citations; and the patent’s technology classification.¹⁹

3.3 Summary Statistics

Table 1 presents detailed summary statistics. Panel A of Table 1 reports statistics for all filings, while Panel B reports statistics from the first filing made by each firm. As mentioned earlier, in our baseline results we use the first filing from each firm, although our main conclusions are unchanged if we instead use data on all filings.

Firms that file multiple reports tend to be younger, smaller, more likely to be speculative (Class “D”) firms, and less likely to be in the manufacturing sector. For the 683 first filings, firms are on average about 7.1 years old when they initially try to raise securities. 57% are Class “C” firms, 41% are in the manufacturing sector, and 22% are in the financial sector. On average, these firms have \$11.3 million in assets at \$3.6 million net worth and earned just over \$539,000 in profits in their last income statement before filing, although standard deviations and inter-quartile ranges for all financial variables are large. On average, intangible assets and patents and other forms of intellectual property account for about 2.3% and 0.9% of total assets, respectively.

¹⁸See the comparison in Andrews (2021).

¹⁹Additionally, we are grateful to Enrico Berkes for providing data on each patent’s text.

Table 2 restricts attention to the sample of firms that report a value for at least one patent. Relative to the full sample of firms, firms with patents tend to be older, less likely to be speculative securities, much more likely to be manufacturing firms, and much less likely to be financial services firms. Patenting firms are comparable to the full sample of firms in terms of total assets, but with a larger net worth and smaller profits. Conditional on having patents, intangible assets and patents and other intellectual property account for about 4.5% and 2.7% of total assets, respectively, for first filings. Figure 1 plots the share of firms' balance sheets that are accounted for by intangible assets for both the full sample of firms and for patenting firms. For the full sample of firms, intangibles comprise a declining share of firms' balance sheets throughout our sample period; for patenting firms, intangibles decline as a share of the balance sheet throughout the early 1920s but then plateau, with wide year-over-year fluctuations, throughout the rest of the sample period.²⁰

On average, each first filing contain about 25 patents for which the patent number is identifiable; this comprises our sample in Section 5. As noted above, the reports contain information on patent values even when we cannot ascertain the specific patent numbers; each first report contains on average 2.16 valuations that mention patents, with about 23 patents mentioned per valuation. Unsurprisingly, patent ownership, even conditional on owning at least one patent, is highly skewed, with the median firm having only four identifiable patent numbers, one reported valuation, and 4 total patents per valuation.

The fact that on average firms report multiple valuations containing patents suggest that some itemization is occurring, but the fact that both the mean and median firm include multiple patents in each valuation means that there is also substantial aggregation occurring.²¹ We consider a valuation to be itemized if only a single intangible asset is reported for that valuation. Table 2 shows that about 32% of valuations with patents meet this definition of itemization, with the other 68% of patents being valued as part of a portfolio with other patents or other intangible assets. Figure 2 shows the share of valuations containing patents that are itemized over time. Large year-over-year fluctuations make it difficult to detect a clear secular trend, although itemization appears to be becoming less common over time.

²⁰The overall pattern is very similar if we restrict attention to the value of patents and other intellectual property on the balance sheet.

²¹Appendix Figure A10 plots the distribution of patents per valuation for all reported valuations containing patents in our sample.

Because the blue sky laws require firms to disclose the patents that they own, regardless of how they obtained those patents, we are also able to investigate which share of patents were acquired versus developed internally. Table 2 shows that about 64% of patent valuations are acquired, with the remaining 36% being internally generated. Figure 3 again shows large year-over-year fluctuations but an overall increasing trend in the share of patents that are acquired.

Finally, we investigate how firms choose to value their patents. Table 2 shows that 26% of patents in first filings are valued at their purchase price, 22% are valued by appraisal, 21% are valued at cost, 15% are valued nominally, and for 15% no information on the valuation method is provided. Figure 4 shows how these shares vary over time. There are again large year-over-year fluctuations. But in general, patents valued at the purchase price were most common in the mid-1920s, with spikes around 1930, 1933, and 1937. Patents valued by appraisal were most common very early in the sample period, as well from 1927-1930. Valuations at cost were common in several years throughout the sample period, while failure to report of a method of valuation was most common during the 1930s.

Appendix D.1 presents additional summary statistics on the valuation of patents in our sample. In particular, Appendix Table A2 and A3 present cross-tabulations showing the number of patents that are itemized versus reported as part of a portfolio, separately for acquired and internally generated patents. These tables also report, for each valuation method, how patents are distributed across itemized versus portfolio reporting and across acquired versus internally generated classifications.

4 Predictors of Patent Valuation Reporting Behavior

As the preceding discussion makes clear, firms made several choices when deciding how to manage their patents and other intangible assets and how to value those assets for the regulator and investors. In this section, we focus on three of these decisions: whether to itemize or value as a portfolio, whether a patent is acquired or developed internally, and whether the firm describes which valuation method it used to assign a value to each patent. We test whether these decisions are predictable from observable firm or patent characteristics, or from other information provided along with the valuation. For this analysis, we use the reported valuations for which we can identify

a specific patent number, and the unit of analysis is the individual patent; we use this same sample of patents for our analysis in the next section.

At the firm level, we use the information from the filed report to measure firm age, whether or not the firm is a Class C firm, the total assets on the firms' balance sheet. We are unable to find information on firm age for about 10% of our sample; for this reason, we set age equal to the median age for these firms and include an indicator equal to one for missing firm age. We also use information on the filing dates of all patents included in the firm's Schedule 7 and for which the firm is listed as an assignee in the [Berkes \(2018a\)](#) data to count the number of previous patents issued to the firm. Finally, we include fixed effects for the one-digit NAICS code for each firm.

At the patent-level, we measure each patent's age (the difference between the date the firm filed its report with the Illinois Secretary of State and the date the patent was issued, set to zero for any patents listed in the report prior to the patent issuing); the age of the patent's USPC subclass (the difference between the date the patent was filed and the earliest date of filing for a patent in that subclass); the number of USPC subclasses for each patent (a proxy for technical scope, [Lerner \(1994\)](#)); and the number of words in each patent's written description (a proxy for the extent of technical disclosure, [Andrews et al. \(2024a\)](#)).

For each reported valuation containing a patent, we measure the precision of the reported valuation as proxied by whether the valuation reports cents and whether the number ends in zero; we discuss these proxies for the precision of valuations in much more detail in [Section 7](#) below. We also count the number of other identifiable intangible assets valued as part of the same portfolio and include an indicator equal to one if the portfolio includes other types of intangible assets in it, such as trademarks, copyrights, blueprints, molds, customer lists, etc.

[Table 3](#) reports estimates of a linear probability model in which the outcome is equal to one if a firm itemizes its patent valuations. We regress this outcome on the set of firm-, patent-, and portfolio-level characteristics. The first column includes the firm-level characteristics; the second column includes only the patent-level characteristics; the third column includes both firm- and patent-level characteristics; the fourth column includes the portfolio-level characteristics; finally, the fifth column includes the full set of firm-, patent-, and portfolio-level characteristics. All columns also include fixed effects for the year in which the firm filed its report with the Illinois Secretary of State and the one-digit USPC patent classification. Larger firms are less likely to itemize their patent

valuations, with a 1% increase in the size of firms' total assets lowering the probability that the firm itemizes by about 2 percentage points. Together, the firm characteristics (including firm fixed effects) are jointly strongly significant. We find that no patent- or portfolio-level characteristics individually significantly predict itemization at the 5% level, nor is each set of predictors jointly significant at the 5% level.²² When combining all firm-, patent-, and portfolio-level characteristics in the same model, we find that larger firms are still less likely to itemize and that patents in older technology classes are more likely to be itemized.

Next, we investigate predictors for whether the firm acquires its patents or generates them internally. Table 4 shows that firms with more previous patent experience are more likely to generate their patents internally. The firm-level characteristics and NAICS code fixed effects are jointly strongly significant. We find that no patent-level characteristics are individually significant at the 5% level, although jointly they are jointly significant at the 1% level. Each additional intangible asset in the portfolio reduces the probability that the patent is acquired by about 16 percentage points, although portfolios that contain other types of intangibles are much more likely to be acquired. The portfolio-level characteristics are likely strongly jointly significant.

Finally, Table 5 finds that younger firms and firms with patenting experience are more likely to report how their patents are valued; the firm-level characteristics are strongly jointly significant. We do not find that the patent-level characteristics are either individually or jointly significant for whether or not the firm reports the valuation method they use. We find that portfolios with more assets in them are less likely to report how the valuation is itemized, although this predictor is no longer statistically different from zero after also including firm- and patent-level characteristics.

Appendix Tables A4-A6 repeat this exercise but estimate logit models rather than linear probability models. Both methods tend to find the same significant predictors.

5 Are Itemized Intangible Disclosures Useful?

We first test whether itemized intangible disclosures, including valuation amounts and characteristics, are predictive of future intangible quality. Among all types of intangibles, patents are

²²The sample sizes are smaller in Columns 1 and 3 because there is no variation within some of the NAICS code fixed effects. In Columns 4 and 5, we do not include information on the number and type of other intangibles valued in the same portfolio, since for itemized patents by definition there are no other assets in the valuation.

particularly well-suited for this purpose because they have a defined legal life and because prior research offers established metrics of patent quality measured later in the patent’s life. For this exercise, we use a text-based measure of patent importance from Kelly et al. (2021).²³ This measure calculates the pairwise textual similarity between all patents issued within a 10-year window and, for each focal patent, divides the average textual similarity between all patents that came after the focal patent by the average textual similarity of all patents that came before. A highly important patent is one that is very similar to all patents that came after (indicating that the patent had high impact) and very different from all patents that came before (indicating high novelty).²⁴

As a first exercise, we show in Table 6 that this measure of patent importance is at least in part predictable from observable characteristics. We regress patent importance on the same sets of firm-, patent-, and portfolio-level characteristics that we use to predict whether valuations are itemized, whether patents are acquired, and whether the valuation method is reported in Tables 3-5 above. Many predictors are individually statistically significant, particularly for patent- and portfolio-level characteristics. Moreover, each set of firm-level, patent-level, and portfolio-level characteristics are highly jointly significant in each specification, and r^2 values, even when adjusting for the number of covariates in the model, are on the order of 24-29%, suggesting that these observables can explain

²³Another commonly used proxy for patent quality is forward citations from other patents (Jaffe and de Rassenfosse, 2017; Higham et al., 2021). We do not use citations because they are less suitable in this historical setting. Patent citations are only recorded on all patents beginning in 1947; prior to that citations were in-text, rare, and tended to be citations to other patents by the same inventor (Berkes, 2018b; Andrews, 2021). While some of the patents from 1919-1937 received post-1947 citations, most did not. Those pre-1947 patents that receive citations are likely to be of very high quality, but there is little variation in citations over the vast majority of low quality patents. While we do not use citations for our baseline results, we show in Appendix F that results are broadly similar when using citations as our measure of patent quality. Another popular measure of patent value in the literature uses changes in firms’ stock prices in narrow event windows around the issuance of a patent to infer patent value (Kogan et al., 2017). We do not use this measure in our setting for two reasons. First, this measure can only be constructed for publicly traded firms, which are exempt from the Illinois blue sky law. Second, this measure captures the value of a patent at the time it issues, which is known to firms before they report valuations to the Illinois Secretary of State; instead, we are interested in understanding whether reported values predict the *future* importance of patents.

²⁴One issue with this measure is that it is a measure of the social value of each patent. So long as inventors can license or sell their patent to extract a return from others who are building on that patent, the social and private value of patents should be positively correlated, even if inventors cannot capture the full returns to their inventions. Kelly et al. (2021) verify that their measure is significantly correlated with measures of the private value of patents, namely with the Kogan et al. (2017) stock price-based measure of patent value, as well as with citations. Other studies, such as Trajtenberg (1990) and Hall et al. (2005), also find that measures of the private and social value of patents tend to be strongly correlated. We further verify that the Kelly et al. (2021) measure of patent importance is significantly correlated with stock price-based measures of private value during the historical period we study (although of course we cannot test this for our sample of patents, since those are owned by non-publicly traded firms). Additionally, since we use the Kelly et al. (2021) measure of patent importance as our outcome variable (rather than a regressor), measurement error that is uncorrelated with reported valuations may reduce precision but will not bias our point estimates. If the text-based measure of patent importance introduces non-additive measurement error of the true quality of patents, then estimates may still be attenuated (deHaan et al., 2019); but in contrast to many variables in accounting, we have no reason to believe measurement error takes this form.

a nontrivial share of the variation in patent importance.

Next, we test whether this measure of patent importance is predictable from reported firm valuations. Such an analysis allows us to test whether these reported valuations contain useful information. Implementing this analysis, however, presents two challenges. First, as described above, firms often report the value of multiple patents as a single portfolio in their Schedule 7 filings. This aggregation likely reflects the complementary nature of patents, which can make it difficult to assign value to individual patents. As a result, we must adopt certain assumptions to allocate the reported portfolio valuation across the individual patents it contains. Second, firms' reported valuations reflect the firm's perception of the value of their patents at a snapshot in time, and typically not at the start of the patent's life. Our measures of patent importance, on the other hand, will reflect the lifetime importance of the patent.

To overcome both of these challenges, we impose several assumptions to assign a valuation to each individual patent. We then verify that our results are robust to numerous alternative methods to assign a valuation. In our baseline results, we assume that each patent has value for the full 17 years of its legal life from the time of issuance.²⁵ We then consider two approaches to handle amortization. First, we impose a straight-line amortization schedule. For each patent i in portfolio I , write the legal age of each patent as $t_i \in [0, 17]$. Then, we write the total valuation of each portfolio I as the sum of un-amortized values for each patent i :

$$Valuation_I = \sum_{i \in I} (17 - t_i) v_I, \tag{1}$$

where v_I is the value of one year of patent life for each patent in I . Then, the total lifetime value of each patent in i at time 0, before any amortization has begun, is given by

$$Value_i = 17 * v_I. \tag{2}$$

Note that this approach imposes the assumption that, when patents were first issued, each patent in the portfolio has equal value. One potential concern with these firm reports from a pre-GAAP

²⁵The Patent Act of 1790 granted patents for up to 14 years, with extensions of up to seven years introduced in 1836 and eliminated in 1861, when Congress set a uniform 17-year term. This term remained in place until the Uruguay Round Agreements Act of 1994 established a 20-year patent term for applications filed on or after June 7, 1995. See [U.S. Patent and Trademark Office \(nd\)](#) for details.

era is that firms often did not report amortization of intangible assets consistently, or, in many cases, at all. For that reason, we also take an alternative approach to assigning values to patents, assuming no amortization until the end of each patent’s legal life, and then full amortization. Again assuming that all patents in a portfolio have the same value,

$$Value_i = \frac{Valuation_I}{\# \text{ Patents in } I} \quad (3)$$

for all $i \in I$. To decide which of these approaches to amortization to use, we rely on the detailed description of valuations in firms’ Schedule 7. If firms indicate that they apply any amortization or depreciation to their patents, then we apply the straight-line amortization schedule; if firms do not indicate applying any amortization or depreciation, then we assume no amortization. If the Schedule 7 does not provide any information about amortization, we also consult firms’ balance sheets; if these report depreciation of patents, we assume straight-line amortization, and otherwise we assume no amortization.²⁶

To test whether reported patent valuations can similarly predict patent importance, we estimate the following model:

$$\begin{aligned} \ln(Importance_{if}) = & \beta \ln(Value_{if}) + FirmControls_f \alpha_1 + PatentControls_i \alpha_2 \\ & + PortfolioControls_f \alpha_3 + ReportYear_f + PatentClass_i + \epsilon_{if}, \end{aligned} \quad (4)$$

where i indexes patents and f indexes firm reports filed with the Illinois Secretary of State. In our baseline model, $Importance_{if}$ is the Kelly et al. (2021) measure of patent importance described above; $ReportYear_f$ is a fixed effect for the year in which the report is filed with the Illinois Secretary of State; $PatentClass_i$ is a fixed effect for the USPC main class of patent i ; and $FirmControls_f$, $PatentControls_i$, and $PortfolioControls_f$ are the vector of firm-, patent-, and portfolio-level characteristics, respectively, used in Tables 3-6 above. We cluster standard errors by firm. In our baseline model, we estimate a log-log specification, so β can be interpreted as an elas-

²⁶When firms provide information about how they amortize patents, they nearly always use straight-line amortization. Often, firms report that they amortize but do not provide any information on how this was done. As noted in Section 2.3, the language that firms use to describe amortization is not consistent, with firms often using the terms “amortization,” “depreciation,” “depletion,” or “extinguishment” interchangeably. In Appendix Table A7, we show that results are similar if we assume all forms followed straight-line amortization or no firms amortized.

ticity. If firms were able to perfectly predict the future economic importance of their patents, and our measure of importance is a perfect proxy for the future discounted cash flow from the patent with no measurement error, we would expect to find an elasticity of exactly one. Of course, we would not expect the correlation to be exactly equal to one in practice. Correlations that are closer to one indicate a higher degree of predictability, while correlations close to zero and imprecisely estimated indicate a low degree of predictability.

We present results in Panel A of Table 7. In each column, we progressively add additional controls and fixed effects. In Column 1, with no fixed effects or controls, we find a positive but extremely small and statistically insignificant estimate for β : a 1% increase in the reported patent value is correlated with a 0.001% increase in patent importance. Including fixed effects and controls only tends to further reduce this correlation. In our preferred and most restrictive specification—which includes the full suite of fixed effects and observable firm-, patent-, and portfolio-level controls—a 1% increase in the reported patent value is correlated with a statistically insignificant 0.003% decrease in patent importance.

We next test whether the correlation between patent importance and the reported valuation varies depending on whether the valuation is itemized or if the patent is valued within a portfolio. On one hand, since we must impute values for individual patents that are included in portfolios, it may be the case that the correlation between values and importance is attenuated for this group due to measurement error. On the other hand, if patents are strongly complementary with one another, then a patent’s value may only be ascertainable when the patent is combined in a portfolio with other assets. We estimate:

$$\begin{aligned} \ln(Importance_{if}) = & \beta \ln(Value_{if}) + \gamma Itemized_{if} + \delta Itemized_{if} \times \ln(Value_{if}) \\ & + FirmControls_f \alpha_1 + PatentControls_i \alpha_2 + PortfolioControls_f \alpha_3 \\ & + ReportYear_f + PatentClass_i + \epsilon_{if}, \end{aligned} \tag{5}$$

where $Itemized_{if}$ is an indicator equal to one if patent i ’s valuation in report f is itemized and equal to zero if the firm instead reports the valuation of an entire portfolio that includes patent i . We present results in Panel B of Table 7, again progressively adding fixed effects and controls in each column. To ease interpretation in the table, we present the intercept and slope for the set of

patents that are itemized and those that are valued as a portfolio.²⁷ The presented coefficient for $ValuedAsPortfolio \times \ln(Valuation)$ therefore shows the predicted increase in patent importance when the valuation increases by 1% for the subset of patents valued as a portfolio; similarly, the coefficient for $Itemized \times \ln(Valuation)$ shows the predicted increase in importance when the valuation increased by 1% for fully itemized patent values. The difference between these estimates shows whether valuations are more predictive for the subset of patents that are itemized or valued as a portfolio. The coefficient on $ValuedAsPortfolio$ (without interacting with $\ln(Valuation)$) is the intercept term that shows the average importance of the patents that are valued as a portfolio; similarly, the coefficient on $Itemized$ is the intercept term showing the average importance of the patents that are fully itemized.²⁸

Across all specifications, we find that logged valuation is not predictive of logged patent importance for either patents valued as a portfolio or when the valuation is itemized, and there is no statistically detectable difference between these two coefficients. While there is no difference in the predictiveness of valuations between patents valued as a portfolio or itemized, we find in our preferred specification—that includes the full set of fixed effects and controls—that patents that are itemized have a statistically significantly higher average importance than patents that are valued as a portfolio. The fact that a firm decided to individually value a patent predicts that the patent is more important; but, conditional on either being itemized or in a portfolio, the amount of the valuation itself does not contain any additional predictive information. We calculate the partial r^2 for $Value_{if}$ and the interaction term $Itemized_{if} \times \ln(Value_{if})$ as well as the $Itemized_{if}$ indicator; the latter is about five times larger than the former in our preferred specification, which means that whether or not a patent’s valuation is itemized is five times more predictive of future patent importance than the valuation itself.

In Panel C, we present results in which we compare the predictability of valuations for acquired

²⁷More specifically, the intercept is the predicted value of $\ln(Importance_{if})$ when $\ln(Value_{if})$ is zero for the group when $Itemized_{if}$ equals zero and equals one, and we likewise calculate marginal effects separately when $Itemized_{if}$ equals zero and equals one. These calculations are performed using Stata’s margins command.

²⁸To put the magnitude of these intercept terms into perspective, recall that our outcome variable is the log of the ratio of a patent’s textual similarity to later patents to the patent’s textual similarity to earlier patents. An intercept of 0 (that is, $\ln(1)$) means that a patent is exactly as similar to later patents as to earlier patents. An intercept of $\ln(2) \approx 0.693$ means that a patent is twice as similar to later patents as to earlier patents, indicating a very important patent. An intercept of $\ln(\frac{1}{2}) \approx -0.693$ means a patent is twice as similar to earlier patents as later patents, indicating a highly derivative patent. In our baseline sample, on average $\ln(Importance) = 0.0507$, which means that the average patent is about 5.2% more similar to later patents than to earlier patents.

patents relative to internally generated patents:

$$\begin{aligned}
\ln(Importance_{if}) = & \beta \ln(Value_{if}) + \gamma Acquired_{if} + \delta Acquired_{if} \times \ln(Value_{if}) \\
& + FirmControls_f \alpha_1 + PatentControls_i \alpha_2 + PortfolioControls_f \alpha_3 \\
& + ReportYear_f + PatentClass_i + \epsilon_{if},
\end{aligned} \tag{6}$$

where $Acquired_{if}$ is an indicator equal to one if the firm that filed report f was not the original assignee of patent i . We display results in a similar manner to Panel B. As noted above, firms may only acquire patents when they are confident in the patent's value. Therefore, the correlation between valuation and importance may be different for patents that are or are not acquired.

Similar to Panels A and B, we find consistent null results that are close to zero in magnitude for both acquired and internally generated patents. Moreover, there is no statistically detectable difference between the two groups, indicating that reported valuations do not reliably predict future patent value regardless of patent origin. These findings provide no justification for excluding internally generated patents from financial statements, despite current accounting standards doing so. Once again, while the valuations themselves are not predictive of future patent importance, whether or not a patent is acquired is informative in some specifications. The partial r^2 analysis reveals that information about whether or not a patent is acquired is 1.67 times more predictive of future importance than the valuation itself. The intercepts for acquired patents are larger than those for internally generated patents in all specifications, although in our preferred specification with the full set of fixed effects and controls the intercept for acquired patents is not statistically different from zero. The fact that how a patent was obtained (either internally developed or externally acquired) may contain useful information about patent quality is another reason why internally generated patents should not be excluded from financial statements.

Finally, in Panel D, we use the information on which method firms used to value their patents.

$$\begin{aligned}
\ln(Importance_{if}) = & \beta \ln(Value_{if}) + \sum_m [\gamma_m ValuationMethod_{ifm} + \delta_m ValuationMethod_{ifm} \times \ln(Value_{if})] \\
& + FirmControls_f \alpha_1 + PatentControls_i \alpha_2 + PortfolioControls_f \alpha_3 \\
& + ReportYear_f + PatentClass_i + \epsilon_{if},
\end{aligned} \tag{7}$$

where $ValuationMethod_{ifm}$ is an indicator equal to one if firms use valuation method m , where m can be one of the five methods described above: valuing at the purchase price, assigning an appraised value, valuing at historical cost, assigning a nominal value, or if the valuation method is unknown. We again display an estimate for the intercept and marginal effect associated with each valuation method.

In our preferred specification that includes the full set of fixed effects and controls, we again find that reported valuations do not predict future patent importance for any valuation method. In our preferred specification, we find that a 1% larger valuation predicts 0.014% *decrease* in patent importance for patents that are valued via appraisal, statistically significant at the 10% level. The negative coefficient raises the possibility that appraised patent valuations may be manipulated, which we explore in much more detail below; even in this case, however, the magnitude is quite small. In fact, across all specifications, the valuation coefficients are small in magnitude for each valuation methods, even if in some specifications they are statistically different from zero; the largest estimated elasticity across all specifications is only 0.036 in magnitude. The fact that we do not find a large or statistically significant slope coefficient for patents valued at cost implies that capitalizing patenting costs, as under IFRS (Oswald et al., 2022b), does not result in more useful valuations, although in this case that is because none of the methods significantly predict future importance. While we do not present tests for the equality of coefficients for each pair of valuation methods to save space, we fail to reject that the slope coefficients are the same for every valuation method.

We once again find that, while the valuation itself is not predictive, the method of valuation provides useful information. Comparisons of partial r^2 reveal that information about the valuation method is about 14.8 times more predictive of future patent importance than is the valuation itself in our preferred specification. In this preferred specification, patents valued at cost had a higher future importance than patents valued with the other methods, followed by patents valued at the purchase price, then patents valued via appraisal, and then nominally valued patents; the intercepts for patents valued at cost and nominally valued patents are statistically different from zero at the 1% level, while the intercept for patents valued at the purchase price are statistically different from zero at the 10% level.

At first glance, it may seem counterintuitive that the method of valuation contains predictive

information about the future importance of patents, but the reported value itself does not. But notice that, with the exception of nominal values, all valuation methods tend to produce values that are of the same order of magnitude (see Appendix Figures [A4](#) and [A6](#) to see the distribution of valuations). This means that, for example, to a user that does not have information on the valuation method, a patent valued at the historical cost that was costly to develop but useless is indistinguishable from a patent for a proven technology that the firm acquired from another and valued at the purchase price. Conditional on using a particular method, the actual valuation is no longer informative. This could be because, for example, while firms may know that a patent is worthwhile to acquire, they do not know what the right price should be. Even when patents are valued nominally, a valuation of \$1 provides the same amount of information as a valuation of \$100. Or consider the signaling story discussed above: the valuation method may be a costly signal. Firms must actually buy a patent in order to value it at its purchase price, and nominally valuing a patent requires writing down the size of firms' total asset; if the patented technology was not valuable, firms might be less willing to take these actions. Valuing a patent at historical cost, in contrast, may indicate that the firm was unwilling to value using another method. But conditional on choosing a patent valuation method, the actual valuation reported is effectively "cheap talk" and plausibly easier to manipulate, so may be expected to contain less usable information; we investigate whether different valuation methods are more likely to be manipulated below..

In Appendix [F](#), we present numerous robustness tests. As discussed above, using the firms' reported valuation to assign a value to each specific patent required several assumptions about amortization. We repeat the above analysis using alternative amortization approaches. We also show results using only patents early in their life, when reported valuations are largely unamortized. We also show results when using only patents that have been fully itemized. Instead of splitting up firms reported valuation across multiple patents in the portfolio, and alternative approach is to aggregate our measure of patent importance over all patents in the portfolio and regress the aggregated importance on the reported valuation; we conduct this exercise as well. We also present results using several alternative functional forms and using forward patent citations (instead of the [Kelly et al. \(2021\)](#) text-based measure) to measure patent importance. Appendix [F](#) also presents several heterogeneity analyses to consider subsamples of firms and patents that may be able to differently predict patent importance. We repeat the analysis using all firm filings (rather than just

first filings); excluding nominally valued patents or cases where the valuation method is unknown; using only the random sample of reports (omitting the over-sampled periods); using only the cases where patent numbers are reported in the Schedule 7's so we know which patents are valued with certainty; examining only manufacturing firms; examining firms headquartered in Illinois; and using only firms established prior to the passage of the Illinois Blue Sky Law in 1919, who may have already made some patent-related decisions before the law was passed. Finally, we separately investigate large and small firms by size of total assets, and firms that were seeking permission to issue large versus small amounts of securities. In the interest of space, we do not provide a full exploration of these results here, although we provide much more detail in Appendices [F](#) and [F.2](#). In the vast majority of cases, however, our conclusions are again similar to our baseline results, and firms' valuations are not predictive of future importance.

We stress that our results in this section are correlational, not causal. Indeed, it would be absurd to suggest that requiring firms to report the historical cost of developing their patents rather than a fair value or purchase price lowers the importance of that patent. Instead, it is the fact that valuation methods are endogenous—that firms choose how to report the values of their patents—that makes this information predictive. This largely aligns with George O. May's perspective that firms should be able to choose the most practical way of valuing their own assets ([Zeff et al., 2021](#); [May, 1972](#); [American Institute of Accountants and New York Stock Exchange, 1934](#)).

Why do we consistently find that firm's reported valuations are not predictive of future patent importance? There are at least three explanations. First, firms may be using inappropriate methods to value their intangible assets that are not informative. We do not think this is likely, since we see null effects across methods of obtaining and valuing patents. Moreover, while the valuations themselves are not predictive, information about how firms arrived at those valuations do contain useful information; instead of firms using uninformative methods, the information encoded in firms' choice of methods is the most predictive information available. Second, firms may be strategically manipulating their reported valuations. Third, it may be particularly difficult to forecast the future importance of patents, and so the null results in this section may simply reflect uncertainty about the future quality of these assets. In the following two sections, we test these latter two explanations in turn, finding little evidence for the second but strong evidence for the third.

6 Do firms manipulate their intangible asset valuations?

Having found no evidence that reported patent valuations are predictive of future patent quality—and that this holds regardless of whether the valuation is itemized, for both acquired and internally generated patents, and for different methods of valuing patents—we now explore whether this lack of informativeness stems from strategic manipulation. Specifically, we investigate whether firms provided good-faith estimates of the expected future benefits or market value of their intangible assets, or whether these valuations were shaped by strategic motives.

It is not obvious whether firms had clear incentives to misreport these values, or in which direction such bias might go. On one hand, inflating the reported value of their patents increases a firm’s total asset valuation, perhaps making the regulator and potential investors believe that the firm is on sounder financial footing. On the other hand, if patents account for a large share of the firm’s total assets, regulators and investors may fear that the firm has few real assets that could be sold as collateral, making the firm a riskier investment (Almeida and Campello, 2007). Moreover, firms may undervalue their patents for strategic reasons, to avoid signaling to competitors which of their technologies are most promising (Long, 2002; Anton and Yao, 2004) or to reduce future depreciation charges (Francis et al., 1996; Reidl, 2004). While the Illinois Blue Sky law (Section 2) prescribed penalties for knowingly misrepresenting intangible asset values, firms may still have strategically misreported them because regulators had limited means to verify such valuations.

Drawing on insights from forensic accounting, we conduct digit analysis to detect whether patent valuations appear to be manipulated. In general, these techniques test whether the observed distribution of a digit or combination of digits in a reported number significantly deviate from well-understood expected distributions if the number were naturally occurring. We further note that not all deviations from expected distributions provide the same information: some tests provide evidence of intentional manipulation, while others may indicate uncertainty about true values; we take advantage of these differences below. To provide further context we also compare the distribution of digits for intangibles to digits of other financial variables from firms’ balance sheets and income statements.

We begin by conducting a first-digit test, which has frequently been used in accounting to detect manipulated numbers in financial reports (Nigrini, 1996; Nigrini and Mittermaier, 1997; Durtschi

et al., 2004; Nigrini, 2012; Geyer and Drechsler, 2014; Kossovsky, 2014; Amiram et al., 2015).²⁹ If numbers are naturally occurring, then the first digit should be distributed according to Benford’s Law, with 1’s occurring more than 30% of the time and 9’s less than 5% of the time. While the failure of an observed distribution of financial values to conform to Benford’s Law is not proof of strategic manipulation (Druică et al., 2018), it does make manipulation much more likely. Likewise, failing to detect a deviation from Benford’s Law does not guarantee that the reported valuations are reflecting truthful reports, but it does mean that any manipulation conforms to Benford’s Law, which we view as extremely unlikely, particularly since Benford’s original observation was not published until 1938, late in our sample period (Benford, 1938).³⁰

In Figure 5, we plot the Benford distribution alongside the empirical distribution of first digits for several financial variables found on firms’ balance sheets and income statements. Note that for this exercise, the unit of observation is the reported valuation; this is in contrast to results in the previous section where the unit of observation was the individual patent included in a reported valuation. The distributions of first digits for most financial variables conform to Benford’s Law quite closely. Aggregate intangibles reported on firms’ balance sheets are more likely to begin with “1” than predicted under a Benford distribution, but this is accounted for by the large number of intangibles valued nominally at \$1, which is especially common for goodwill. When we examine aggregate patent values reported on balance sheets in Panel B, we find that the distribution of first digits matches Benford’s Law very closely.³¹

Panel C reports the distribution of first digits for valuations for machinery and equipment. While there are some deviations, overall these valuations are also close to the Benford distribution. Panel D reports valuations of real estate. We find this comparison especially illuminating. Like patents and other intangibles, each piece of real estate is a unique asset, making it difficult to appraise

²⁹Beyond testing for irregularities in financial reports, first digit testing has been used in such varied applications as detecting academic fraud (Horton et al., 2020), manipulation of economic data (Tödter, 2015), election fraud (Pericchi and Torres, 2011; Deckert et al., 2011), and money laundering (Badal-Valero et al., 2018). For mathematical background on Benford’s Law, see Berger and Hill (2011, 2021).

³⁰In 1881, the astronomer Simon Newcomb observed the Benford distribution in the use of logarithm tables (Newcomb, 1881), although the pattern was not observed in numerous other physical phenomena until Benford’s work more than a half century later. While he clearly did not anticipate applications in accounting, Newcomb closes his note by anticipating digit testing: “It is curious to remark that this law would enable us to decide whether a large collection of independent numerical results were composed of natural numbers of logarithms” (Newcomb, 1881, p. 40).

³¹On firm’s balance sheets, this line item is labeled “Patents, Trademarks, and Other Intangibles.” It is a separate line item from firms’ Goodwill. Inspection of firms’ Schedule 7’s reveal that these line items predominantly consist of patents, and so we label this as “Patents (Balance Sheet).” We further discuss disaggregating information in firms’ Schedule 7’s below.

based on comparable properties, and the market is often highly illiquid. Consistent with this, the valuations for real estate are not as close to the Benford distribution, with fewer observations beginning with “1,” “3,” and “4” than expected, and more beginning with “2,” “7,” and “9.” In fact, the distribution of first digits for real estate appears to deviate further from the Benford distribution than do the distributions of first digits for patents and other intangibles, a result that we confirm with formal statistical tests below. Panels E-G plot the distribution of first digits for total assets, the total capital stock, and net worth from the balance sheet, respectively. Panels H-I plot the distribution of first digits for gross sales and net profit from the income statement, respectively. While there are minor deviations, visual inspection of these distributions does not reveal any glaring deviations from the Benford distribution.

In Table 8 Panel A, we formally test how close the distribution of each type of valuation is to the Benford distribution. The first column reports the number of observations for each valuation. Column 2 reports the sample mean for the first digit of each valuation. This is compared to the mean of the first digits in the Benford distribution, which is 3.44 and reported in Column 3.

Columns 4 and 5 report Pearson χ^2 test statistics and p -values, respectively, from comparing the entire distribution of first digits of the observed valuations to the expected Benford distribution.³² When examining aggregate patents from firms’ balance sheets, we fail to reject that the distributions of first digits conform to Benford’s Law; in fact, p -values are higher than 0.6. When comparing valuations reported in financial statements, we find lower χ^2 statistics (and larger p -values) for patents than for any other financial variable. The first digit tests therefore provide no reason to believe that valuations of patents are more likely to be strategically manipulated than are other financial variables.

To further reinforce the point that valuations of patents are no more likely to be strategically manipulated than other financial variables commonly reported on the balance sheet, in Panel B of Table 8 we conduct χ^2 test of homogeneity for the equality of the distributions of first digits of pairs of financial variables. We compare the distribution of first digits for patents to total assets, machinery and equipment, and real estate. We do not find a significant difference in the distribution

³²We compare the entire distribution of first digits for each financial variable to the distribution expected under Benford’s Law; conducting a digit-by-digit test increases the probability of incorrectly rejecting the null that digits conform to Benford’s Law (Cleary and Thibodeau, 2005).

of first digits between patents and any of these other financial variables.³³

In Appendix G.1, we present additional tests to assess how closely the first digits of the various financial variables conform to Benford’s Law. Appendix Table A11 presents results from the distortion factor test proposed by Nigrini (1996), which tests for the direction of distortion. Only total intangibles listed on the balance sheet (which include the often nominally valued goodwill), have statistically significant distortion factors, which are consistent with an over-representation of “1”s. Appendix Table A12 presents results from an exact bootstrap test proposed by Suh and Headrick (2010), which also fails to detect deviations from Benford’s Law.³⁴

Perhaps firms whose balance sheets contain intangible assets are more unscrupulous overall, and distort valuations for all of their assets and not just intangibles, making the distributions of intangibles appear more similar to the distributions of other financial variables. We investigate this in Figure 6, plotting the distribution of first digits for the non-intangible financial variables on firms’ balance sheets and income statements separately for patenting and non-patenting firms. The distribution is quite similar between patenting and non-patenting firms, suggesting that the firms that make up our patenting sample do not report valuations systematically differently than do the firms in the full sample. We formally test these differences in Table 9. In the first two columns, we present sample sizes and mean of the first digit for patenting firms, followed by the same information for non-patenting firms in Columns 3-4. In Columns 5-6, we present test statistics and p -values from χ^2 tests of homogeneity comparing the distribution of first digits for patenting firms to non-patenting firms for each financial variable. We fail to reject that the distributions of first digits are the same between patenting and non-patenting firms for all of these financial variables.

6.1 Testing for Manipulation for Different Subsamples of Intangible Valuations

Next, we further drill down into the distribution of first digits of intangible assets by using the more detailed disclosures available in Schedule 7 to see if particular kinds of intangible assets

³³Pairwise χ^2 test results comparing any two sets of financial variables are available upon request.

³⁴We additionally perform the first digit tests using all sub-samples of firms for which we conduct robustness and heterogeneity analysis to our regression analysis in Appendix F and find qualitatively similar results. In the interest of space, we do not include these results. They are available upon request.

or approaches to valuation show evidence of potential manipulation. For each report, we consult the firm’s Schedule 7 to obtain all reported valuations of intangible assets; when no Schedule 7 is provided, or when the Schedule 7 does not list any valuations, we use the valuation reported in each firm’s balance sheet. This means that we have a larger sample of intangibles and patent valuations for this analysis than when only using the more aggregated valuations that appear on firms’ balance sheets analyzed above. We plot the distribution of first digits for these disaggregated intangibles in Figure 7. When we split the sample of intangibles into various types of assets and approaches to valuation, we often have small sample sizes that can lead to visual deviations from the Benford distribution, even if statistical tests would fail to reject such a deviation. We present results from Pearson χ^2 tests of the equality of these first digit distributions to the Benford distribution in Table 10 Panel A.

We reject that the distribution of first digits conform to Benford’s Law for all disaggregated intangibles, for all disaggregated patents, for all goodwill, and for all other forms of intangibles (e.g., other forms of IP, patterns, customer lists). We find this unsurprising, since firms often report nominal valuations. As we verify below, we do not expect the valuations for nominally valued assets to conform to the Benford distribution. At the same time, we do not interpret deviations from Benford’s Law in the case of nominal valuations to be evidence of attempted manipulation; since firms disclose that they are conservatively valuing their patents at a nominal value, there is no attempt to deceive users. For this reason, it is important to further understanding for what types of intangibles and which valuation methods we observe deviations from Benford’s Law.

Next, we compare the first digit distributions for patents valued as a portfolio and fully itemized patent valuations to the Benford distribution. Table 10 Panel A shows that, while we cannot detect any differences between the first digit distribution of patents valued as a portfolio and Benford’s Law, the first digit distribution for itemized patents is statistically different. The first row of Table 10 Panel B shows that, while the distribution for itemized patents differs from Benford’s Law, we cannot reject that first digits for portfolio-valued patents and itemized patent are drawn from the same distribution. Nevertheless, the results in Panel A raises the possibility that the valuations for itemized patents may be manipulated. This is surprising, as in other contexts, disaggregating reported valuations is typically found to make manipulation less likely (Libby and Brown, 2013; Lu and Mande, 2014). On the other hand, if patents are strongly complementary to

one another, valuing as a portfolio may actually make a valuation more transparent, and in turn itemized valuations may be more difficult to assess and so easier for a patent owner to get away with manipulation. An additional factor is that patents that are valued as a portfolio or itemized may tend to use different methods to arrive at their valuation. As noted above, we expect patents valued nominally to deviate from Benford’s Law by construction. Itemized patents are slightly more likely to have be nominally valued, although excluding those patents (shown in Appendix Table A13), lowers the χ^2 -statistic for the itemized patents only slightly and the distribution is still significantly different from the Benford distribution. Itemized patents are substantially more likely to be appraised than are patents valued as a portfolio; when we exclude appraised patents (shown in Appendix Table A14), the χ^2 -statistic falls substantially and we fail to reject that the first digit distribution differs from the Benford distribution at the 5% level.

Next, we compare the distribution of first digits for patents that have been acquired by the reporting firm and patents that were internally generated. The valuation of patents that were acquired may be less likely to have been strategically manipulated if the sale led to a paper trail that could be investigated by auditors, investors, or regulators; valuations of internally generated patents may be more likely to be strategically manipulated if firms know there is no external market for these patents and so others may lack the expertise to identify an inaccurate valuation.³⁵ The distribution of first digits for acquired intangibles is statistically indistinguishable from the Benford distribution, while there is a detectable difference for internally generated patents at the 5% level. In Panel B of Table 10, we show that even though the distribution of first digits for internally generated patents is statistically distinguishable from Benford’s Law while the first digit distribution for acquired patents is not, we still cannot statistically distinguish the first digit distributions of acquired and internally generated patents from one another. Internally generated patents are far more likely to be nominally valued than are acquired patents; when we exclude nominally valued patents, we fail to reject that the distribution of first digits for internally generated patents deviates from Benford’s Law.

Finally, we compare first digit distributions for the different methods firms can use to value their patents. Consistent with the discussion about acquired patents, we find that when firms report the

³⁵See [Akcigit et al. \(2016\)](#); [Andrews et al. \(2024b\)](#) for discussions of how the knowledge of inventors and other market participants about the value of patents can affect the ability to transact them. In the next section, we discuss the related question of whether patents are more likely to be transacted when there is less uncertainty about their value.

purchase price of a patent, the distribution of first digits appears to match the Benford distribution quite closely. When reporting an appraised value, the distribution of first digits differs from the Benford distribution, with fewer valuations beginning with “1” than expected and many more beginning with “3” and “5;” we strongly reject that the distribution of first digits for appraised patents is equal to the Benford distribution. This is likewise consistent with the discussion of itemized patents, many of which were appraised, above. The distribution of first digits for patents that are valued at cost matches the Benford distribution closely. Consistent with our conjecture above, when a patent is valued nominally, we also strongly reject that the distribution of first digits is equal to the Benford distribution; instead, almost all of these valuations begin with “1,” and are usually \$1, \$10, or \$100. Finally, we report the distribution of first digits for patents for which we cannot identify a method of valuation; we fail to reject that this distribution differs from the Benford distribution.

Consistent with our intuition that patents valued at their purchase price or historical cost are not manipulated, Table 10 Panel B shows that the distribution of first digits for these two methods of valuation are statistically indistinguishable from one another. While the above discussion raises the possibility that appraised values are strategically manipulated, we fail to reject that the distribution of first digits for appraised patents and patents valued at the purchase price or at historical cost are drawn from the same distribution at conventional levels.

In Appendix Tables A15 and A16 we repeat the same distortion factor and bootstrap tests as described above using our set of intangible asset values from firms’ Schedule 7’s. In both cases, we only strongly reject that distributions of first digits follow the Benford distribution for nominally valued patents.

Summing up, we interpret this as suggestive evidence that appraised valuations may be manipulated. On the basis of this evidence, we believe regulators are justified in not allowing firms to report appraised values or, at the very least, imposing rules on how allowable appraisals can be conducted; no consistent rules governed how firms could appraise their intangible assets under the Illinois blue sky law. Nominally valued patents also deviate from Benford’s Law, although this is expected since nominal valuation typically begin with a “1” by convention; again, we do not interpret this as evidence of manipulation.

While we find that the first digit distribution for itemized and internally generated patents differ

from the predicted distribution, this can largely be attributed to the fact that assets valued using methods that are less likely to conform to Benford’s Law (namely appraisal for itemized patents and nominally for internally generated patents). As we show in Section 5, the knowledge that a patent was itemized vs. valued as a portfolio or acquired vs. internally generated contains useful information; if firms were not required to report valuations for internally generated patents or to fully itemize valuations out of fear of manipulation—as is the case under current GAAP—then this useful information is lost. We therefore recommend that firms continue to report this information, but that they do so using valuation methods that are less susceptible to manipulation.³⁶

7 Are Firms Unable to Precisely Value their Intangibles?

In the previous section, we found no evidence that (with the notable exception of appraised valuations) strategic manipulation explains the inability of patent valuations to predict future patent importance. We now consider an alternative explanation: this may instead be driven by the inherent uncertainty involved in the valuation of intangible assets.

In particular, if there is no objective way to accurately value intangibles, firms may be highly uncertain about the value of their intangibles and hence unable to assign a valuation with any precision. In this section, we present evidence of this imprecision. To do this, we conduct a last-digit test. If firms were able to precisely value their assets, then the last reported significant digit should be uniformly distributed.³⁷ Evidence of rounding, such as the heaping of values ending in 0’s or 5’s, is evidence that firms are uncertain of the true valuation and are just assigning a round, approximate value.

Following our analysis in the previous section, we present distributions of the last significant digit for financial variables in the balance sheet and income statement in Figure 8 and conduct Pearson χ^2 tests for the equality of these distributions to the uniform distribution in Table 11 Panel A. We exclude any assets that report exactly \$0 on the balance sheet; since many firms do not have any

³⁶Our results are again anticipated by George O. May, who wrote “[T]he contrast between the practicing and the academic accountants in their approach...may reflect their attitudes towards the risk of managerial misrepresentation. The dweller in the academic world, fearful, perhaps, of being deemed naive, is apt to exaggerate the danger” (May, 1972, p. 13). May concludes that the risk of strategic manipulation is more than offset by the additional information that can be communicated when firms choose the most effective methods to disclose their financial information.

³⁷The Benford distribution of the last digit approaches the uniform distribution as the number of digits in a valuation approaches infinity. In practice, the distribution of last digits is approximately uniform as long as the valuation contains more than two or three digits (Hill, 1995).

intangibles, counting these null values as having a last digit of zero further increases the difference between intangibles and other financial variables. We fail to reject a uniform distribution for last digits of several financial variables, namely total assets, machinery and equipment, gross sales, net worth, gross sales, and net profit; we additionally fail to reject a uniform distribution for real estate at the 5% level, although we can reject it at the 10% level. We strongly reject that the last digit distribution for patents and other intangibles follow a uniform distribution; in fact, these distributions appear to be especially far from the uniform distribution and have exceptionally high shares ending in 0.³⁸ In Table 11 Panel B, we show that we can strongly reject that the last digit distribution for patents is the same as the last digit distribution for total assets, machinery and equipment, and real estate.

In Figure 9 and Table 12, we conduct last digit tests for the disaggregated intangible-level information provided in firms' Schedule 7's. When examining last digits, almost all types of valuations reflect substantial amounts of rounding. We strongly reject that last digits follow a uniform distribution both for acquired patents and internally generated patents, as well as for both itemized patents and patents valued as portfolios. The distribution of last digits for patents valued at the purchase price, appraised patents, and nominally valued patents also do not conform to the uniform distribution. The only exceptions are patents valued at cost—for which we obtain a p -value of 0.085, below the 10% threshold but above the 5% threshold—and patents with an unknown method of valuation. The fact that we find a smaller χ^2 -statistic for patents valued at cost is consistent with firms being able to more precisely value the cost of R&D and legal inputs rather than the value of innovation outputs, although even here firms often report costs that are round numbers.

In Panel B of Table 12, we show that the distribution of last digits is usually similar across groups of patents. In particular, we fail to reject that the distribution of digits is different across patents valued as a portfolio and fully itemized valuations, suggesting that firms are able to value patents with similar precision regardless of whether they fully itemize or not. We do find a significant difference in the distribution of last digits between acquired and internally generated patents; our results in Panel A show that both distributions are significantly different from the uniform

³⁸Firms' valuations of their capital stocks are similarly likely to end in 0 to the valuations of intangibles and have even larger χ^2 test statistics. Recall that none of these firms are traded on public exchanges; instead, firms tend to issue large, round numbers of shares to directors and officers, to value these shares at round number values when they issue, and then to hold these shares so that the price is not adjusted via buying and selling in a liquid market. Hence, we find it unsurprising that the value of the capital stock deviates substantially from the uniform distribution.

distribution, and if anything values for acquired patents deviate from the uniform distribution even further than values of internally generated patents. Finally, we reject at the 10% level that the distribution of last digits is identical across appraised patents and purchased patents; we fail to reject that the distribution of last digits for patents valued at cost differs from either purchased or appraised patents at conventional levels, although we find p -values less than 0.15 in both cases.

A complementary method to show how precisely firms are able to value particular types of intangible and financial variables is to check how frequently valuations report cents versus how frequently they round valuations to the nearest dollar or to another focal dollar amount (e.g., reporting \$104.87 instead of \$105 or \$100). Table 13 Column 1 shows that patents and other intangibles are particularly unlikely to report cents. On the balance sheet, 71% of all intangibles and 65% of patents report cents, similar to the rates for real estate and much smaller than total assets, machinery and equipment, net worth, gross sales, and net profit. In firms' Schedule 7's, patents and other intangibles are even less likely to report cents; only about 37% of patent valuations in Schedule 7 report cents.

Table 13 Column 2 builds on the intuition from Figures 8 and 9 by showing that patents and other intangible assets end in zero at rates comparable to real estate, but much more than other financial variables like total assets, machinery and equipment, net worth, gross sales, and net profit. In firms' Schedule 7, intangibles are even more likely to end in zero; almost half of all Schedule 7 valuations end in zero. The motivation for examining whether a valuation ends in "0" here is similar to that in demography and economic history, in which "age heaping" is interpreted as evidence that individuals do not know their true ages (Tollnek and Baten, 2016; Stockwell and Wicks, 1974; A'Hearn et al., 2009).³⁹ Column 3 uses an alternative and more restrictive method to see if valuations are more likely to cluster on focal values. We define an asset to be valued at a focal value if all digits are zero except for the first digit. This means that, for instance, an asset valued at \$2,000 or \$3,000 would be considered to have a focal value, while an asset valued at \$2,500 would not; an asset valued at \$200 or \$300 would be considered to have a focal value, while an asset valued at \$250 would not; and so on. Intangible assets on the balance sheet are more likely to have a focal value than other assets, with the exception once again of real estate. In Schedule

³⁹A related idea in a different setting is found in recent work by Dube et al. (2025) and Reyes (2024), who document the presence of extensive heaping in firms' wage settings, and conclude that this is caused by misoptimization by firms that are unable to set economically efficient wages.

7, intangibles are even more likely to be valued at a focal value than are any other assets in the balance sheet or income statement.

Imprecise valuations may be more common for large valuations. If this is true, valuations that end in 0 or focal valuations may reflect innocuous rounding rather than signaling that firms are unable to assign a precise value. We believe that this is unlikely to be the case for intangible assets for two reasons. First, recall from Tables 1 and 2 that patents and other intangible assets, while often valuable, are typically less valuable than other financial variables like machinery and equipment or real estate; by definition, intangibles must be less valuable than the total value of assets. Yet the valuations of all of these other financial variables are reported more precisely than are intangibles. Second, in Figure 10, we split patents into above- and below-median valuations and plot the distribution of last digits. About 50% of valuations end in 0 for both the high and low valuations. Hence, imprecise valuations are a phenomenon unique to patents and other intangible assets, regardless of the size of the valuation. In Appendix Table A17, we formalize the test suggested in Figure 10, conducting χ^2 tests that compare high and low valuations for several financial variables.

Another possible explanation for the large degree of imprecision observed in the valuation of patents and other intangible assets is that firms that own intangibles are particularly unskilled at making precise valuations for any type of financial variable. To test this, we compare the distribution of last digits for various financial variables in firms' balance sheets and income statements between firms with patents and firms without patents; this is the last-digit analogue to Figure 6 above, which compares the distribution of first digits between patenting and non-patenting firms. We plot results in Figure 11. If anything, patenting firms exhibit less bunching of last digits on zero and have closer-to-uniform distributions for most financial variables than do non-patenting firms. We present results of χ^2 tests comparing the distribution of last digits for patenting to non-patenting firms in Table 14; this is the last-digit analog to Table 9. The distribution of last digits between patenting and non-patenting firms is indistinguishable for all of these financial variables. Hence, the imprecision in the valuation of patents and other intangibles is a feature unique to those assets, not a feature of the firms making the valuation. This supports our interpretation that intangibles are inherently difficult to precisely value.

8 Conclusion

Current accounting standards exclude internally generated intangible assets from balance sheets and require only aggregate reporting for acquired intangibles, reflecting long-standing uncertainty about whether and how such assets should be recognized. We shed light on this debate by examining a rare historical setting—the 1919 Illinois blue sky law—in which firms were required to itemize all intangible assets in financial statements and disclose the valuation methods used, without distinguishing between acquired and internally generated intangibles.

Focusing on patents, the only category of intangibles with observable long-term outcomes, we find that firm-reported valuation amounts are generally uncorrelated with subsequent patent importance. This lack of association holds across acquired and internally generated patents, itemized and non-itemized disclosures, and most valuation methods. Using forensic digit tests, we find little evidence that these patterns reflect strategic manipulation. Instead, the evidence points to substantial valuation uncertainty at the time of reporting, consistent with the inherent difficulty of assessing the future economic benefits of intangible assets.

Importantly, while valuation amounts themselves are largely uninformative, firms' reporting choices do convey useful information. Patents that are itemized, acquired, or valued at purchase price or historical cost tend to be more important. These findings underscore that accounting communicates information not only through reported values, but also through managers' choices of valuation methods and disclosure practices.

Taken together, our results speak directly to current standard-setting debates at the FASB. Our historical evidence suggests that requiring firms to disclose valuations for all intangibles—including IGIs—is feasible and largely undertaken in good faith. However, it also cautions against assuming that capitalized intangible values will be inherently decision-useful. Instead, our findings suggest that while expanded disclosure can be informative, especially when it allows firms discretion in how intangibles are reported, a uniform valuation model for intangible assets is unlikely to be effective.

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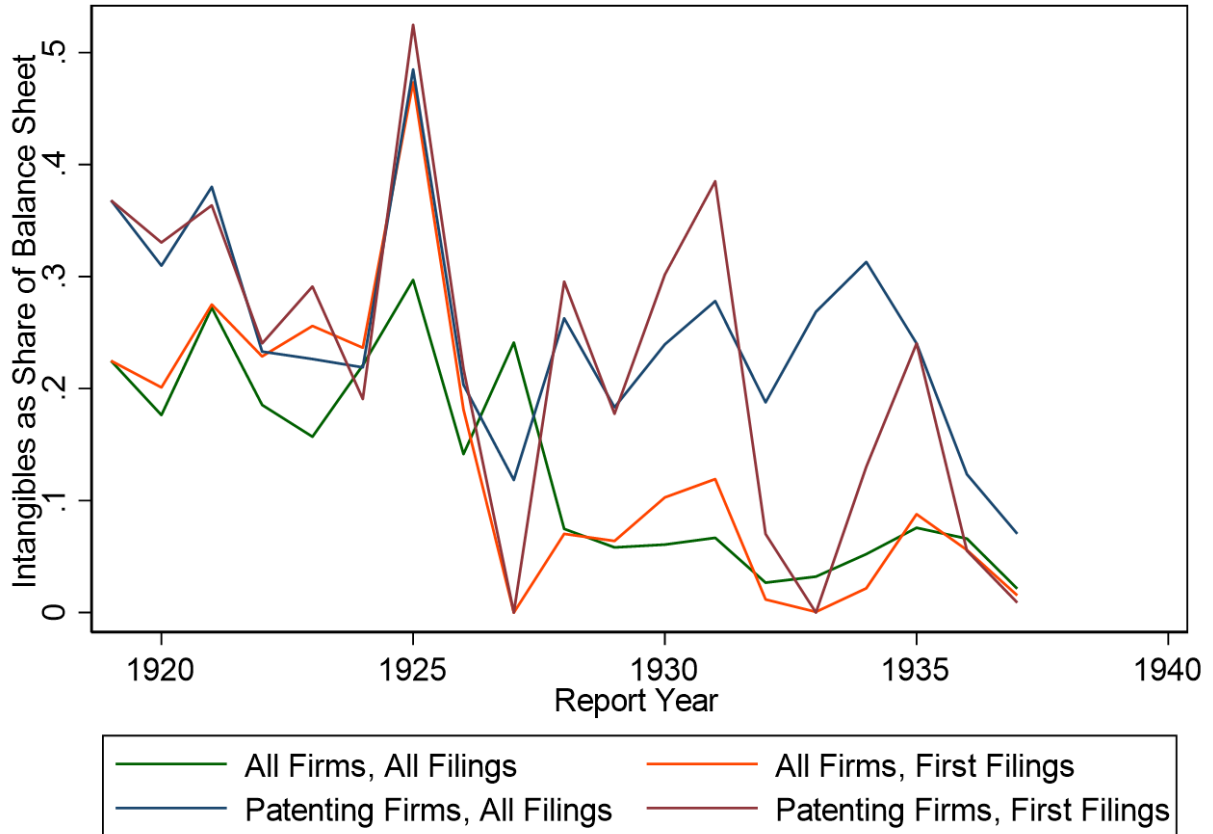
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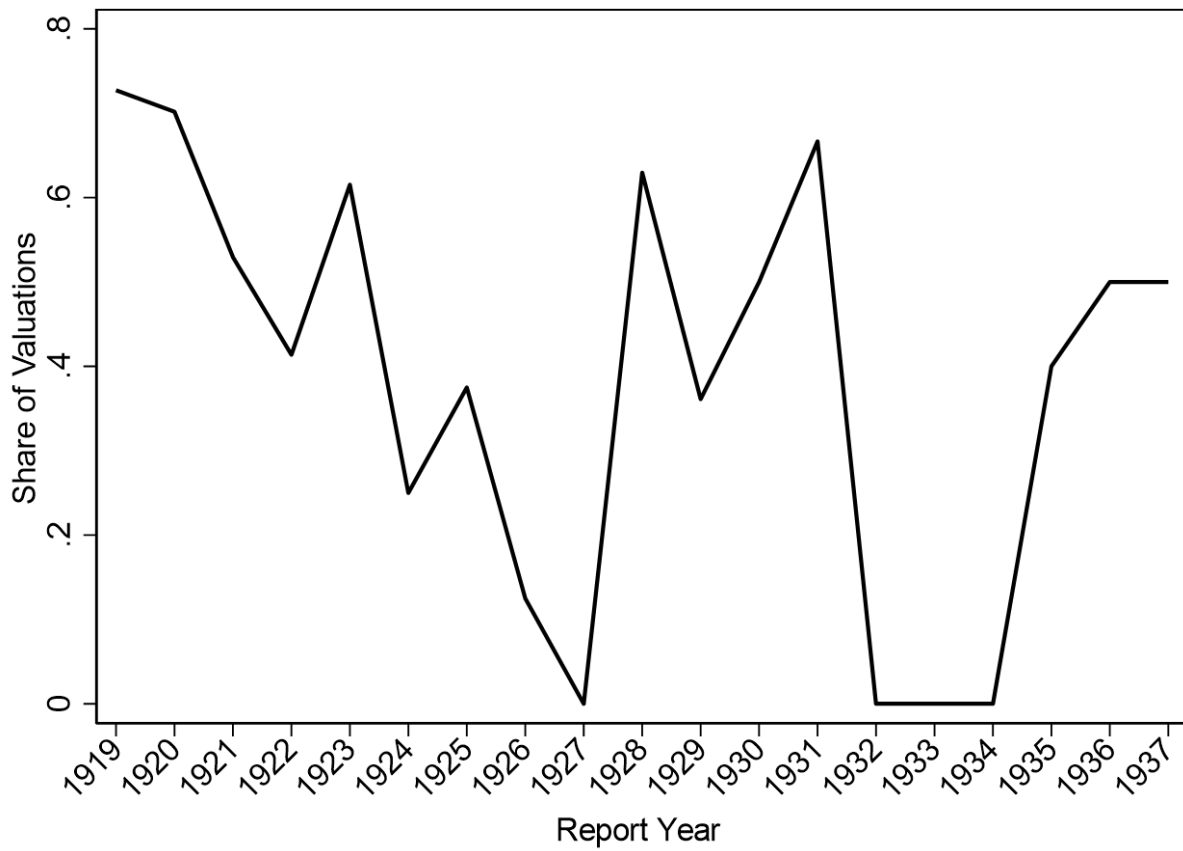
Figures and tables

Figure 1: Share of Balance Sheet Consisting of Intangible Assets



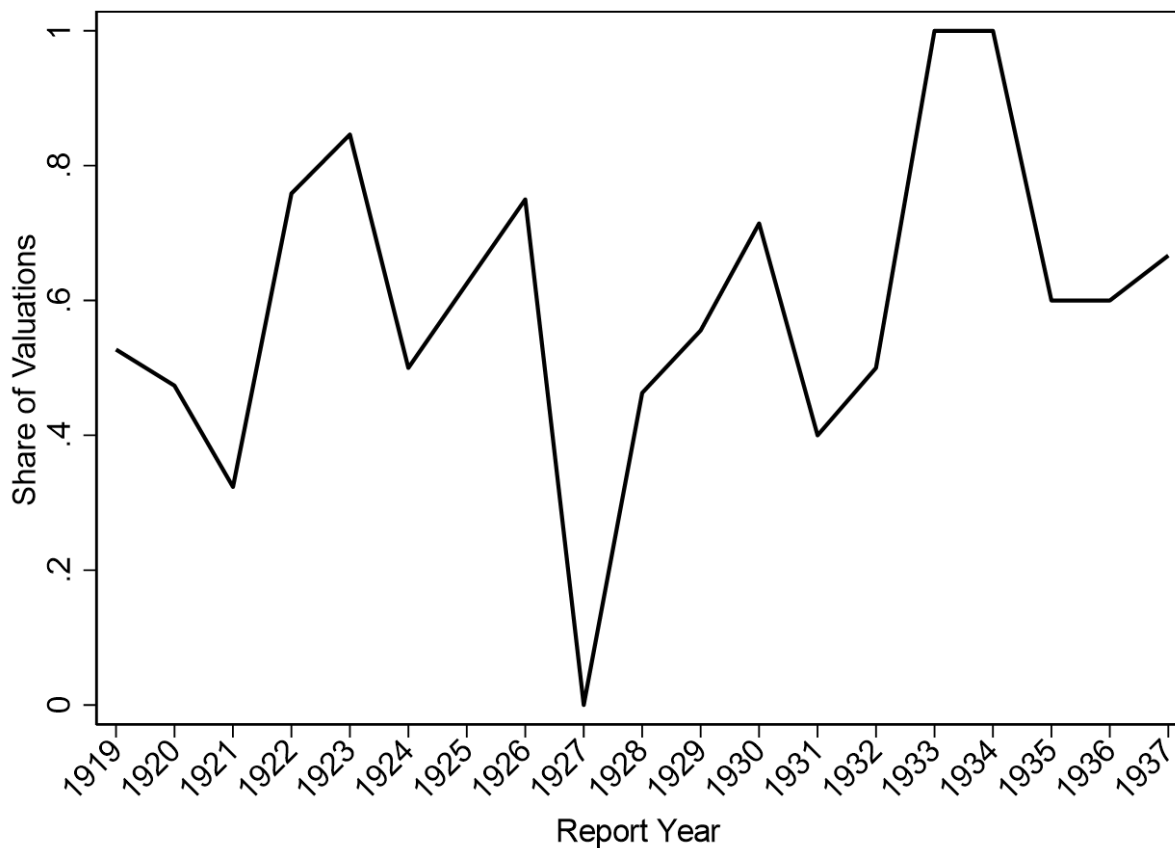
Notes: The reported value of intangible assets on the balance sheet divided by the value of total assets on the balance sheet, using all filings for all firms, first filings for all firms, all filings for firms with at least one patent, and first filings for firms with at least one patent.

Figure 2: Share of Patent Valuations that Are Itemized



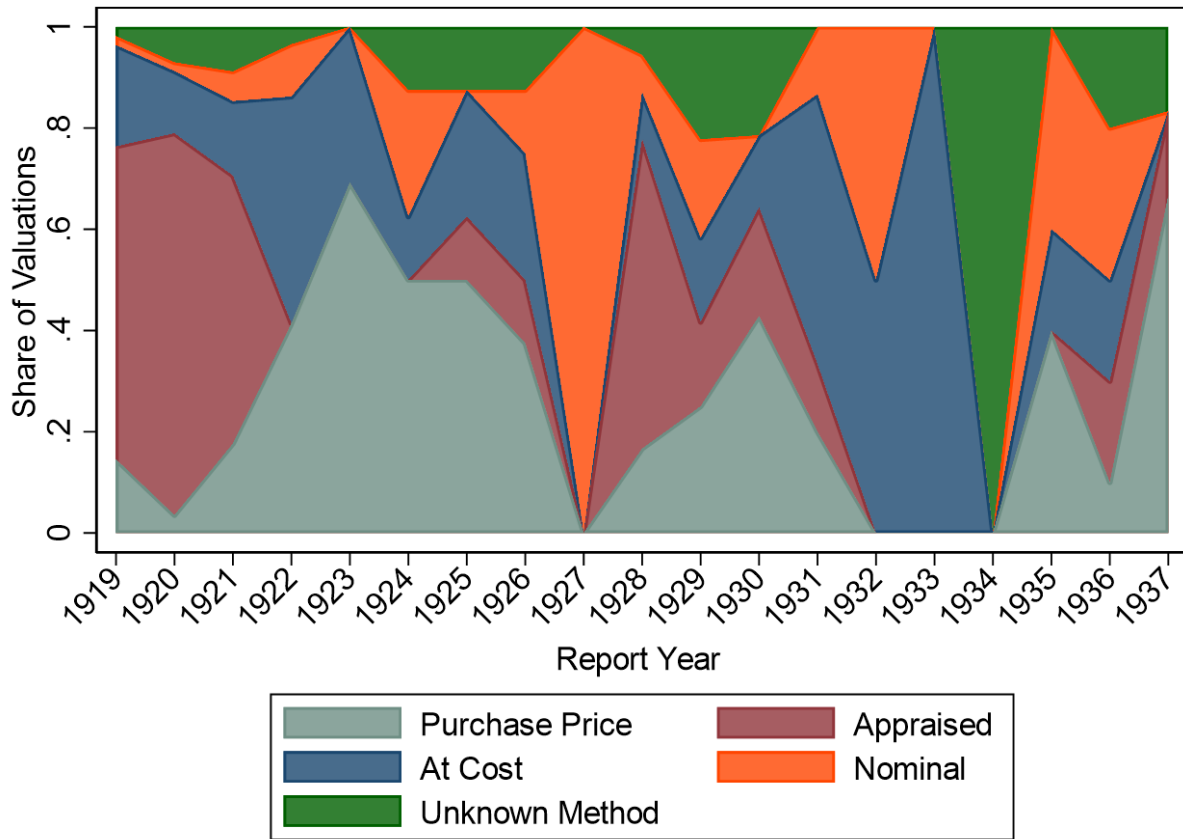
Notes: Share of valuations containing patents in which the patent values are itemized (that is, a unique value is assigned to each patent) in each year. The share is calculated for first filings from all firms with at least one patent.

Figure 3: Share of Patents that Are Acquired



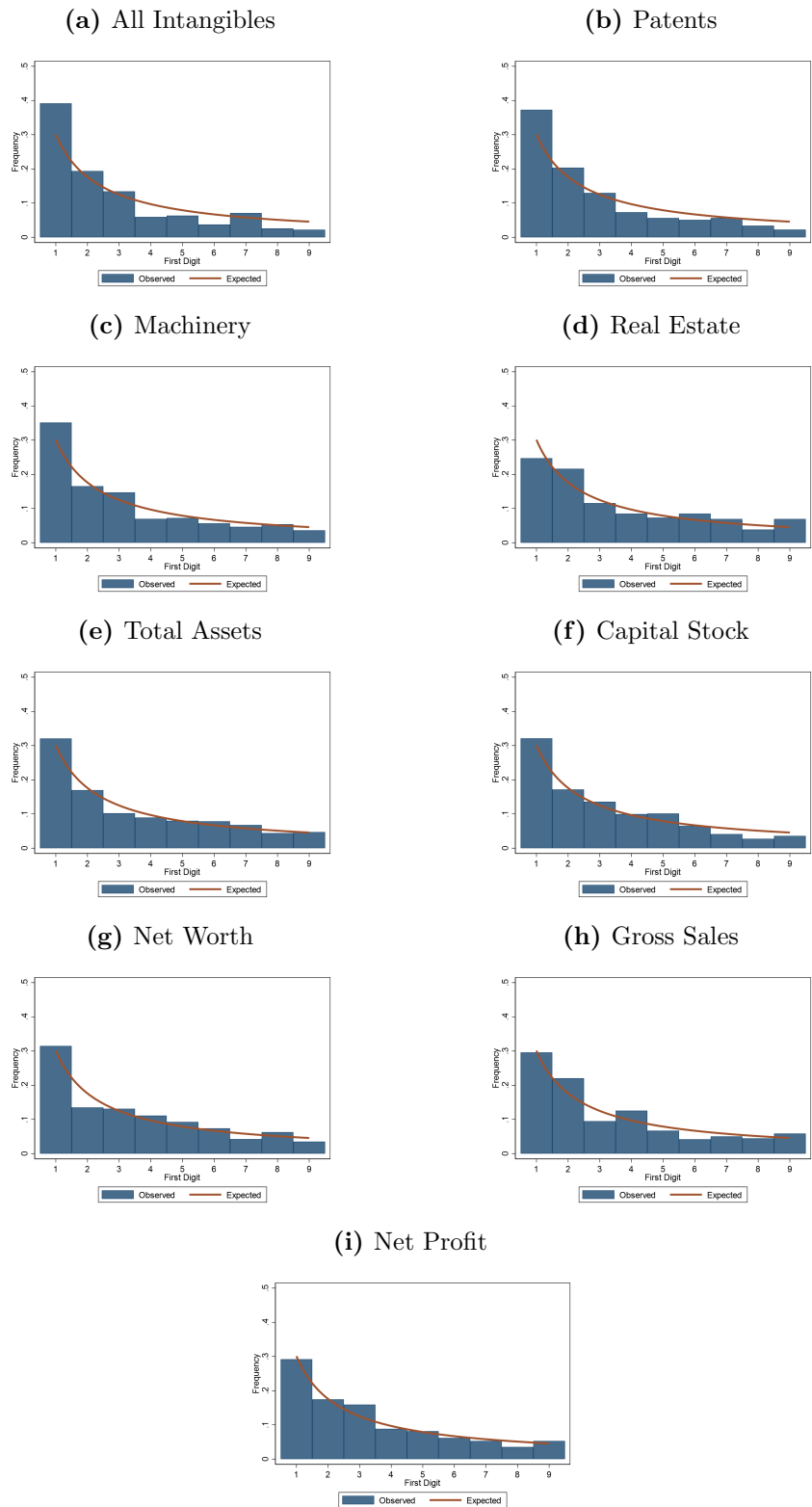
Notes: Share of valuations containing acquired patents in each year. The share is calculated for first filings from all firms with at least one patent.

Figure 4: Share of Patent Valuations by Valuation Method



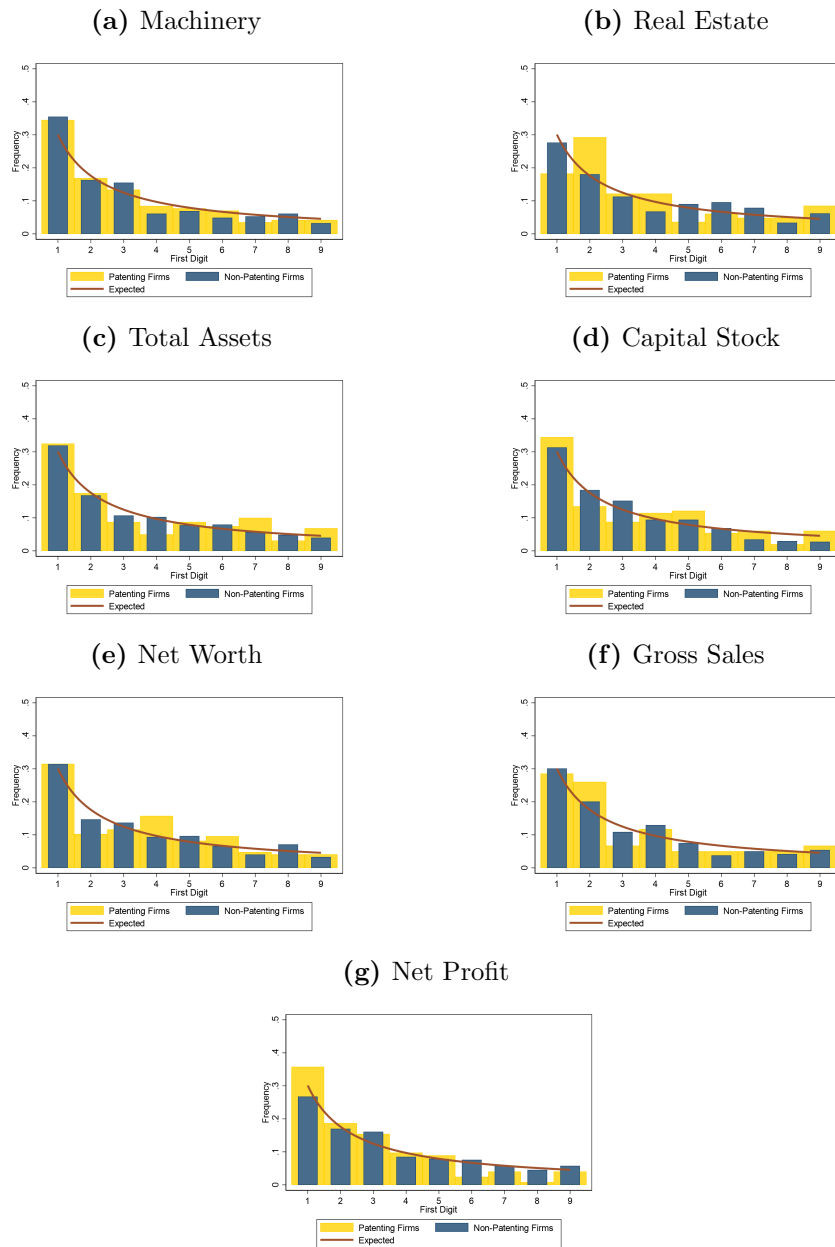
Notes: Share of valuations containing patents that are valued using each of five methods: valued at the purchase price, valued via appraisal, valued at cost, valued nominally, or in which the method of valuation is unknown. The share is calculated for first filings from all firms with at least one patent.

Figure 5: Distribution of First Digits From Balance Sheets and Income Statements



Notes: Distribution of first digits for several values reported in financial statements (balance sheets and income statements) from firm reports.

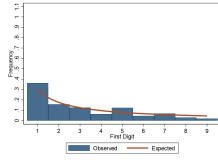
Figure 6: Distribution of First Digits for Patenting Firms vs. Non-Patenting Firms



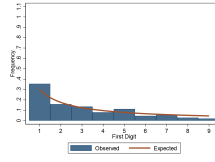
Notes: Distribution of first digits for several values reported in firm reports. First digits are plotted both for firms that report having patents and firms that do not report having patents.

Figure 7: Distribution of First Digits From Schedule 7 (Intangible Assets)

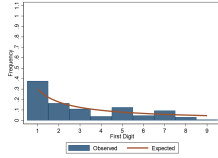
(a) All Intangible Assets



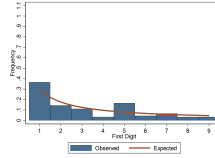
(b) All Patents



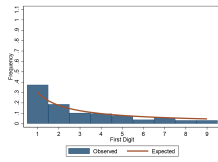
(c) Goodwill



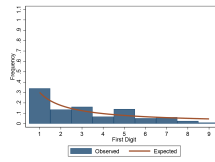
(d) Other Intangibles



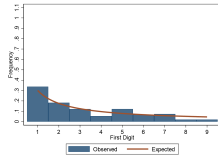
(e) Patents Valued as Portfolio



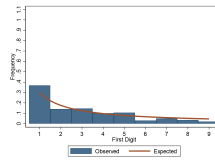
(f) Itemized Patent Values



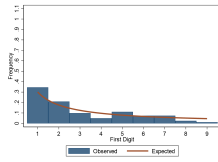
(g) Acquired Patents



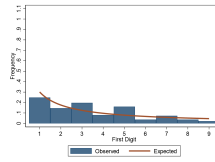
(h) Internally Generated Patents



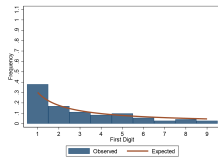
(i) Purchased Patents



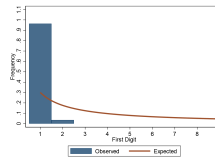
(j) Appraised Patents



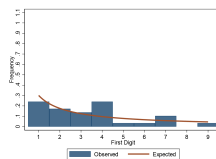
(k) At Cost Patents



(l) Nominally Valued Patents



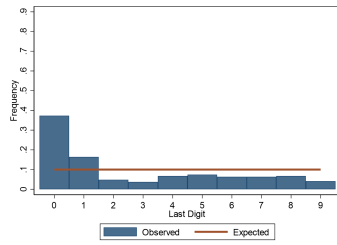
(m) Unknown Valuation Method Patents



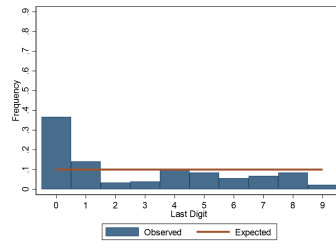
Notes: Distribution of first digits for several values reported in Schedule 7 of firm reports, which contains detailed information on intangible assets.

Figure 8: Distribution of Last Digits From Financial Statements

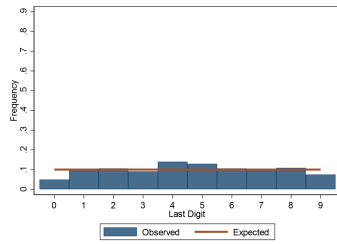
(a) All Intangibles (Balance Sheet)



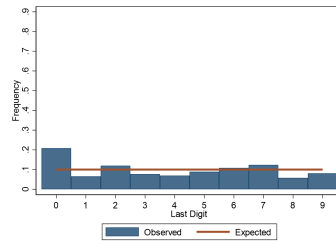
(b) Patents (Balance Sheet)



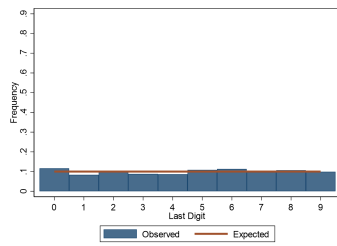
(c) Machinery



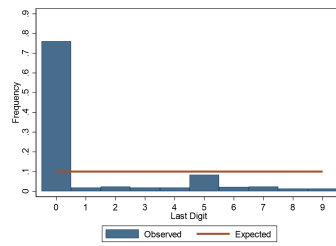
(d) Real Estate



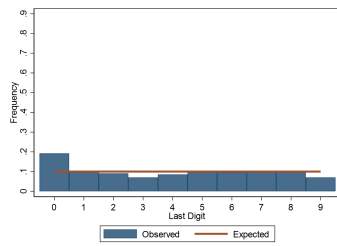
(e) Total Assets



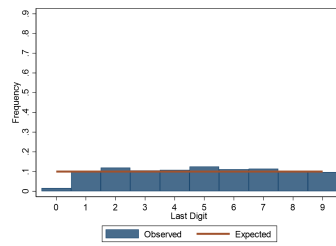
(f) Capital Stock



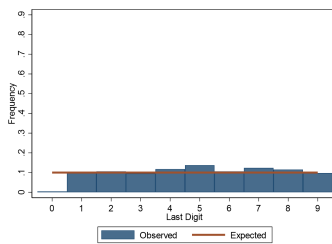
(g) Net Worth



(h) Gross Sales

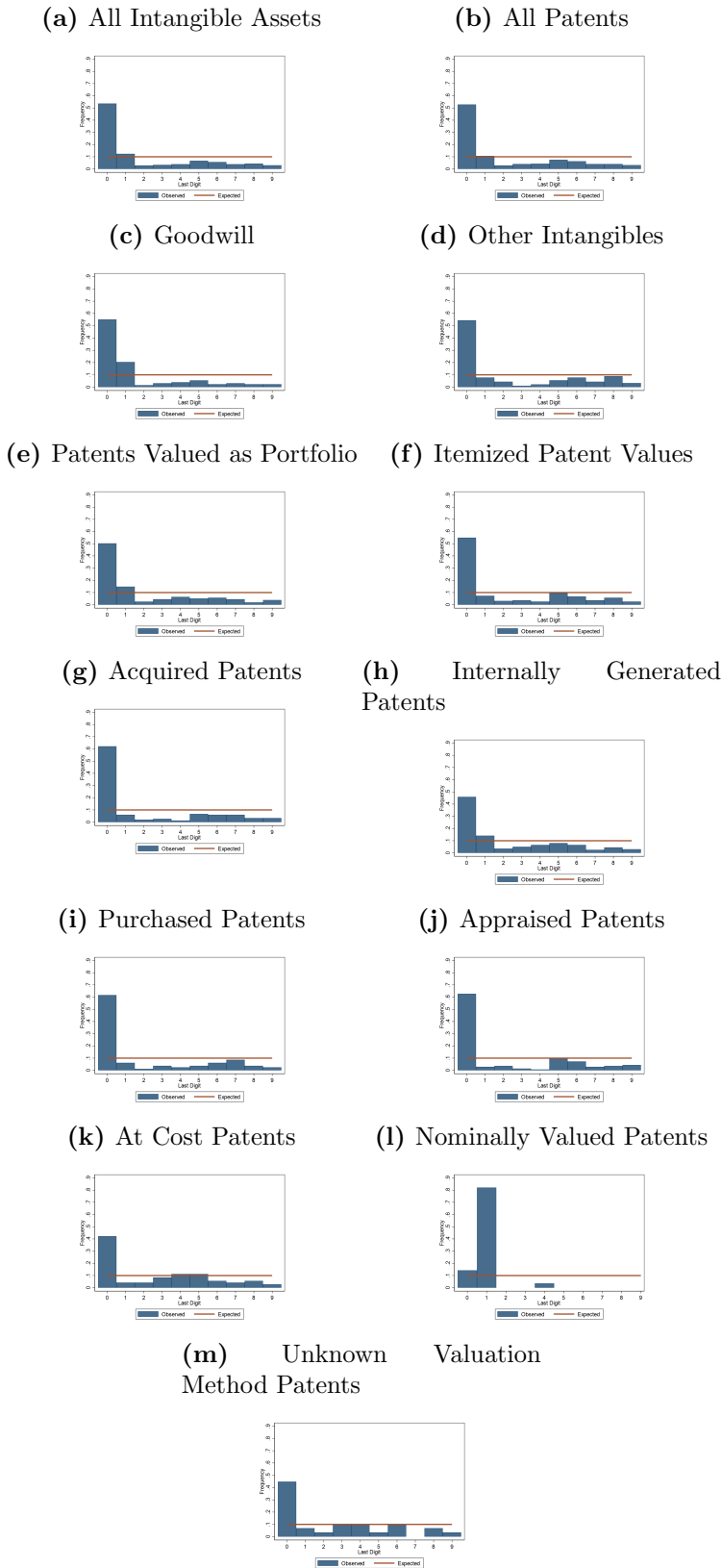


(i) Net Profit



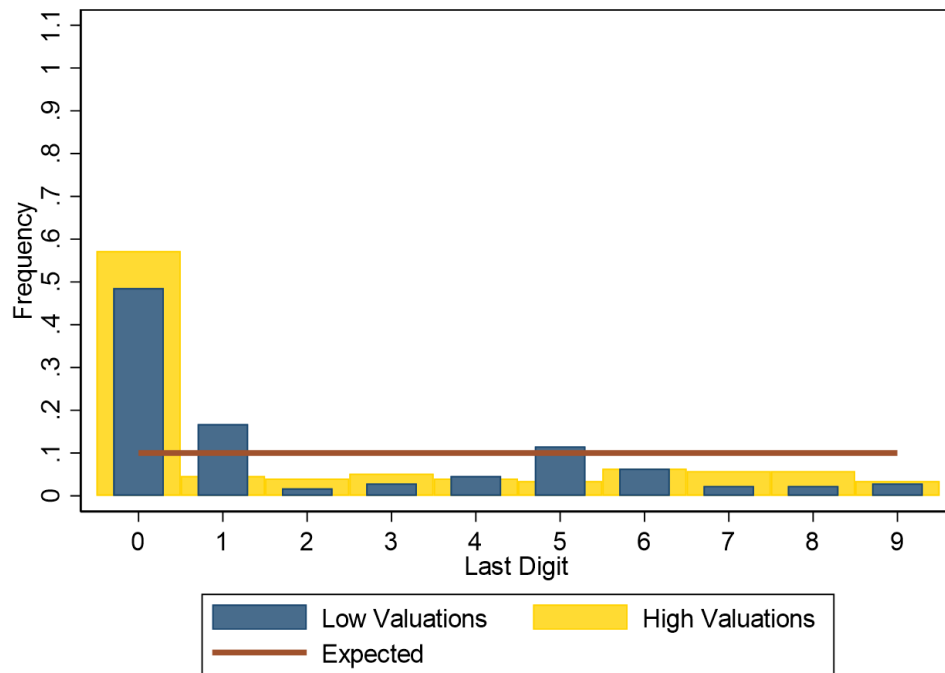
Notes: Distribution of first digits for several values reported in financial statements (balance sheets and income statements) from firm reports.

Figure 9: Distribution of Last Digits From Schedule 7 (Intangible Assets)



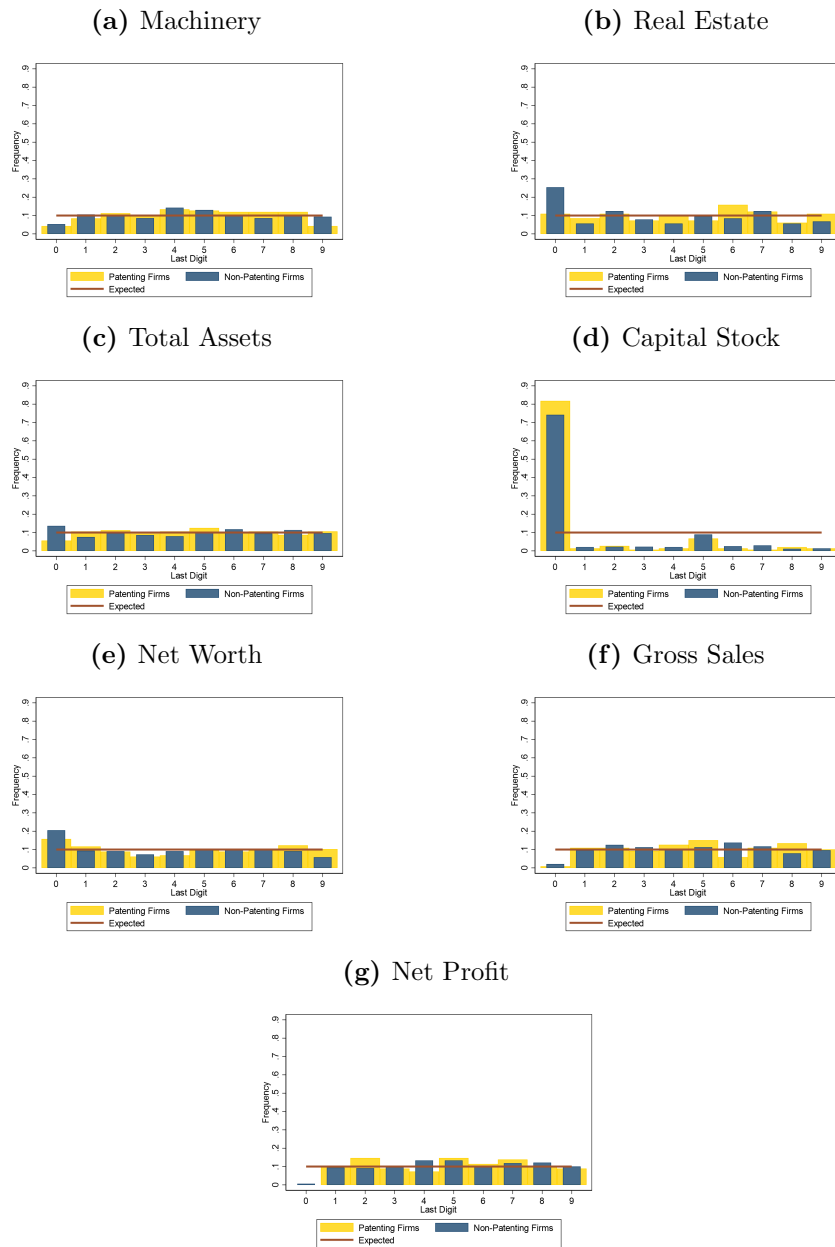
Notes: Distribution of first digits for several values reported in Schedule 7 of firm reports, which contains detailed information on intangible assets.

Figure 10: Distribution of Last Digits for Patents with High vs. Low Valuations



Notes: The distribution of last digits for patents separately for patent valuations greater than or equal to the median and less than the median.

Figure 11: Distribution of Last Digits for Patenting Firms vs. Non-Patenting Firms



Notes: Distribution of last digits for several values reported in firm reports for firms with patents and firms without patents.

Table 1: Summary Statistics of Sample Firms**(a) All Filings**

	N	Mean	Standard Deviation	Min	25th Pct	Median	75th Pct	Max
Report Year	1,734	1,930.22	4.52	1,919.00	1,929.00	1,930.00	1,932.00	1,948.00
Firm Age	1,319	7.19	9.61	-3.00	1.00	3.00	10.00	74.00
Class C Firm	1,734	0.48	0.50	0.00	0.00	0.00	1.00	1.00
Manufacturing Firm	1,734	0.31	0.46	0.00	0.00	0.00	1.00	1.00
Financial Services Firm	1,734	0.28	0.45	0.00	0.00	0.00	1.00	1.00
Total Assets	1,574	8,469,392.87	43,514,211.22	239.28	161,000.00	653,524.19	2,741,842.28	776,957,307.44
Real Estate	1,577	1,024,750.73	16,654,384.10	0.00	0.00	0.00	129,197.78	639,665,144.30
Machinery and Equipment	1,577	499,138.98	4,499,311.95	0.00	0.00	3,140.98	76,171.64	117,106,342.10
Intangible Assets	1,734	402,516.31	4,982,780.31	0.00	0.00	0.00	851.30	83,873,958.46
Patents (and Other IP)	1,734	58,705.23	594,435.83	0.00	0.00	0.00	0.00	22,391,853.64
Goodwill	1,577	378,376.09	5,189,878.13	0.00	0.00	0.00	0.00	83,873,958.46
Net Worth	1,577	3,556,956.52	23,122,581.86	-509,063.89	63,512.53	233,140.33	1,109,087.94	675,833,052.40
Net Profit	1,244	416,088.80	1,937,363.99	-2,046,731.22	1,683.70	17,166.10	135,718.83	31,295,850.58

(b) First Filings

	N	Mean	Standard Deviation	Min	25th Pct	Median	75th Pct	Max
Report Year	683	1,928.34	4.08	1,919.00	1,928.00	1,929.00	1,930.00	1,937.00
Firm Age	558	7.14	10.79	-3.00	0.00	3.00	10.00	74.00
Class C Firm	683	0.57	0.49	0.00	0.00	1.00	1.00	1.00
Manufacturing Firm	683	0.41	0.49	0.00	0.00	0.00	1.00	1.00
Financial Services Firm	683	0.22	0.42	0.00	0.00	0.00	0.00	1.00
Total Assets	636	11,339,872.90	55,578,672.72	1,000.00	138,877.90	720,773.94	4,027,096.72	776,957,307.44
Real Estate	638	1,869,303.32	25,982,022.06	0.00	0.00	0.00	167,748.60	639,665,144.30
Machinery and Equipment	638	939,855.82	6,851,573.31	0.00	0.00	5,556.28	120,531.72	117,106,342.10
Intangible Assets	683	268,421.75	2,951,743.48	0.00	0.00	0.00	18,440.38	71,885,749.85
Patents (and Other IP)	683	101,955.35	920,902.95	0.00	0.00	0.00	1.00	22,391,853.64
Goodwill	638	180,479.66	2,903,705.66	0.00	0.00	0.00	0.00	71,885,749.85
Net Worth	638	3,631,894.33	21,316,558.87	-20,189.52	30,000.00	196,721.32	1,144,125.29	445,678,164.08
Net Profit	457	539,157.48	1,989,584.61	-2,046,731.22	7,479.25	50,877.37	362,330.49	31,295,850.58

Notes: Summary statistics for several variables from the sample of firm filings. Panel A reports summary statistics for all firms and all filings. Panel B reports summary statistics for the first filing for all firms. The first column reports the number of observations for which the variable is observed. The remaining columns report the mean, standard deviation, minimum, 25th percentile, median, 75th percentile, and maximum for each variable.

Table 2: Summary Statistics of Patenting Firms in Sample**(a) All Filings**

	N	Mean	Standard Deviation	Min	25th Pct	Median	75th Pct	Max
Report Year	250	1,927.04	5.50	1,919.00	1,922.00	1,928.00	1,930.00	1,948.00
Firm Age	229	9.66	10.11	0.00	2.00	6.00	15.00	50.00
Class C Firm	250	0.58	0.50	0.00	0.00	1.00	1.00	1.00
Manufacturing Firm	250	0.90	0.31	0.00	1.00	1.00	1.00	1.00
Financial Services Firm	250	0.02	0.14	0.00	0.00	0.00	0.00	1.00
Total Assets	244	6,655,773.34	46,033,983.83	14,349.50	190,903.69	783,842.70	1,847,427.92	667,835,123.70
Real Estate	244	1,193,151.69	9,140,574.90	0.00	0.00	14,661.31	283,970.36	132,845,222.20
Machinery and Equipment	244	426,086.56	1,488,527.52	0.00	7,030.72	73,384.61	209,308.09	19,114,929.32
Intangible Assets	250	352,625.89	1,079,252.90	0.00	6,500.00	43,490.54	202,638.90	12,500,000.00
Patents (and Other IP)	250	235,662.79	592,485.29	0.00	1,889.20	24,369.94	154,132.50	4,225,000.00
Goodwill	244	110,505.74	895,816.84	0.00	0.00	0.00	0.00	12,500,000.00
Net Worth	244	4,511,385.09	31,325,405.05	0.00	107,387.94	462,648.67	1,261,337.42	445,678,164.08
Net Profit	198	258,893.51	788,573.06	-2,046,731.22	148.55	36,194.54	178,381.45	6,151,688.63
Number of Identifiable Patent Numbers	250	17.55	46.59	0.00	1.00	3.00	15.00	555.00
Number of Valuations with Patents	250	1.92	3.09	1.00	1.00	1.00	1.00	27.00
Number of Patents per Valuation	250	17.72	44.82	1.00	1.00	3.00	12.50	384.00
Share of Patents with Itemized Valuations	250	0.32	0.44	0.00	0.00	0.00	1.00	1.00
Share of Patents Acquired	250	0.57	0.47	0.00	0.00	1.00	1.00	1.00
Share of Patents Valued at Purchase Price	250	0.22	0.39	0.00	0.00	0.00	0.25	1.00
Share of Patents Valued by Appraisal	250	0.18	0.38	0.00	0.00	0.00	0.00	1.00
Share of Patents Valued at Cost	250	0.21	0.38	0.00	0.00	0.00	0.20	1.00
Share of Patents Valued Nominally	250	0.15	0.35	0.00	0.00	0.00	0.00	1.00
Share of Patents with Unknown Valuation Method	250	0.23	0.42	0.00	0.00	0.00	0.00	1.00

(b) First Filings

	N	Mean	Standard Deviation	Min	25th Pct	Median	75th Pct	Max
Report Year	165	1,926.10	5.26	1,919.00	1,921.00	1,927.00	1,929.00	1,937.00
Firm Age	148	9.07	10.60	0.00	1.00	5.00	14.00	50.00
Class C Firm	165	0.62	0.49	0.00	0.00	1.00	1.00	1.00
Manufacturing Firm	165	0.90	0.30	0.00	1.00	1.00	1.00	1.00
Financial Services Firm	165	0.02	0.13	0.00	0.00	0.00	0.00	1.00
Total Assets	163	9,003,204.46	56,163,473.88	14,349.50	162,774.87	677,060.02	1,963,161.39	667,835,123.70
Real Estate	163	1,381,811.73	10,729,350.62	0.00	0.00	3,500.00	272,799.40	132,845,222.20
Machinery and Equipment	163	518,039.96	1,761,963.38	0.00	5,568.09	51,582.10	248,071.84	19,114,929.32
Intangible Assets	165	413,758.07	1,276,615.98	0.00	6,000.00	37,119.78	220,000.00	12,500,000.00
Patents (and Other IP)	165	250,595.53	637,201.68	0.00	2,141.24	26,627.70	154,700.64	4,225,000.00
Goodwill	163	156,130.83	1,091,507.36	0.00	0.00	0.00	0.00	12,500,000.00
Net Worth	163	5,999,243.79	38,193,744.90	0.00	89,888.04	411,200.00	1,341,477.55	445,678,164.08
Net Profit	126	301,045.63	784,093.47	-2,046,731.22	3,898.88	50,272.47	242,493.44	5,465,739.56
Number of Identifiable Patent Numbers	165	22.41	56.10	0.00	1.00	4.00	18.00	555.00
Number of Valuations with Patents	165	2.16	3.70	1.00	1.00	1.00	2.00	27.00
Number of Patents per Valuation	165	22.58	53.30	1.00	1.50	4.00	16.11	384.00
Share of Patents with Itemized Valuations	165	0.29	0.42	0.00	0.00	0.00	0.67	1.00
Share of Patents Acquired	165	0.64	0.45	0.00	0.00	1.00	1.00	1.00
Share of Patents Valued at Purchase Price	165	0.26	0.42	0.00	0.00	0.00	0.50	1.00
Share of Patents Valued by Appraisal	165	0.22	0.41	0.00	0.00	0.00	0.00	1.00
Share of Patents Valued at Cost	165	0.21	0.38	0.00	0.00	0.00	0.20	1.00
Share of Patents Valued Nominally	165	0.15	0.35	0.00	0.00	0.00	0.00	1.00
Share of Patents with Unknown Valuation Method	165	0.15	0.36	0.00	0.00	0.00	0.00	1.00

Notes: Summary statistics for several variables from the sample of firm filings for the firms that report, including variables related to reported patent valuations. Panel A reports summary statistics for all firms with at least one valuation containing patents and all filings. Panel B reports summary statistics for the first filing for all firms with at least one valuation containing patents. The first column reports the number of observations for which the variable is observed. The remaining columns report the mean, standard deviation, minimum, 25th percentile, median, 75th percentile, and maximum for each variable.

Table 3: Predictors for Whether Itemized Patent Values Are Reported

	(1)	(2)	(3)	(4)	(5)
Firm Age	0.000599 (0.000503)		0.000663 (0.000459)		0.000546 (0.000571)
Missing Firm Age	0.0570 (0.0960)		0.0584 (0.0977)		0.0573 (0.0991)
ln(Num. Previous Patents + 1)	-0.00272 (0.00260)		-0.00280 (0.00247)		-0.00267 (0.00254)
Class C Firm	0.0148 (0.0456)		0.0168 (0.0451)		0.0154 (0.0458)
ln(Total Assets)	-0.0210*** (0.00629)		-0.0211*** (0.00631)		-0.0206*** (0.00637)
Patent Age		0.000831 (0.00118)	-0.000157 (0.00111)		-0.000126 (0.00112)
USPC Subclass Age		0.000541 (0.000439)	0.000739** (0.000353)		0.000759** (0.000345)
Num. Patent Classes		0.00128 (0.00188)	0.00189 (0.00178)		0.00196 (0.00175)
ln(Num. Words)		-0.0101 (0.00751)	-0.00538 (0.00607)		-0.00549 (0.00616)
Use Cents				-0.0138 (0.0207)	0.00295 (0.0234)
End in 0				0.0544 (0.0361)	0.0152 (0.0211)
# Patents	3664	3697	3664	3697	3664
# Firms	142	144	142	144	142
r ²	0.118	0.0867	0.123	0.0966	0.124
Adjusted r ²	0.113	0.0815	0.116	0.0919	0.117
Mean of Dep. Var.	0.0218	0.0289	0.0218	0.0289	0.0218
p-Val of Sig. of Firm Characteristics	0.00283		0.00257		0.00185
p-Val of Sig. of Patent Characteristics		0.283	0.127		0.114
p-Val of Sig. of Portfolio Characteristics				0.293	0.728
Report Year FEs	x	x	x	x	x
USPC Class FEs	x	x	x	x	x
Firm NAICS Code FEs					

Notes: Linear probability model regressions in which the dependent variable is an indicator equal to one if a patent valuation is itemized. All columns contain fixed effects for filing year bins and USPC main classes. Column 1 includes firm-level characteristics and 1-digit NAICS code fixed effects as regressors. Column 2 includes patent-level characteristics as regressors. Column 3 includes firm- and patent-level characteristics as regressors. Column 4 includes portfolio-level characteristics as regressors. Column 5 includes the full set of firm-, patent-, and portfolio-level characteristics as regressors. Standard errors are clustered at the level of the firm and shown in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$

Table 4: Predictors for Whether a Patent Is Acquired

	(1)	(2)	(3)	(4)	(5)
Firm Age	-0.00471 (0.00362)		-0.00483 (0.00366)		-0.00342 (0.00265)
Missing Firm Age	-0.0686 (0.0782)		-0.0644 (0.0752)		0.0328 (0.0837)
ln(Num. Previous Patents + 1)	-0.0394*** (0.00589)		-0.0389*** (0.00585)		-0.0367*** (0.00555)
Class C Firm	-0.199* (0.102)		-0.205** (0.102)		-0.223** (0.103)
ln(Total Assets)	-0.0347* (0.0188)		-0.0343* (0.0192)		-0.0174 (0.0254)
Patent Age		0.00456 (0.00378)	0.00206 (0.00261)		0.00258 (0.00260)
USPC Subclass Age		-0.000787 (0.00110)	-0.00160 (0.000966)		-0.00118 (0.000981)
Num. Patent Classes		0.0113* (0.00650)	0.00473 (0.00403)		0.00550 (0.00400)
ln(Num. Words)		-0.00148 (0.0364)	-0.00134 (0.0298)		0.00191 (0.0253)
Use Cents				0.0192 (0.157)	0.0950 (0.165)
End in 0				0.0782 (0.0917)	0.0904 (0.0729)
ln(Num. Items in Valuation)				-0.159*** (0.0275)	-0.0654 (0.0421)
Have Other Type of Asset in Valuation				0.303*** (0.113)	0.232* (0.127)
N	3664	3697	3664	3697	3664
Num. Firms	142	144	142	144	142
r ²	0.505	0.249	0.509	0.397	0.546
Adjusted r ²	0.502	0.245	0.505	0.394	0.542
Mean of Dep. Var.	0.0218	0.0289	0.0218	0.0289	0.0218
p-Val of Sig. of Firm Characteristics	2.60e-25		2.48e-25		1.43e-16
p-Val of Sig. of Patent Characteristics		0.0513	0.210		0.129
p-Val of Sig. of Portfolio Characteristics				8.76e-08	0.0539
Report Year FEs	x	x	x	x	x
USPC Class FEs	x	x	x	x	x
Firm NAICS Code FEs	x		x		x

Notes: Linear probability model regressions in which the dependent variable is an indicator equal to one if a patent is acquired. All columns contain fixed effects for filing year bins and USPC main classes. Column 1 includes firm-level characteristics and 1-digit NAICS code fixed effects as regressors. Column 2 includes patent-level characteristics as regressors. Column 3 includes firm- and patent-level characteristics as regressors. Column 4 includes portfolio-level characteristics as regressors. Column 5 includes the full set of firm-, patent-, and portfolio-level characteristics as regressors. Standard errors are clustered at the level of the firm and shown in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$

Table 5: Predictors for Whether a Patent Valuation Method Is Reported

	(1)	(2)	(3)	(4)	(5)
Firm Age	-0.0121** (0.00531)		-0.0123** (0.00522)		-0.0105** (0.00505)
Missing Firm Age	0.323*** (0.114)		0.332*** (0.114)		0.343*** (0.125)
ln(Num. Previous Patents + 1)	-0.00528 (0.00764)		-0.00513 (0.00822)		-0.00556 (0.00797)
Class C Firm	0.150 (0.136)		0.136 (0.133)		0.123 (0.126)
ln(Total Assets)	-0.0494 (0.0515)		-0.0471 (0.0506)		-0.000767 (0.0637)
Patent Age		-0.00250 (0.00583)	0.000351 (0.00545)		0.00111 (0.00526)
USPC Subclass Age		-0.00255* (0.00131)	-0.00241** (0.00116)		-0.00276** (0.00110)
Num. Patent Classes		0.00902 (0.0105)	0.00141 (0.00540)		0.00135 (0.00512)
ln(Num. Words)		-0.0293 (0.0307)	-0.0336 (0.0267)		-0.0321 (0.0231)
Use Cents				0.0759 (0.116)	0.110 (0.122)
End in 0				-0.152 (0.160)	-0.102 (0.137)
ln(Num. Items in Valuation)				-0.149*** (0.0508)	-0.0948* (0.0536)
Have Other Type of Asset in Valuation				0.0944 (0.140)	0.0620 (0.0999)
# Patents	3664	3697	3664	3697	3664
# Firms	142	144	142	144	142
r ²	0.447	0.285	0.451	0.399	0.474
Adjusted r ²	0.444	0.281	0.447	0.395	0.470
Mean of Dep. Var.	0.639	0.643	0.639	0.643	0.639
p-Val of Sig. of Firm Characteristics	0.000319		0.000204		0.00202
p-Val of Sig. of Patent Characteristics		0.384	0.166		0.0579
p-Val of Sig. of Portfolio Characteristics				0.0437	0.189
Report Year FEs	x	x	x	x	x
USPC Class FEs	x	x	x	x	x
Firm NAICS Code FEs					

Notes: Linear probability model regressions in which the dependent variable is an indicator equal to one if the firm reports the method by which the patent is valued. All columns contain fixed effects for filing year bins and USPC main classes. Column 1 includes firm-level characteristics and 1-digit NAICS code fixed effects as regressors. Column 2 includes patent-level characteristics as regressors. Column 3 includes firm- and patent-level characteristics as regressors. Column 4 includes portfolio-level characteristics as regressors. Column 5 includes the full set of firm-, patent-, and portfolio-level characteristics as regressors. Standard errors are clustered at the level of the firm and shown in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$

Table 6: Correlations between ln(Patent Importance) and Firm, Patent, and Valuation Characteristics

	(1)	(2)	(3)	(4)	(5)
Firm Age	-0.00111 (0.00103)		-0.000943 (0.00106)		-0.00168* (0.000906)
Missing Firm Age	-0.0459** (0.0230)		-0.0460** (0.0218)		-0.0586** (0.0284)
ln(Num. Previous Patents + 1)	-0.00189 (0.00152)		-0.00163 (0.00144)		-0.00159 (0.00138)
Class C Firm	-0.0155 (0.0253)		-0.0183 (0.0250)		-0.0137 (0.0261)
ln(Total Assets)	0.00992 (0.00625)		0.00865 (0.00621)		-0.00636 (0.00888)
USPC Subclass Age		-0.00202*** (0.000590)	-0.00210*** (0.000598)		-0.00199*** (0.000574)
Num. Patent Classes		0.0104*** (0.00221)	0.00892*** (0.00216)		0.00893*** (0.00216)
ln(Num. Words)		0.00815 (0.0125)	0.00755 (0.0124)		0.00723 (0.0113)
Use Cents				-0.0564* (0.0339)	-0.0527* (0.0286)
End in 0				0.0178 (0.0162)	0.0258 (0.0183)
ln(Num. Items in Valuation)				0.0168** (0.00662)	0.0343*** (0.0115)
Have Other Type of Asset in Valuation				-0.00962 (0.0237)	-0.0407* (0.0235)
# Patents	3662	3695	3662	3695	3662
# Firms	142	144	142	144	142
r ²	0.247	0.257	0.268	0.246	0.288
Adj. r ²	0.242	0.253	0.263	0.242	0.282
Mean of Dep. Var.	0.0509	0.0507	0.0509	0.0507	0.0509
p-Val of Sig. of Firm Characteristics	0.0257		0.0303		0.0296
p-Val of Sig. of Patent Characteristics		0.00000344	0.0000258		0.00000679
p-Val of Sig. of Portfolio Characteristics				0.0156	0.0103
Report Year FEs	x	x	x	x	x
USPC Class FEs	x	x	x	x	x
Firm NAICS Code FEs					

Notes: OLS regressions of logged patent importance using the [Kelly et al. \(2021\)](#) measure of patent importance on firm-, patent-, and portfolio-level characteristics. All columns contain fixed effects for filing year bins and USPC main classes. Column 1 includes the fixed effects and firm-level characteristics and 1-digit NAICS code fixed effects as regressors. Column 2 includes the fixed effects and patent-level characteristics as regressors. Column 3 includes the fixed effects and firm- and patent-level characteristics as regressors. Column 4 includes the fixed effects and portfolio-level characteristics as regressors. Column 5 includes the full set of fixed effects, firm-, patent-, and portfolio-level characteristics as regressors. Standard errors are clustered at the level of the firm and shown in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$

Table 7: Correlations between ln(Patent Importance) and ln(Valuations)**(a) All Patents**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(Valuation)	0.00123 (0.00336)	-0.00112 (0.00353)	-0.00122 (0.00300)	-0.00268 (0.00319)	-0.00125 (0.00303)	-0.00276 (0.00322)	-0.00202 (0.00353)	-0.00287 (0.00357)
# Patents	3697	3695	3695	3662	3695	3662	3695	3662
# Firms	144	144	144	142	144	142	144	142
r ²	0.000541	0.139	0.234	0.248	0.263	0.275	0.247	0.295
Adj. r ²	0.000270	0.136	0.230	0.243	0.259	0.270	0.242	0.289
Mean of Dep. Var.	0.0507	0.0507	0.0507	0.0509	0.0507	0.0509	0.0507	0.0509
Report Year FEs		x	x	x	x	x	x	x
USPC Class FEs			x	x	x	x	x	x
Firm Controls				x		x		x
Patent Controls					x	x		x
Portfolio Controls							x	x

(b) Patents Valued as Portfolio vs Itemized Patent Values

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Valued as Portfolio × ln(Valuation)	0.00122 (0.00346)	-0.00118 (0.00366)	-0.00126 (0.00311)	-0.00274 (0.00329)	-0.00129 (0.00314)	-0.00283 (0.00332)	-0.00222 (0.00365)	-0.00282 (0.00362)
Itemized Value × ln(Valuation)	0.00336 (0.00550)	0.00114 (0.00597)	0.000114 (0.00637)	-0.00317 (0.00782)	0.0000830 (0.00652)	-0.00406 (0.00797)	-0.000424 (0.00635)	-0.00790 (0.00823)
Valued as Portfolio	0.0438* (0.0231)	0.0579*** (0.0204)	0.0581*** (0.0171)	0.0668*** (0.0171)	0.0580*** (0.0168)	0.0672*** (0.0164)	0.0621*** (0.0199)	0.0657*** (0.0195)
Itemized Value	0.0107 (0.0420)	0.0413 (0.0437)	0.0612 (0.0497)	0.104 (0.0634)	0.0682 (0.0510)	0.119* (0.0647)	0.123** (0.0552)	0.207*** (0.0734)
(Itemized - Portfolio Value) × ln(Valuation)	.00214 (.00672)	.00232 (.00756)	.00138 (.00751)	-.000433 (.00872)	.00138 (.00761)	-.00123 (.00884)	.00179 (.00757)	-.00508 (.00929)
# Patents	3697	3695	3695	3662	3695	3662	3695	3662
# Firms	144	144	144	142	144	142	144	142
r ²	0.000834	0.139	0.234	0.249	0.264	0.276	0.250	0.300
Adj. r ²	0.000220	0.136	0.230	0.244	0.259	0.270	0.245	0.294
Partial r ² Valuation	0.000869	0.000727	0.00115	0.00488	0.00118	0.00511	0.00257	0.00426
Partial r ² Itemized	0.00310	0.000691	0.0000229	0.00213	0.000229	0.00401	0.00646	0.0214
Report Year FEs		x	x	x	x	x	x	x
USPC Class FEs			x	x	x	x	x	x
Firm Controls				x		x		x
Patent Controls					x	x		x
Portfolio Controls							x	x

(c) Acquired vs. Internally Generated Patents

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Internally Generated × ln(Valuation)	0.000603 (0.00375)	-0.00134 (0.00383)	-0.00144 (0.00323)	-0.00288 (0.00343)	-0.00145 (0.00328)	-0.00289 (0.00346)	-0.00264 (0.00385)	-0.00307 (0.00380)
Acquired × ln(Valuation)	-0.00675 (0.0117)	-0.00376 (0.00457)	-0.00201 (0.00430)	-0.00370 (0.00504)	-0.00162 (0.00421)	-0.00319 (0.00494)	-0.00422 (0.00408)	-0.00478 (0.00523)
Internally Generated	0.0313 (0.0196)	0.0515** (0.0213)	0.0565*** (0.0178)	0.0656*** (0.0174)	0.0572*** (0.0172)	0.0669*** (0.0164)	0.0571*** (0.0211)	0.0648*** (0.0200)
Acquired	0.154 (0.120)	0.101*** (0.0314)	0.0739*** (0.0266)	0.0841** (0.0340)	0.0689*** (0.0256)	0.0761** (0.0327)	0.111*** (0.0265)	0.0985*** (0.0330)
(Acquired - Internally Generated) × ln(Valuation)	-.00736 (.0119)	-.00243 (.00481)	-.000569 (.00436)	-.000816 (.00467)	-.000168 (.0042)	-.000294 (.00444)	-.00158 (.00431)	-.00171 (.00463)
# Patents	3697	3695	3695	3662	3695	3662	3695	3662
# Firms	144	144	144	142	144	142	144	142
r ²	0.0255	0.143	0.235	0.249	0.264	0.276	0.252	0.296
Adj. r ²	0.0247	0.140	0.231	0.243	0.259	0.270	0.247	0.290
Partial r ² Valuation	0.000181	0.000852	0.00138	0.00500	0.00137	0.00492	0.00328	0.00459
Partial r ² Acquired	0.00714	0.0123	0.00227	0.00193	0.00124	0.000568	0.0196	0.00753
Report Year FEs		x	x	x	x	x	x	x
USPC Class FEs			x	x	x	x	x	x
Firm Controls				x		x		x
Patent Controls					x	x		x
Portfolio Controls							x	x

(d) By Valuation Method

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Purchase Price \times ln(Valuation)	-0.0362* (0.0213)	-0.00307 (0.0115)	-0.000195 (0.00859)	-0.0000960 (0.00916)	0.00258 (0.00765)	0.00215 (0.00797)	-0.00680 (0.00764)	-0.00268 (0.00591)
Appraised \times ln(Valuation)	-0.00285 (0.00735)	-0.00381 (0.00804)	-0.00394 (0.00699)	-0.00764 (0.00763)	-0.00459 (0.00688)	-0.00829 (0.00759)	-0.00662 (0.00781)	-0.0143* (0.00837)
At Cost \times ln(Valuation)	0.00692 (0.0125)	-0.0000188 (0.00771)	-0.00216 (0.00708)	-0.00622 (0.00667)	-0.00282 (0.00714)	-0.00614 (0.00681)	0.00269 (0.00679)	-0.00250 (0.00637)
Nominal \times ln(Valuation)	0.00910*** (0.00193)	0.0109*** (0.00351)	0.01000*** (0.00292)	0.0110*** (0.00317)	0.00891*** (0.00281)	0.00999*** (0.00308)	0.00358 (0.00398)	0.00368 (0.00380)
Unknown \times ln(Valuation)	-0.00461 (0.00755)	-0.00578 (0.00767)	-0.00230 (0.00708)	-0.00107 (0.00607)	-0.00155 (0.00672)	-0.000665 (0.00598)	-0.00316 (0.00685)	-0.00111 (0.00497)
Purchase Price	0.434** (0.203)	0.132 (0.104)	0.0754 (0.0757)	0.0571 (0.0839)	0.0517 (0.0655)	0.0353 (0.0707)	0.154** (0.0672)	0.0958* (0.0525)
Appraised	-0.00313 (0.0534)	0.0183 (0.0547)	0.0157 (0.0456)	0.0347 (0.0469)	0.0190 (0.0445)	0.0381 (0.0474)	0.0356 (0.0544)	0.0877 (0.0594)
At Cost	0.0176 (0.0646)	0.0680 (0.0503)	0.0859* (0.0505)	0.111** (0.0450)	0.0918* (0.0490)	0.111** (0.0437)	0.0747 (0.0467)	0.109*** (0.0422)
Nominal	0.0347* (0.0199)	0.0544** (0.0265)	0.0554** (0.0220)	0.0547** (0.0225)	0.0553*** (0.0209)	0.0560*** (0.0209)	0.0665*** (0.0223)	0.0651*** (0.0205)
Unknown	0.0625 (0.0584)	0.0661 (0.0597)	0.0534 (0.0516)	0.0525 (0.0448)	0.0513 (0.0465)	0.0523 (0.0418)	0.0440 (0.0505)	0.0407 (0.0360)
# Patents	3697	3695	3695	3662	3695	3662	3695	3662
# Firms	144	144	144	142	144	142	144	142
r ²	0.0987	0.176	0.260	0.271	0.286	0.297	0.274	0.316
Adj. r ²	0.0965	0.172	0.254	0.265	0.280	0.290	0.268	0.309
Partial r ² Valuation	0.00213	4.16e-08	0.000653	0.00613	0.00109	0.00573	0.00110	0.00109
Partial r ² Valuation Method	0.0327	0.00778	0.00788	0.00999	0.00772	0.0106	0.0146	0.0164
Report Year FEs		x	x	x	x	x	x	x
USPC Class FEs			x	x	x	x	x	x
Firm Controls				x		x		x
Patent Controls					x	x		x
Portfolio Controls							x	x

Notes: OLS regressions of logged patent importance using the Kelly et al. (2021) measure of patent importance on logged patent valuations. Column 1 contains no fixed effects or other controls. Column 2 contains fixed effects for filing year bins. Column 3 additionally includes fixed effects for USPC main classes. Column 4 includes the fixed effects and firm-level characteristics and 1-digit NAICS code fixed effects as regressors. Column 5 includes the fixed effects and patent-level characteristics as regressors. Column 6 includes the fixed effects and firm- and patent-level characteristics as regressors. Column 7 includes the fixed effects and portfolio-level characteristics as regressors. Column 8 includes the full set of fixed effects, firm-, patent-, and portfolio-level characteristics as regressors. In Panel B, patent valuations are interacted with an indicator for whether the patent valuation is itemized. In Panel C, patent valuations are interacted with an indicator for whether the patent is acquired. In Panel D, patent valuations are interacted with an indicator for each of the five methods of valuing patents: valued at the purchase price, valued via appraisal, valued at cost, valued nominally, or in which the method of valuation is unknown. Standard errors are clustered at the level of the firm and shown in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$

Table 8: First Digit Tests for Financial Variables on Firms' Balance Sheets and Income Statements

(a) Test Comparing Distributions of First Digits to Benford's Law

	N	Sample Mean	Expected Mean	χ^2 Stat	χ^2 p-value
Intangibles (Balance Sheet)	268	2.87	3.44	23.45	0.003
Patents (Balance Sheet)	177	2.92	3.44	9.77	0.281
Total Assets	636	3.45	3.44	6.92	0.545
Machinery and Equipment	387	3.19	3.44	10.55	0.228
Real Estate	259	3.66	3.44	11.37	0.182
Total Capital Stock	582	3.20	3.44	15.47	0.051
Net Worth	540	3.45	3.44	13.42	0.098
Gross Sales	358	3.35	3.44	15.69	0.047
Net Profit	452	3.39	3.44	7.85	0.449

(b) Test for Whether Empirical Distributions of First Digits Are Equal for Selected Pairs of Variables

	χ^2 Stat	χ^2 p-value
Patents (Balance Sheet) vs. Total Assets	5.82	0.667
Patents (Balance Sheet) vs. Machinery and Equipment	2.98	0.936
Patents (Balance Sheet) vs. Real Estate	11.30	0.185

Notes: Panel A reports, for several financial variables reported in firms' balance sheets and income statements, the number of observations for that value, the mean of the distribution of first digits from the observed distribution for that value, the expected mean if the data followed a Benford distribution, the Pearson χ^2 test statistic testing for the equality of the observed and expected distribution of first digits, and the Pearson χ^2 p -value. Panel B reports test statistics and p -values for χ^2 tests for homogeneity that compare the distributions of first digits for pairs of financial variables.

Table 9: Test for Whether Empirical Distributions of First Digits Are Equal for Firms with and without Patents

	Patenting Firms		Non-Patenting Firms		Patenting vs. Non-Patenting	
	N	Mean	N	Mean	χ^2 Stat	χ^2 p-value
Total Assets	160	3.59	476	3.40	7.30	0.505
Machinery and Equipment	142	3.20	245	3.19	2.64	0.955
Real Estate	82	3.67	177	3.66	7.98	0.435
Total Capital Stock	148	3.41	434	3.13	8.30	0.405
Net Worth	146	3.52	394	3.42	5.42	0.712
Gross Sales	119	3.39	239	3.33	3.55	0.896
Net Profit	123	2.89	329	3.57	9.16	0.329

Notes: For non-intangible-related financial variables in firms' balance sheets for firms with and without patents, the test statistics of χ^2 tests for homogeneity of the equality of the observed distributions of first digits between firms with and without patents, and the p -value of the χ^2 test.

Table 10: First Digit Tests for Intangibles Reported in Firms' Schedule 7's

(a) Test Comparing Distributions of First Digits to Benford's Law

	N	Sample Mean	Expected Mean	χ^2 Stat	χ^2 p-value
Intangible Assets	563	3.11	3.44	47.04	0.000
Patents	346	3.08	3.44	20.68	0.008
Goodwill	127	3.09	3.44	19.25	0.014
Other Intangibles	90	3.26	3.44	16.05	0.042
Patents Valued as Portfolio	155	3.02	3.44	7.00	0.537
Itemized Patent Values	191	3.14	3.44	24.02	0.002
Acquired Patents	148	3.16	3.44	12.43	0.133
Internally Generated Patents	198	3.03	3.44	14.89	0.061
Purchase Price Patents	81	3.09	3.44	7.94	0.439
Appraised Patents	137	3.47	3.44	24.25	0.002
At Cost Patents	71	3.01	3.44	3.84	0.872
Nominal Patents	28	1.04	3.44	58.69	0.000
Unknown Method Patents	29	3.38	3.44	10.42	0.237

(b) Test for Whether Empirical Distributions of First Digits Are Equal for Selected Pairs of Variables

	χ^2 Stat	χ^2 p-value
Patents Valued as Portfolio vs. Itemized Patent Values	9.37	0.312
Acquired Patents vs. Internally Generated Patents	6.95	0.542
Appraised Patents vs. Purchase Price Patents	12.91	0.115
At Cost Patents vs. Purchase Price Patents	3.60	0.891
At Cost Patents vs. Appraised Patents	6.58	0.582

Notes: Panel A reports, for several variables related to intangible assets from firms' Schedule 7's, the number of observations for that value, the mean of the distribution of first digits from the observed distribution for that value, the expected mean if the data followed a Benford distribution, the Pearson χ^2 test statistic testing for the equality of the observed and expected distribution of first digits, and the Pearson χ^2 p -value. Panel B reports test statistics and p -values for χ^2 tests for homogeneity that compare the distributions of first digits for pairs of intangible asset-related variables.

Table 11: Last Digit Tests for Financial Variables on Firms' Balance Sheets and Income Statements

(a) Test Comparing Distributions of Last Digits to the Uniform Distribution

	N	Sample Mean	Expected Mean	χ^2 Stat	χ^2 p-value
Intangibles (Balance Sheet)	268	2.75	5.00	52.66	0.000
Patents (Balance Sheet)	177	2.85	5.00	33.83	0.000
Total Assets	636	4.55	5.00	5.76	0.674
Machinery and Equipment	387	4.65	5.00	12.71	0.122
Real Estate	259	3.97	5.00	15.26	0.054
Total Capital Stock	582	1.16	5.00	305.13	0.000
Net Worth	541	4.01	5.00	11.40	0.180
Gross Sales	358	4.86	5.00	5.52	0.701
Net Profit	452	5.05	5.00	11.71	0.165

(b) Test for Whether Empirical Distributions of Last Digits Are Equal for Selected Pairs of Variables

	χ^2 Stat	χ^2 p-value
Patents (Balance Sheet) vs. Total Assets	48.79	0.000
Patents (Balance Sheet) vs. Machinery and Equipment	66.32	0.000
Patents (Balance Sheet) vs. Real Estate	36.83	0.000

Notes: Panel A reports, for several financial variables reported in firms' balance sheets and income statements, the number of observations for that value, the mean of the distribution of last digits from the observed distribution for that value, the expected mean if the data followed a Uniform distribution, the Pearson χ^2 test statistic testing for the equality of the observed and expected distribution of last digits, and the Pearson χ^2 p -value. Panel B reports test statistics and p -values for χ^2 tests for homogeneity that compare the distributions of last digits for pairs of financial variables.

Table 12: Last Digit Tests for Intangibles Reported in Firms' Schedule 7's, Comparing Distribution of Last Digits to the Uniform Distribution

(a) Test Comparing Distributions of Last Digits to the Uniform Distribution

	N	Sample Mean	Expected Mean	χ^2 Stat	χ^2 p-value
Intangible Assets	563	2.02	5.00	159.96	0.000
Patents	346	2.11	5.00	88.38	0.000
Goodwill	127	1.53	5.00	64.32	0.000
Other Intangibles	90	2.36	5.00	24.89	0.002
Patents Valued as Portfolio	155	2.02	5.00	45.69	0.000
Itemized Patent Values	191	2.18	5.00	51.94	0.000
Acquired Patents	148	1.94	5.00	49.71	0.000
Internally Generated Patents	198	2.24	5.00	48.49	0.000
Purchase Price Patents	81	1.98	5.00	27.57	0.001
Appraised Patents	137	2.01	5.00	51.88	0.000
At Cost Patents	71	2.73	5.00	13.87	0.085
Nominal Patents	28	0.96	5.00	166.49	0.000
Unknown Method Patents	29	2.52	5.00	7.20	0.515

(b) Test for Whether Empirical Distributions of Last Digits Are Equal for Selected Pairs of Variables

	χ^2 Stat	χ^2 p-value
Patents Valued as Portfolio vs. Itemized Patent Values	12.51	0.186
Acquired Patents vs. Internally Generated Patents	17.75	0.038
Appraised Patents vs. Purchase Price Patents	14.79	0.097
At Cost Patents vs. Purchase Price Patents	13.44	0.144
At Cost Patents vs. Appraised Patents	14.02	0.122

Notes: Panel A reports, for several intangibles-related variables reported in firms' Schedule 7's, the number of observations for that value, the mean of the distribution of last digits from the observed distribution for that value, the expected mean if the data followed a uniform distribution, the Pearson χ^2 test statistic testing for the equality of the observed and expected distribution of last digits, and the Pearson χ^2 *p*-value. Panel B reports test statistics and *p*-values for χ^2 tests for homogeneity that compare the distributions of last digits for pairs of intangibles-related variables.

Table 13: Share of Assets Valued Imprecisely

(a) Financial Variables in Firms' Balance Sheets and Income Statements

	Use Cents	End in 0	Focal Value
Intangibles (Balance Sheet)	0.716	0.209	0.166
Patents (Balance Sheet)	0.652	0.301	0.268
Total Assets	0.958	0.033	0.005
Machinery and Equipment	0.866	0.124	0.110
Real Estate	0.674	0.300	0.279
Total Capital Stock	0.582	0.395	0.117
Net Worth	0.862	0.131	0.070
Gross Sales	0.979	0.014	0.010
Net Profit	0.976	0.005	0.005

(b) Intangibles in Firms' Schedule 7's

	Use Cents	End in 0	Focal Value
Intangible Assets	0.357	0.474	0.352
Patents	0.373	0.462	0.356
Goodwill	0.315	0.496	0.433
Other Intangibles	0.356	0.489	0.222
Patents Valued as Portfolio	0.409	0.403	0.314
Itemized Patent Values	0.343	0.510	0.389
Acquired Patents	0.365	0.545	0.404
Internally Generated Patents	0.378	0.398	0.318
Purchase Price Patents	0.402	0.512	0.305
Appraised Patents	0.257	0.590	0.431
At Cost Patents	0.662	0.296	0.113
Nominal Patents	0.033	0.200	0.900
Unknown Method Patents	0.500	0.367	0.167

Notes: The share of each type of asset that are valued imprecisely, measured in several different ways. Column 1 reports the share of each asset that report valuations precise down to the cents. Column 2 reports the share of each asset that ends in 0. Column 3 reports the share of each asset that is a focal value (defined as a value for which only the first digit is non-zero). Panel A contains financial variables from firms' balance sheets and income statements. Panel B contains intangible asset-related variables from firms' Schedule 7's.

Table 14: Test for Whether Empirical Distributions of Last Digits Are Equal for Firms with and without Patents

	Patenting Firms		Non-Patenting Firms		Patenting vs. Non-Patenting	
	N	Mean	N	Mean	χ^2 Stat	χ^2 p-value
Total Assets	160	4.66	476	4.51	8.60	0.475
Machinery and Equipment	142	4.67	245	4.64	4.98	0.836
Real Estate	82	4.56	177	3.69	8.56	0.479
Total Capital Stock	148	0.89	434	1.25	5.12	0.824
Net Worth	146	4.35	395	3.89	4.15	0.902
Gross Sales	119	4.97	239	4.80	7.47	0.588
Net Profit	123	4.93	329	5.10	5.39	0.799

Notes: For non-intangible-related financial variables in firms' balance sheets for firms with and without patents, the test statistics of χ^2 tests for homogeneity of the equality of the observed distributions of last digits between firms with and without patents, and the p -value of the χ^2 test.