

## **Institutional Ownership and the Strategic Drafting of Patents**

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# **Institutional Ownership and the Strategic Drafting of Patents**

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## **ABSTRACT**

We examine how institutional investors affect the textual transparency of a firm's patents. Developing arguments on the (dis)advantages of disclosure over time, we hypothesize that institutional ownership promotes transparency in a firm's patents. We posit that this effect is higher among firms subject to incentive misalignments between institutional owners and CEOs, due to CEOs' short-term career concerns and alertness to the strategic advantage of withholding innovation-related information. Using rich information on the textual properties of around 200,000 US patents, we find empirical support for our hypotheses. Collectively, our results suggest that governance mechanisms play a key role not only for the extent of innovation activities but also for how companies craft and disseminate information about such activities.

*Keywords:* Institutional investors; CEOs; Vagueness; Patents; Innovation

## INTRODUCTION

Institutional investors own significant portions of public firms around the world (Bebchuk *et al.*, 2017). The presence of institutional investors in a firm's equity has been shown to promote several processes that can ameliorate agency problems within the firm and thus improve firm performance (McCahery *et al.*, 2016; Field and Lowry, 2009). The beneficial effect of institutional owners appears particularly salient for innovation-related activities such as R&D (Bushee, 1998; Wahal and McConnell, 2000), product development (Kochhar and David, 1996) and patenting (Aghion *et al.*, 2013). A key mechanism through which institutional owners can spur innovation rests on their commonly held long-term incentives, which curb problems of managerial short-termism typically associated with underinvestment in innovation (Zhang and Gimeno, 2016; Cremers *et al.*, 2020).

In this paper, we argue that institutional owners not only affect the *level* of innovation (in its variants, from R&D to patents) but also the way in which a firm crafts and disseminates information about its innovation activities. Specifically, we set to examine for the first time how ownership by institutional investors affects the textual content of a firm's patents, i.e. the vagueness of the language used in drafting the patent documents.<sup>1</sup> Patents embody significant information which contributes to enlarge the stock of cumulated public knowledge and is used by external parties (e.g., analysts, competitors, investors) to evaluate a firm's technology. It is thus important to understand the nexus of incentives that determine how firms craft such relevant information in their patent documents.

Firms rely extensively on the patent system to capture value from their innovative efforts (Teece, 1986; Cockburn *et al.*, 2016). The patent system is set to both provide innovation incentives by granting exclusory rights over intellectual property and, at the same

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<sup>1</sup> We refer to vagueness as “the use of linguistic means to make communication less precise in meaning and impossible to paraphrase precisely” (Channell, 1994; Guo *et al.*, 2017).

time, disseminate knowledge through the publication of patent documents (Hall et al., 2014). Thus, patents provide significant information to a broad set of parties including competing firms, who often monitor available patent datasets to scrutinize the technological moves of rivals (Aristodemou and Tietze, 2018). By crafting a patent document in a *vague* manner, a firm can make its competitors less able to decipher the technological nature of its innovation activities and thus engage in imitation or predatory actions. However, due to a more blurred definition of the underlying technology and its legal boundaries, a vague patent may offer a more fragile legal protection, which may in turn lead to: (1) a greater risk of future litigation, and (2) a lower predictability of the outcome of a lawsuit.<sup>2</sup> Blurred patent claims have indeed been associated with the upsurge of patent lawsuits in recent decades (Bessen and Maurer, 2008). Together, these arguments suggest that, in drafting their patent documents, firms would face an intertemporal tension between using a vague language in order to manage current competitive pressures vis-à-vis using a transparent language in order to achieve a higher legal protection and thus minimize litigation risk in the long run.

Our thesis is that institutional investors play a key role in shaping this tradeoff as they typically influence a firm's information environment (Ajinkya *et al.*, 2005; Bushee and Noe, 2000), change the nature of the agency relationships with corporate executives (McCahery *et al.*, 2016), and ultimately impact on a firm's innovation processes. In particular, we posit that institutional ownership affects patent vagueness as a result of a discrepancy between the time-horizon of institutional investors and that of CEOs (Zhang and Gimeno, 2016). While patent lawsuits are, on average, filed about 10 years after a patent application, CEOs spend around 6 years at a given firm (Jenter and Lewellen, 2015). An opportunistic CEO may thus be able to reap the short-term strategic benefits of patent vagueness while avoiding the private costs of

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<sup>2</sup> An illustrative example is *Nautilus Inc. v. Biosig Instruments Inc.* Biosig had sued Nautilus, its competitor, for allegedly infringing a heart-rate monitor patent granted in 2005. While the District Court and the Court of Appeals for the Federal Circuit found that the patent was valid in favor of Biosig, the Supreme Court on June 2, 2014, ruled unanimously that Biosig's patent was too vague to meet patentability standards.

patent lawsuits (e.g. in terms of reputational damages) that will typically manifest over a longer time-horizon. In contrast, institutional investors often embrace a long-term perspective, and have enough power and incentives to discipline an opportunistic management (Boone and White, 2015; Ajinkya *et al.*, 2005; Pukthuanthong *et al.*, 2017). These arguments suggest that, by constraining CEOs' opportunism and excessive focus on short-term goals, institutional owners promote transparency (i.e. decrease vagueness) in a firm's patents. To validate this mechanism, we explore how CEO characteristics shape the relationship between institutional ownership and patent vagueness.

Several works have argued that founder CEOs exhibit a strong attachment and commitment to their firms, and closely link their personal success with their firms' long-term prospects (Carroll, 1984; Dobrev and Barnett, 2005; Donaldson and Davis, 1991). This intrinsic motivation lengthens the time-horizon of their decision-making (Fahlenbrach, 2009), which in turn implies that the *corrective* effect of institutional ownership on patent vagueness is muted for founder CEOs. Next, we look into CEO's educational background. In particular, we focus on CEOs who have obtained a degree from law schools and argue that, as compared to other educational profiles, a legal background makes CEOs overly confident in their ability to successfully deal with potential legal issues (Goodman-Delahunty *et al.*, 2010) and better able to grasp the legal advantages provided by the strategic drafting of patents. This, in parallel with the above argument that a CEO's time horizon within a given firm is typically shorter than the time-span of a patent lawsuit, will imply that a CEO's legal background may be positively associated with patent vagueness. Institutional owners, in turn, will have stronger incentives to step in to ameliorate the divergence between CEOs and long-term investors' incentives toward patent transparency.

We test our hypotheses on a rich dataset covering around 200,000 patents filed by US listed firms from 1980 to 2006. For each of these patent documents, we use linguistic analysis

to construct a text-based measure of vagueness. We find strong support for our baseline hypothesis that institutional ownership is negatively associated with patent vagueness. This result holds controlling for several characteristics at the patent level, such as citations, claims and the number of figures, which proxy for a patent's quality and its underlying technological complexity, as well as for firm characteristics such as size, profitability, capital, market valuation and industry. To derive a causal interpretation, we use the instrumental variable approach in Aghion *et al.* (2013); the analysis largely confirms that institutional ownership decreases patent vagueness. Then, testing our moderation hypotheses, we find evidence that institutional ownership reduces patent vagueness mostly when the CEO is non-founder and when he/she holds a law degree. Finally, to validate our time-frame argument, we exploit the heterogeneity across institutional investors (e.g. Dharwadkar *et al.*, 2008) and show that institutional ownership will decrease patent vagueness only when the investors have a long-term orientation (i.e. low portfolio turnover).

Collectively, our work expands existing studies on the organizational and strategic implications of institutional investors by showing that they matter not only for the extent of technological activities but also for how companies craft and disseminate information about such activities. Our assessment is thus central to understanding the drafting of patent documents from a strategic perspective. In the discussion section, we will elaborate on how our enquiry is relevant for both regulatory and managerial viewpoints.

## **THEORY AND HYPOTHESES**

Before theorizing about the mechanisms linking institutional ownership to patent vagueness, we elaborate on the role of institutional investors and their impact on corporate actions.

### **Institutional investors and corporate actions**

Institutional investors own a big chunk of outstanding equity of US corporations (Parrino *et al.*, 2003). While there may be some variation in their time horizon, they tend to have significant incentives to orient the firm's top management to focus on shareholder's wealth and long-term interests (Holderness and Sheehan, 1988; Hoskisson *et al.*, 1994). Institutional owners play an active role in the type of strategies and activities that the companies undertake (Gilson and Kraakman, 1991; Smith, 1996) and in shareholders' decision-making processes (Sundaramurthy, 1996). As a result, institutional owners have been shown to influence strategic decisions such as corporate R&D spending (David *et al.*, 2001), CEO compensation (David *et al.*, 1998), strategic turnaround (Filatotchev and Toms, 2006), CSR activities (Dyck *et al.*, 2019), and patents (Aghion *et al.*, 2013). With regard to patent and R&D, which are especially pertinent to our study, the existing literature has shown that there are positive effects of institutional ownership.

Institutional owners have access to information that is typically unavailable to other investors (Gillan and Starks, 2007). This, in parallel with their significant equity holdings and time horizon, makes them well positioned to monitor the management toward safeguarding the firms' long-term interests. There is large evidence that institutional owners discipline top managers trying to ensure that they do not misinform or mislead shareholders (Chung *et al.*, 2002). To ameliorate the concern that executives would engage in short-term opportunistic actions inconsistent with shareholder value creation (Graham *et al.*, 2005), institutional investors often undertake significant "behind the scene" governance interventions (McCahery *et al.*, 2016) and use the threat of liquidating their equity position (McCahery *et al.*, 2016), which disciplines the firm's management by imposing a downward pressure on the firm's stock price (Parrino *et al.*, 2003).

### **Institutional investors and patent vagueness**

The extent to which a firm can reap the benefits of its innovation efforts depends on appropriability mechanisms (Teece, 1986). A large stream of research has emphasized patents as a key appropriability mechanism for innovation (Cockburn, *et al.*, 2016; Galasso and Schankerman, 2015; Somaya, 2012). Patents provide the right to exclude others from using the invention for a limited duration in exchange of disclosing the knowledge behind the invention (Hall *et al.*, 2014). Disclosure is thus a crucial component of the patent system because it sets the foundation for follow-on inventions (Scotchmer, 1991) and informs other innovators to minimize the risk of infringement. At the same time, disclosing information in a patent document may help the rivals of the patenting firm to develop competing innovation projects which may undermine a company's positioning and competitive advantage. This explains why, in many circumstances, innovating firms prefer to protect their innovations through secrecy rather than patents (Kultti *et al.*, 2007; Png, 2017).

As patent-based market intelligence proliferates (Aristodemou and Tietze, 2018), companies are developing strategies to mitigate the downsides of patent disclosure. One such approach is the use of vague language in patent documents in order to minimize the disclosure of information that can be used by rivals.<sup>3</sup> Indeed, such vagueness can make rivals less capable of deciphering the technological nature of a firm's innovation activities thereby limiting their ability to imitate the patented innovation. In addition, vague patent claims help broaden the coverage of the patent, which is another channel through which vague language might keep rivals at bay. Relatedly, it has been shown that – in order to deter new entrants and decrease information spillovers – a firm's management often intentionally manipulates various dimensions of language in their communication (Guo *et al.*, 2017). This is not just a theoretical possibility. According to a patent attorney at a major European company interviewed by one

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<sup>3</sup> Inventors are not those who draft a firm's patents. In large corporations, this is often done by patent attorneys in collaboration with patent engineers (who understand both the technology and the patent system, but do not hold a law degree). Patent attorneys often report to the Business Development unit rather than the R&D unit.



of the authors, “the burden imposed by the legal language is in sharp contrast with the precision of the technical language used by inventors to such an extent that inventors often have a hard time to recognize their own inventions.”<sup>4</sup>

That said, vagueness in patent documents comes at a cost. A more blurred definition of a firm’s technologies and their legal boundaries in patent documents may raise uncertainty about the outcome of potential lawsuits and thus increase both the risk of litigation in court (for supportive evidence, see Choi and Triantis, 2010) and the probability of losing the patent dispute. Along this line, there is significant evidence that firms seek to minimize the risk of litigation by raising the accuracy the information disclosed to the public (Humphery-Jenner *et al.*, 2019). Consistently, our data show that litigated patents display slightly greater vagueness than other patents (see Appendix A).

Choosing the degree of linguistic vagueness in a patent, therefore, entails a tradeoff between the benefits of lower imitation risk vis-à-vis the costs of higher litigation risk. Importantly, these two risks manifest over a different time horizon.<sup>5</sup> Usually, the timing of imitation is a function to the competitive dynamics of an industry and its product lifecycles. Typically, imitation efforts start to kick in as soon as a patent document is published, which occurs 18 months after filing if the patent is not granted before. Imitation likely generates additional competitive pressures that result in lower margins and/or reduced market share, whose effects are amplified by financial markets which are typically short-termed.

To the contrary, litigation concerns arise much later in time and are less likely to be anticipated by analysts and financial markets. For instance, in our data, the average patent lawsuit is filed about 10 years after a firm has applied for a patent (see Figure 1). Despite their

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<sup>4</sup> Phone interview held on May 15<sup>th</sup>, 2020. Name kept anonymous for confidentiality.

<sup>5</sup> If vagueness is pushed to the limit, the patent granting process might fail altogether or be seriously delayed. We provide some evidence of the correlation between patent vagueness and grant delays in Appendix B. This is another risk of patent vagueness that we do not analyze here because it does not affect the intertemporal tradeoff central to our theoretical mechanism.

late occurrence in time, patent litigations represent an important burden for firms. First, the likelihood that a given patent will be involved in litigation is a non-negligible 1-2%, on average (Lerner, 2010), and this figure is plausibly much higher for higher-value patents. Second, the number of patent cases filed in the US has increased significantly from the mid-1980s, which implies that the likelihood of any given firm to be involved in patent litigation has increased as well (Bessen and Meurer, 2005). The median direct costs at the end of patent infringement litigation have been estimated to be between \$1 million and \$6 million.<sup>6</sup> Arguably, the total costs could be much higher. Event studies have shown that a firm's share price decreases by around 2-3% after a lawsuit is announced (Bhagat *et al.*, 1994) and, on average, there is a drop in firm value by \$28.7 million during a lawsuit (Bessen and Meurer, 2012). More in general, allegations of wrongdoing make firms face significant financial losses and reputational damage (Pontikes *et al.*, 2010), difficulties in procuring resources (Weber *et al.*, 2009), and weakening of relationships with suppliers (Jensen, 2006), customers (Jonsson *et al.*, 2009) and employees (Sullivan *et al.*, 2007). Even if the court decision may eventually be favorable, the firm has to incur these losses before the verdict is given.

A natural implication of these arguments is that a decision-maker with a short-term horizon that heavily discounts the future will care more about the risk of imitation and less about the risk of litigation. This, in turn, will tilt his/her preference towards patent vagueness. By contrast, a decision-maker with a long-term horizon will tend to more carefully assess the risk of patent litigation and thereby choose a lower level of patent vagueness. As anticipated, there is significant evidence that executives often engage in short-term actions that are detrimental to long-term value (Graham *et al.*, 2005). For instance, Cremers *et al.* (2020) show that a short-term orientation leads to cuts in long-term investment and increased short-term earnings. In turn, this generates boosts in equity valuations that are, however, reversed over

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<sup>6</sup> American Intellectual Property Law Association (Report of the Economic Survey, 2011).

time. The general discussion on short-termism goes in parallel with recent evidence that the average CEO serves the company for, on average, 5-6 years; short tenures tend to magnify career-concerns making a CEO more attentive toward short-term performance results, rather than toward actions aimed at reducing litigation risks, which would threaten the firm's value in the long-term.<sup>7</sup> By contrast, as argued above, institutional owners tend to have a longer time-horizon. Thus, a greater share of institutional ownership in a firm's equity will curb executives' tendency to exploit the short-term benefits of patent vagueness, and will thus be positively associated with transparency in patent documents.

***Hypothesis 1:*** Institutional ownership is negatively associated with patent vagueness.

### **Founder CEOs**

A rich literature has investigated the effect of CEO traits on firm-level outcomes, such as leverage and investment (Bertrand and Schoar, 2003; Malmendier and Tate, 2005), innovation (Galasso and Simcoe, 2011) and, ultimately, firm performance (Bennedsen *et al.* 2020; Mackey, 2008). We draw from this literature to investigate how CEOs' characteristics interact with institutional investors to shape the intertemporal tradeoff between the risk of imitation and the risk of litigation. In Hypothesis 1, we have argued that because CEOs often prioritize short-term results (Graham *et al.*, 2005) while institutional investors display stronger preferences for long-term outcomes (Bushee, 1998), the latter tend to intervene by influencing top executives to decrease vagueness in their firms' patents.

Of course, not all CEOs are equally short-term oriented, i.e. the time (in)consistency between CEOs' and institutional owners' time horizon may vary. In particular, we posit that

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<sup>7</sup> We envision CEOs putting pressure on the Business Development unit to meet revenue targets and expand the firm's market share. Patent attorneys work closely with the Business Development unit to define the scope of patent claims. Thus, the chain of transmission goes from the CEO to the Head of the Business Development unit to the patent attorneys. Institutional owners may influence this process via a direct influence on the CEO or indirectly via discussions and engagements with board members and other executives.

CEOs who have (co-) founded their firms would feature a longer time orientation as compared to non-founder CEOs. In other words, the mismatch in the time orientation of institutional investors and CEOs may be less severe among firms that are led by their founders. Indeed, founder CEOs tend to identify with their firms, have strong attachment and commitment to the company, and closely link their personal success with that of their firms (Carroll, 1984; Dobrev and Barnett, 2005; Donaldson and Davis, 1991). Relatedly, they have a strong intrinsic motivation to pursue strategies that maximize shareholder value rather than concentrating on short-term or “quiet life” actions (Fahlenbrach, 2009). Since they are in office for much longer than non-founder CEOs (in our data, the tenure of founder CEOs is more than three times longer than that of non-founders, i.e. 17 years on average) and also own more equity than they do (Nelson, 2003), founder CEOs tend to be more sensitive to long-term threats to their firms’ value. All these mechanisms are likely to align the interests of institutional investors with those of founder CEOs. This incentive alignment over long-term outcomes will make institutional investors intervene less intensively in decisions related to information disclosure.

By contrast, non-founder CEOs are expected to behave more consistently with the framework theorized in Hypothesis 1. They will have a higher probability to meet short-term performance targets by cutting long-term investments, demonstrate their success to analysts and other firms, negotiate better contracts within their firms, and even get better job offers from other firms. As non-founder CEOs typically spend a relatively short time-spell in a firm (e.g., Jenter and Lewellen, 2015), they are keen to appropriate their firms’ innovations by disclosing less information, i.e. increasing vagueness, in their patents, which helps keep imitators and rivals at bay (Guo *et al.*, 2017). However, by doing so they expose their firms to future lawsuits which, as argued, increase with the level of vagueness in firms’ patents. In such firms, institutional investors will need to exert a stronger monitoring and governance effort to pressure

the CEO to pursue strategies that increase transparency and, thus, increase shareholder value over the long term.

*Hypothesis 2:* A CEO's non-founder status will positively moderate the negative association between institutional ownership and patent vagueness.

### **Lawyer CEOs**

The literature on top-management teams suggests that the educational background of top executives may significantly influence their firms' outcomes and behaviors (Finkelstein *et al.*, 2009). For instance, CEOs with advanced business degrees implement more energy efficient policies (Amore *et al.*, 2019) and improve firm performance by adopting riskier business models (King *et al.*, 2016) while CEOs with legal degrees decrease voluntary disclosure of information (Lewis *et al.*, 2014). Because both the drafting of patent documents and patent lawsuits are activities that demand strong legal understanding, we focus on CEOs with legal background.

We shall argue that institutional owners will need to exert more aggressively their monitoring and governance role when the CEO has a legal background. First, compared to other CEOs, CEOs with legal background are expected to be more aware of the opportunities provided by the strategic drafting of patent documents to obfuscate key technological information to rivals. Given their legal expertise, they are also more likely to be heard by patent layers who are materially in charge to draft patent documents or influence the top management to whom the patent attorneys respond. In other words, if they like to do so, CEOs with a law degree are more likely to play an active role in shaping the information content of their firms' patents. Second, in addition to the above-mentioned argument that patent litigation occurs, on average, about 10 years after a firm has filed the patent application, which is considerably longer than an average CEO's tenure in a firm, there is empirical evidence suggesting that

individuals with a legal background tend to be highly confident in their ability to reach certain goals in legal disputes (Goodman-Delahunty *et al.*, 2010). A higher confidence in the ability to deal with legal issues makes CEOs with a law degree likely to prioritize the strategic advantage of withholding information over the expected cost of vagueness.<sup>8</sup> As argued, institutional investors would instead value transparency and firms' long-term prospects. These priorities make them intervene more significantly in firms led by CEOs with law background, who may use their expertise to strategically influence the drafting of patents so as to derive personal benefit at the expense of long-term hazards for their firms.

***Hypothesis 3:*** A CEO's legal background will positively moderate the negative association between institutional ownership and patent vagueness.

## DATA AND METHODS

To test our theoretical conjectures, we build a sample by merging data from different sources. First, we start with the universe of US listed companies as reported in COMPUSTAT, which contains comprehensive accounting and financial information. Second, we get information on institutional ownership from Thomson Reuters and complement it by collecting data from Form 13-F, which public firms are required to submit to the SEC, by using the SEC's EDGAR database. Third, for each of these firms we extract patent documents from the USPTO website. We supplement this data with information from the NBER patent dataset (Hall *et al.*, 2001), which contains rich data including a patent's application and grant date, number of claims, technological classes, and citations.

We combine data on patents, institutional ownership, and financial measures by using the matching file provided from the NBER patent dataset (Bessen, 2009). After removing

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<sup>8</sup> We will empirically validate the notion that a CEO's law background is positively associated with litigation hazard.

observations with missing values in our main variables (described below), the final dataset contains 262,524 patents and 2,546 unique US listed firms for the period 1980-2006.<sup>9</sup>

### **Dependent variable**

Our main variable of interest captures the level of linguistic vagueness in a patent document. To operationalize this variable, we use the list of vague expressions developed by Arinas (2012). This study randomly selected 350 US patents and made a list of the vague expressions that occur most frequently in such sample (see Appendix C for details). This approach has been validated and used in other works such as Kim and Valentine (2019) and Amore (2020). Using a Python algorithm, we rely on the above list to identify and count the number of vague expressions in all patents filed by our sample firms. For each of these patents, we divide the number of vague expressions by the total number of words and thus create our dependent variable (*Percentage of Vague Expressions*).<sup>10</sup>

### **Explanatory variables**

Our main explanatory variable is the percentage of shares owned by institutional investors. We aggregate the quarterly data on institutional ownership into yearly data by taking the average of the quarterly data.

To test our second and third hypotheses, we need information at the CEO level. First, we identify if CEOs have (co-)founded the firms where they currently serve as the CEO. Since we are interested in Non-Founder or Professional CEOs, we create a dummy variable set equal to 1 if the CEO is *not* a (co-) founder and zero otherwise. Second, we measure a CEO's legal

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<sup>9</sup> While the NBER patent dataset covers the period 1976-2006, data on institutional investors start in 1980. In some regressions, we further restricted the analysis to the period 1992-2006 because data on CEOs starts in 1992.

<sup>10</sup> We do not claim that patent attorneys intentionally attempt to increase the number of vague expressions, but that this is a consequence of their efforts to make patent claims broader, less precise and thus more difficult to decipher by technological rivals.

background through a dummy variable, which we set to 1 if the CEO has a law degree, and zero otherwise. Data on both CEO education and CEO (co-) founder status come from BoardEx.

### **Control variables**

We include controls at both firm and patent level. At the firm level, we control for profitability (i.e. return on assets, computed as the ratio of earnings before interest and taxes scaled by the book value of total assets), size (natural logarithm of a firm's sales)<sup>11</sup>, investment (computed as ratio of capital expenditures to total assets), capital-to-labor ratio (natural logarithm of property, plants and equipment scaled by employees), and market valuation (market to book ratio). These controls are apt to capture the fact that firms with varying degrees of performance and investment opportunities may have different incentives to file vaguer patents.

At the patent level, we control for a patent's originality, truncation-adjusted patent citations, the number of claims, and the number of figures. For a patent  $i$ , we measure originality as:

$$\text{Originality}_i = 1 - \sum_j^n s_{ij}^2$$

where  $s_{ij}$  is the percentage of the citations that a patent  $i$  makes from a technological class  $j$ ; hence, new patents that cite more patents from a broader range of technological classes will have a higher originality score (Hall *et al.*, 2001). Generally, these controls are useful to alleviate the omitted-factor concern that institutional ownership influences vagueness by affecting a patent's quality (as captured by citations and claims) and originality, as well as its intrinsic technological complexity (which we aim at capturing by means of the number of figures in the patent document).

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<sup>11</sup> Results are unchanged if we measure firm size by the natural logarithm of total assets.



## Empirical analysis

Our baseline hypothesis maintains that institutional ownership will be negatively associated with the use of vague expressions in a firm's patents. We test this prediction by estimating the following model:

$$Y_{i,p,t} = \beta_0 + \beta_1 X_{i,p,t} + \gamma_2 A_{i,t} + \gamma_3 B_{p,t} + \delta_i + \theta_t * \pi_j + \epsilon_{i,p,t} \quad (1)$$

where  $Y$  is the percentage of vague expressions in a patent document, and  $X$  is our main independent variable, i.e. the percentage of institutional ownership. The vector  $A$  contains firm level controls, while the vector  $B$  contains patent level controls. We also add a set of fixed effects to further reduce concerns of omitted factor bias:  $\delta_i$  are firm fixed effects,  $\theta_t$  are year dummies, and  $\pi_t$  industry fixed effects. Including firm fixed effects removes unobserved heterogeneity that is common across firms, while interacting year and 3-digit SIC dummies accounts for industry-time trends. We test our main prediction by using an OLS regression with clustered standard errors at the firm level, which account for serial correlation and heteroskedasticity in the structure of residuals.

## RESULTS

We report the descriptive statistics for our variables of interest in Table 1. Notice that our dataset is at the patent level. As shown, institutional ownership on average amounts to about 40%. An average patent makes 18 claims, includes 6 figures, and about 1.7% of its text is made up of vague expressions. At the CEO-level: 86% of CEOs are non-founders, and about 6% of them have a law degree.

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INSERT TABLE 1 HERE

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In Figure 1, we present filing years and lawsuit years of sued patents, whereas in Figure 2 we compare the distribution of the number of years between patents' filing and lawsuit with the distribution of CEO tenure (in years). Because of data availability, the years in which patent lawsuits are filed range from 2003 to 2016. The figure reports a substantial lag between the filing year of patents and the year in which they are sued, i.e. patent lawsuits are more of a long-term risk for firms. Taken together, these figures provide additional support to the notion that patent lawsuits often do not occur during the tenure of CEOs who were in office when firms applied for those patents.

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INSERT FIGURE 1 HERE

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INSERT FIGURE 2 HERE

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### **Institutional ownership and patent vagueness**

In Table 2, we present the results of OLS regressions that estimate the relationship between patent vagueness and institutional ownership after including firm- and patent- level controls. All models include firm and industry-year fixed effects.

In Column (1), which includes institutional ownership and no controls at the firm and patent levels, we find that institutional ownership has a negative ( $\beta = - 0.0818$ ) and significant ( $p < 0.05$ ) relationship with patent vagueness.

In Column (2), we add the firm-level controls. Here, we find no statistically significant relationship between ROA, capital expenditure, capital-to-labor ratio and market to book ratio, and patent vagueness; however, the relationship between institutional ownership and patent vagueness becomes more negative and statistically significant ( $\beta = - 0.1117$ ,  $p < 0.01$ ).

In Column (3), we further add patent level controls such as number of citations, originality of patent, number of figures, and number of claims. The result obtained suggests that a one percentage point increase in institutional ownership will decrease patent vagueness ( $\beta = -0.1154$  and  $p < 0.01$ ) by 0.12 percentage points (i.e. a 7.3% reduction from the sample mean). Looking at the control variables, we find that larger firms use vaguer expressions in their patents ( $\beta = 0.0286$  and  $p < 0.05$ ). At the patent-level, patents that are more original ( $\beta = 0.0157$  and  $p < 0.10$ ), that make more claims ( $\beta = 0.0025$  and  $p < 0.01$ ) and that receive more citations ( $\beta = 0.0004$  and  $p < 0.01$ ) use vaguer expressions, whereas patents that have a higher number of figures ( $\beta = -0.0022$  and  $p < 0.05$ ) use fewer vague expressions.

Overall, the models in Tables 2 provide support for H1 that as the share of institutional ownership in a firm increases, the level of vagueness in its patents decreases.

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INSERT TABLE 2 HERE  
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#### *Endogeneity of Institutional Ownership*

While the above results hold controlling for an extensive host of variables, endogeneity concerns remain. In particular, it is plausible that institutional ownership correlates with omitted factors which, in turn, are also associated with patent vagueness. Or it may be that causality runs in the opposite direction, i.e. that institutional owners invest more in companies with more transparent patent portfolios.

To increase confidence in the causal interpretation of our results, we employ an instrumental variable approach. Specifically, consistent with research on institutional ownership and outcomes such as corporate innovation, we use a firm's inclusion in the S&P 500 index as an instrumental variable (Aghion *et al.*, 2013). The idea behind this approach is that the inclusion of a firm in the S&P 500 significantly increases institutional ownership in

that firm (due to, e.g., the fact that many funds are trackers of the S&P 500 itself and thus would increase that firm in their portfolio); at the same time, the exclusion restriction is likely satisfied as stocks are added to the S&P because they represent well a certain sector, not because of their expected performance or investment potential.

We estimate a two-stage least squares model based on the following equations:

$$IO_{i,p,t} = \alpha + \tau D_{i,t} + \beta_1 A_{i,t} + \beta_2 B_{p,t} + \delta_i + \theta_t * \pi_j + \epsilon_{i,p,t} \quad (3)$$

$$Y_{i,p,t} = \beta_0 + \beta_1 \widehat{IO}_{i,t} + \beta_2 A_{p,t} + \beta_3 B_{p,t} + \delta_i + \theta_t * \pi_j + \epsilon_{i,p,t} \quad (4)$$

where  $D_{i,t}$  is an indicator variable that is 1 if firm  $i$  is in the S&P 500 index at time  $t$  and 0 otherwise. Notice that, as Aghion *et al.* (2013), we do not include firm fixed effects, which would require within-firm variations in the S&P 500 (which are rare).

The F-statistic of the first-stage regressions is  $F(9, 3061) = 17.80$  with a p-value of 0.000, which alleviates weak-instrument concerns. We report the results of the two stage models in Table 3. In Column (2), i.e. the second stage, the main coefficient confirms that an increase in institutional ownership decreases patent vagueness ( $\beta = -0.8051$ ,  $p < 0.10$ ).<sup>12</sup> Despite a limited statistical precision, this finding yields further support to Hypothesis 1.

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 INSERT TABLE 3 HERE  
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### **CEO attributes, institutional ownership, and patent vagueness**

In Table 4, we report the OLS models that test the moderating effect of CEOs' attributes on the relationship between patent vagueness and institutional ownership. In Column (1), we test our first moderator (Non-Founder CEO). The conditional effect of Non-Founder CEO shows that

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<sup>12</sup> Notice that, contrary to Aghion *et al.* (2013), our unit of analysis is patent-year rather than firm-year. Thus, the instrument triggers a variation in institutional ownership common to all patents of a given firm. Our results are clustered by firm to account for potential correlation in residuals across firms.

when institutional ownership is (close to) zero, patent vagueness is greater when CEOs are not founders ( $\beta = 0.1373$ ,  $p < 0.01$ ). The interaction term indicates that when CEOs are not founders, an increase in institutional ownership would decrease patent vagueness ( $\beta = -0.2681$ ,  $p < 0.01$ ). The conditional effect of institutional ownership suggests that when CEOs are founders, an increase in institutional ownership has no statistically significant effect on patent vagueness.

In Column (2), we test our second moderator: a CEO's law background. The conditional effect of a CEO with a law background shows that when institutional ownership is (close to) zero, patent vagueness is greater when the CEO has a law background ( $\beta = 0.3513$ ,  $p < 0.05$ ). The conditional effect of institutional ownership indicates that an increase in institutional ownership would decrease patent vagueness when the CEO does not have a law background ( $\beta = -0.1519$ ,  $p < 0.05$ ). According to the interaction term, patent vagueness decreases even further with institutional ownership when the CEO has a law background ( $\beta = -0.5775$ ,  $p < 0.01$ ). To sum up, firms led by CEOs who have a law background and have (nearly) zero institutional ownership file more vague patents; however, this differential effect tends to vanish as institutional ownership increases.

We have argued that CEOs with a legal background would incur in higher litigation hazard because of their overconfidence about their ability to resolve legal dispute in their favor and their alertness about the strategic opportunities of patent vagueness to generate short-term benefits. In Appendix D, we confirm this notion by estimating a model in which the dependent variable is a dummy equal to one if the firm has been involved in a patent litigation, and zero otherwise. As shown, the legal background is positively associated with patent litigation. By contrast, other types of education (such as technology-related degrees or MBA) do not have a significant effect on the likelihood of patent litigation.

Collectively, these findings provide empirical support to our hypotheses 2 and 3.

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INSERT TABLE 4 HERE  
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### **Additional analysis on institutional owners' time horizon**

We have painted institutional owners with a broad brush as a homogenous group of investors. However, extant works have shown that there is some heterogeneity in institutional owners' objectives and time horizons (Dharwadkar *et al.*, 2008, Connelly *et al.*, 2010; Hoskisson *et al.*, 2002). Institutional owners can be classified as transient, quasi-indexers, and dedicated depending on their portfolio turnover and diversification (Bushee, 1998). Transient institutional owners are considered short-term oriented, while quasi-indexers and dedicated institutional investors are considered long-term oriented. Transient institutional investors typically trade at a high turnover rate, hold diversified portfolios, and thus prioritize current results rather than long-term results (Bushee, 2001). Most importantly, they may exit the firm before threats to long-term firm value, such as patent lawsuits, affect their investment. Thus, in the case of transient institutional investors, the time horizon misalignment with an opportunistic CEO is likely small, as they both prefer the short term (Dharwadkar *et al.*, 2008). By contrast, dedicated investors and quasi-indexers have long holding periods, and hold concentrated and diversified portfolios. Therefore, these funds tend to counteract the CEO's tendency to meet short-term goals (Bushee, 2001). Because of their long-term orientation, these investors may consider the threats of patent litigation, reputation damage, and sanctions more carefully than other investors do. We explore this heterogeneity to validate the proposed mechanism on the time frame of institutional owners vs. CEOs' decision-making.

We measure short-term institutional ownership as the ratio of shares owned by transient institutional investors to the total outstanding shares of a firm; similarly, we measure long-term institutional ownership as the ratio of shares owned by dedicated investors and quasi-indexers

to the total outstanding shares of a firm (Cremers *et al.*, 2020). Alternatively, we measure the relative presence of long-term oriented vs. short-term oriented investors by creating a dummy variable, *Long-Term IO Majority*, set equal to one if long-term oriented investors own more shares than short-term oriented investors do. In our sample, 13.52% and 31.22% of the shares of the average company are held by short-term and long-term institutional investors, respectively. Consistent with our theory, 91.52% of the observations in our sample are associated with a dominance of long-term institutional owners vs. short-term owners.

In Table 5, we present the results of our investigation of the relationship between the time-horizon of institutional owners and the use of vague expressions in patents. In Column (1) we estimate separately the effects of short-term and long-term orientation of institutional owners on patent vagueness. As shown, patent vagueness decreases when the ownership of institutional owners with a long-term orientation increases ( $\beta = - 0.0683$ ,  $p < 0.05$ ); however, an ownership change of short-term oriented institutional owners is not significantly related with patent vagueness.

In Column (2), we test whether the relationship between institutional ownership and patent vagueness is moderated by the dominance of long-term oriented institutional owners over short-term oriented ones. The coefficient of the interaction between this variable and the share of institutional ownership suggests that when long-term oriented institutional owners own more shares than short-term oriented ones, an increase in institutional ownership decreases patent vagueness ( $\beta = - 0.0962$ ,  $p < 0.01$ ). The conditional effect of institutional ownership when short-term oriented institutional owners own more shares than long-term oriented ones is not statistically different from zero. The conditional effect of long-term oriented institutional owners owning more shares than short-term ones is marginally statistically significant ( $\beta = - 0.0345$ ,  $p < 0.10$ ).

To sum up, the time-horizon of institutional investors changes the effect of institutional ownership on patent vagueness. Patent vagueness decreases by 0.07 units (i.e. a 4.3% reduction from the sample mean) in a firm when the ownership share of long-term oriented institutional owners increases by one unit; however, changes in the ownership share of short-term oriented owners has no effect on patent vagueness. When long-term oriented institutional owners own more shares than short-term oriented ones, a unit increase in the share of institutional ownership decreases patent vagueness by 0.09 units (i.e. a 5.5% reduction from the sample mean).

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INSERT TABLE 5 HERE  
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## CONCLUSION

In this study, we investigated the role played by institutional investors in the strategic drafting of a firm's patent documents. By probing into the textual content of patents, we demonstrated that institutional owners can influence not only the level of firms' innovation activities, as previously analyzed (e.g. Aghion *et al.*, 2013), but also the way in which firms communicate information about such innovation.

Conceptually, we outlined a novel intertemporal tradeoff between the strategic advantages of withdrawing innovation-related information versus the legal advantages of transparency in terms of reduce risk of patent lawsuits, and then articulated a theory about how such tradeoff is affected by the congruence or discrepancy in the time horizon of CEOs and institutional investors. The literature on institutional investors and innovation has extensively investigated the effect of innovation inputs such as R&D (Bushee, 1998) as well as innovation outputs such as patents (Aghion *et al.*, 2013) and product development (Kochhar and David, 1996). To the best of our knowledge, our study is the first to investigate the role of institutional investors in shaping the information content of firms' patents. In this way, we expand existing research on



the nexus between institutional ownership and a firm's information environment (Ajinkya *et al.*, 2005).

Our results indicated a causal relationship between institutional ownership and patent vagueness: an increase in institutional ownership significantly decreases patent vagueness. Moreover, we identified a number of boundary conditions for this relationship. First, certain characteristics of the CEO influence the relationship between institutional investors of a firm and the vagueness of its patents. We demonstrated that institutional investors intervene in innovation outputs and information disclosure when CEOs are non-founders or hold a law background. As such, we contribute to research on managerial styles (Bertrand and Schoar, 2003) and on the role of (long-term) institutional investors in improving governance in firms (McCahery *et al.*, 2016). These findings complement existing works on the two-sided role of institutional owners depending on their portfolio turnover (Bushee, 2001; Dharwadkar *et al.*, 2008).

### **Limitations and future research**

In our inquiry, we have faced a number of limitations, which we wish to mention before concluding.

First, establishing the direction of causality is a tall order. Our instrumental variable approach, which produced marginally significant results, is useful to this end. But it is important to keep in mind that the whole institutional ownership literature is still struggling to find an ideal identification strategy to ascertain causal effects.<sup>13</sup> Second, our study does not account for the role of patent attorneys. We touched upon this issue by considering the legal background of firms' CEOs. Yet, a more direct investigation of the role of patent attorneys, and their dynamics among institutional investors and firms' management, can be a potentially

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<sup>13</sup> We tried using the Russell 1000/2000 discontinuity as an instrument, but our results were generally weak.

interesting extension. Third, we exclusively focus on the textual content of patent documents. While patents are certainly important for many actors from analysts to technology experts, institutional investors and firms can strategically manage communication across multiple other documents such as 10-Ks, letters to shareholders, and conference calls. For example, they may simultaneously increase use of vague language in one or more documents and decrease vague language in other documents. According for these potential substitution (or complementarity) effects across different level of vagueness is a fruitful research avenue. Another useful extension of our work could be to examine the consequences and outcomes of patent vagueness, in terms of e.g. CEO compensation or firm value. Relatedly, an interesting channel of inquiry could be to investigate information spillovers among rivals after a focal firm uses vaguer expressions in its patents.

Finally, we have specifically focused on the long-term costs of patent vagueness, that is, the risk of future litigation. However, another negative consequence of using a vague language in patents is that, on average, patent examiners might spend more time in examining vague patents. This may become more critical in a patent race: firms that file vague patents may risk losing out to firms that file clearer patents. In an explorative analysis, we have found a positive correlation between vagueness and the period during which a patent is under examination (see Appendix E). Moreover, there is also evidence of a negative correlation between institutional ownership and the period during which patents are under examination (Appendix F). On average, firms with higher levels of institutional ownership have a shorter duration between patent application and patent grant dates compared to those with lower levels of institutional ownership. While not in the scope of this study, this tentative finding could be an interesting avenue of future research on the role of institutional investors in the patent process of their firms.

While we leave these questions for future research, we believe that the findings in our study can have implications for multiple parties: for institutional investors seeking to spur their portfolio firms' innovation and align executive incentives toward long term value creation, for rival firms who actively search for information to compete more effectively in the marketplace, and for regulators and policy makers who wrestle around the pros and cons of patents as a mean to protect firms' intellectual property.

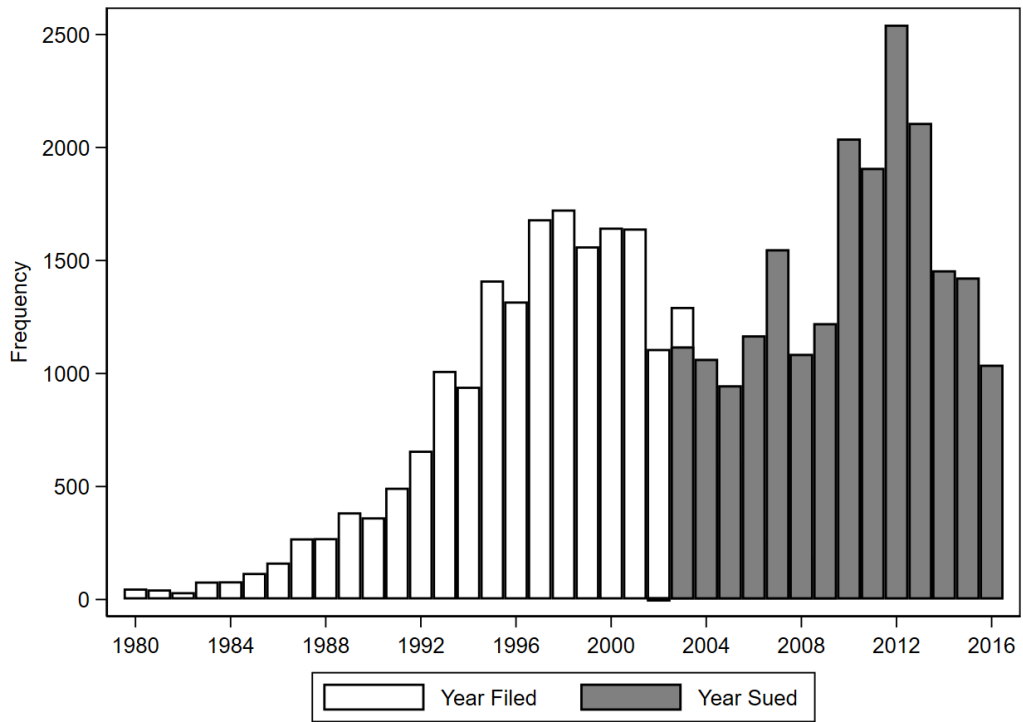
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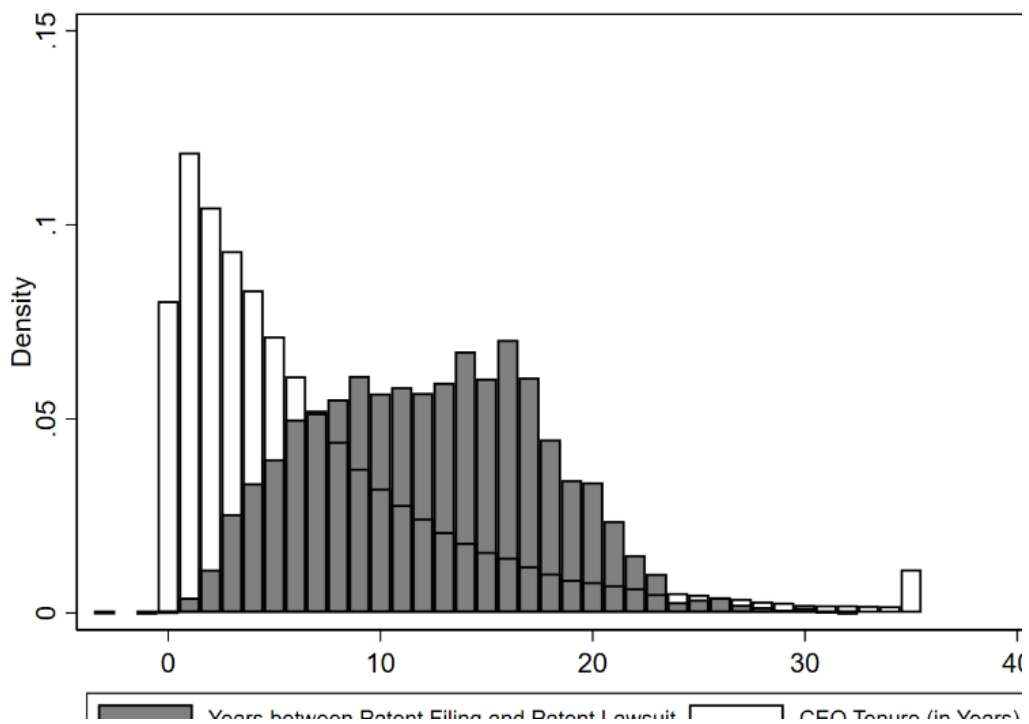
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**Figure 1.** Filing years and lawsuit years of sued patents



**Figure 2.** Time to lawsuit and CEO tenure



**Table 1.** Descriptive Statistics

	N	Mean	SD	P25	Median	P75	P95	Min	Max
Institutional Ownership	261,538	0.55	0.19	0.42	0.57	0.69	0.82	0	1
<i><b>Firm Characteristics</b></i>									
ROA	261,538	0.14	0.14	0.1	0.15	0.2	0.29	-1.37	0.39
Firm Size	261,538	7.89	2.01	6.89	8.23	9.39	10.43	-6.21	12
Capital/Labor	261,538	3.98	0.9	3.32	3.87	4.64	5.56	-6.21	12
Capital Expenditure	261,538	0.07	0.05	0.04	0.06	0.1	0.16	0	0.9
Market to Book Ratio	261,538	4.39	3.58	1.28	3.05	7.85	10	0	10
<i><b>Patent Characteristics</b></i>									
Patent Vagueness	261,538	1.65	0.69	1.19	1.55	1.98	2.86	0	13.63
Number of Citations	261,538	16.61	26.48	1.92	8.6	20.38	60.72	0	712.01
Originality of Patent	261,538	0.53	0.33	0.29	0.61	0.8	1	0	1
Number of Figures	261,538	6.92	6.21	3	6	9	20	0	29
Number of Claims	261,538	18.52	14.89	9	16	23	45	1	868
<i><b>CEO Characteristics</b></i>									
Non-Founder CEO	159,342	0.90	0.30	1	1	1	1	0	1
Law Background CEO	123,148	0.06	0.24	0	0	0	1	0	1



**Table 2.** Institutional Owners and Patent Vagueness

Dependent variable: Patent Vagueness			
	(1)	(2)	(3)
Institutional Ownership	-0.0818** (0.0354)	-0.1117*** (0.0380)	-0.1154*** (0.0380)
ROA		0.0161 (0.0380)	0.0173 (0.0372)
Firm Size		0.0274** (0.0115)	0.0286** (0.0112)
Capital/Labor		0.0031 (0.0169)	0.0038 (0.0169)
Capital Expenditure		-0.0717 (0.0883)	-0.0825 (0.0857)
Market to Book Ratio		0.0023 (0.0018)	0.0021 (0.0018)
Number of Citations			0.0004*** (0.0001)
Originality of Patent			0.0157* (0.0086)
Number of Figures			-0.0022** (0.0010)
Number of Claims			0.0025*** (0.0003)
Firm Fixed Effects	Yes	Yes	Yes
Industry-Year Fixed Effects	Yes	Yes	Yes
Observations	260,525	260,525	260,525
Adjusted $R^2$	0.121	0.121	0.124

Standard errors in parentheses. SE clustered at the firm level. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 3.** 2SLS results

Dependent variable:	Institutional Ownership	Patent Vagueness
	<i>First Stage</i> (1)	<i>Second Stage</i> (2)
Institutional Ownership		-0.8051* (0.4864)
S&P 500 Membership	0.0526** (0.0209)	
Firm Controls	Yes	Yes
Patent Controls	Yes	Yes
Firm Fixed Effects	No	No
Industry-Year Fixed Effects	Yes	Yes
Observations	261,111	261,111

Standard errors in parentheses. SE clustered at the firm level. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 4.** The Moderating Effect of CEO characteristics

Dependent variable: Patent vagueness		
	(1)	(2)
Institutional Ownership	0.0369 (0.0815)	-0.1519** (0.0770)
Non-Founder CEO	0.1373*** (0.0505)	
Non-Founder CEO X Institutional Ownership	-0.2681*** (0.0982)	
Law Background		0.3513** (0.1370)
Law Background X Institutional Ownership		-0.5775*** (0.2058)
Firm Controls	Yes	Yes
Patent Controls	Yes	Yes
Firm Fixed Effects	Yes	Yes
Industry-Year Fixed Effects	Yes	Yes
Observations	159,147	123,026
Adjusted $R^2$	0.097	0.080

Standard errors in parentheses SE clustered at the firm level. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 5.** The Role of Institutional Owners' Time horizon

Dependent variable: Patent vagueness		
	(1)	(2)
Institutional Ownership		-0.0337 (0.0491)
Ownership of Long-Term IO	-0.0683** (0.0341)	
Ownership of Short-Term IO	-0.0501 (0.0474)	
Long-Term Ownership Majority		0.0345* (0.0199)
Long-Term Ownership Majority X Institutional Ownership		-0.0962*** (0.0357)
Firm Controls	Yes	Yes
Patent Controls	Yes	Yes
Firm Fixed Effects	Yes	Yes
Industry-Year Fixed Effects	Yes	Yes
Observations	251,424	256,519
Adjusted $R^2$	0.123	0.123

Standard errors in parentheses. SE clustered at the firm level. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Appendix A. Patent vagueness and Patent lawsuits**

	Mean (Sued = 1)	Mean (Sued = 0)	Diff.	Std. Error	Obs.
Patent Vagueness	1.6831	1.6521	-0.0310***	0.0079	264936

T-test using unequal variances. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Appendix B. Patent Vagueness & Examination Period (in months).**

	(1)	(2)	(3)
Patent Vagueness	0.3687*** (0.1035)	0.3698*** (0.1036)	0.3344*** (0.0986)
Firm Controls	No	Yes	Yes
Patent Controls	No	No	Yes
Firm Fixed Effects	Yes	Yes	Yes
Industry-Year Fixed Effects	Yes	Yes	Yes
Observations	254108	254108	254108
Adjusted $R^2$	0.212	0.212	0.226

Standard errors in parentheses. SE clustered at the firm level. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

### Appendix C. List of vague expressions

Vague category identifiers		
<p>According to +</p> <p>In accordance with +</p> <p>In +</p> <p>It is +</p>	<p>an/the alternate +</p> <p>an/the alternative +</p> <p>an/the +</p> <p>another +</p> <p>one +</p> <p>the above described +</p> <p>a (still) further</p> <p>exemplary +</p> <p>a further +</p> <p>an illustrative +</p> <p>a predetermined +</p> <p>a preferred +</p> <p>an +</p> <p>still/yet another +</p> <p>a broad +</p>	<p>embodiment of the present invention</p> <p>aspect of the present invention</p>
<p>This +</p> <p>The present +</p> <p>The +</p>	<p>invention is not limited +</p>	<p>by</p> <p>in this respect</p> <p>thereto</p>
<p>The present disclosure relates +</p> <p>The present invention relates +</p> <p>This invention is related +</p>	<p>To</p> <p>generally to</p> <p>in general to</p>	
Vague quantities		
<p>between, at least ranging from, preferably, preferred, a plurality of, a ratio of , a set of, a subset of, a member of, a section of, a mixture of, a segment of, portions of, components of, embodiments of</p>		
Lack of interpretation standard		
<p>may be, may also be, can be, can also be, if, substantially, selectively</p>		

Source: Arinas (2012).

### Appendix D. CEO background and risk of patent litigation

Dependent variable: Litigation risk			
	(1)	(2)	(3)
Law CEO	0.1629** (0.0600)		
Tech CEO		-0.0259 (0.0461)	
MBA CEO			-0.0291 (0.0358)
Firm Controls	Yes	Yes	Yes
Patent Controls	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
Industry-Year Fixed Effects	Yes	Yes	Yes
Observations	120410	120410	120410
Adjusted $R^2$	0.333	0.333	0.333

Standard errors in parentheses. SE clustered at the firm level. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

### Appendix E. Patent vagueness and Examination Period (in months)

	Mean (Vague = 1)	Mean (Vague = 0)	Diff.	Std. Error	Obs.
Examination Period	28.2928	26.4001	- 1.8927***	.0551	255,103

T-test using unequal variances. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

### Appendix F. Institutional Ownership and Examination Period (in months)

	Mean (IO = 1)	Mean (IO = 0)	Diff.	Std. Error	Obs.
Examination Period	26.6862	28.0109	1.3248***	.0552	255,103

T-test using unequal variances. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$