Basic vs. Applied Science: The Market Value of Corporate Research in IPOs

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Abstract

This paper investigates the impact of corporate science on the way Initial Public Offering (IPO) investors perceive the innovation potential of firms in Europe. An important issue for SMEs going public is how to signal their value to potential investors. Previous literature has highlighted the value of different measures of firm quality for IPO investors in high-tech firms, such as patents (Useche, 2014), trademarks (Fisch et al., 2022), venture capitalists and strategic alliances (Stuart et al., 1999) and the presence of highly reputed scientist (Higgins et al., 2011), among others signals (Bafera and Kleinert, 2023; Connelly et al., 2011). However, to our knowledge, there is little previous evidence on how corporate science (i.e., basic and applied science) affects IPO performance. We found evidence that corporate science is important to IPO investors, but that the signalling power of scientific publications is a proxy for the signalling value of patent protection. In contrast, we also found that the quality of publications and patents are also important for stock market investors and appear to be complementary for IPO investors in science-intensive sectors.

Keywords: IPO; Corporate Science; Markets signals.

1 Introduction

Scientific knowledge plays a fundamental role in shaping technological progress and firm competitiveness. By codifying discoveries in the form of scientific publications and patents, firms contribute to both basic and applied research, influencing the broader innovation ecosystem(Arora et al., 2022; Nelson, 1959; Partha and David, 1994). While publications reflect engagement in basic science, expanding general knowledge and signaling absorptive capacity, patents capture applied research, bringing discoveries closer to commercialization and market applications (Cohen and Levinthal, 1990; Fleming and Sorenson, 2004). These different forms of corporate science can serve as valuable signals for investors, particularly in high-tech industries where firms often lack traditional financial indicators of success.

In the context of IPO markets, investors face significant uncertainty when assessing the potential of young, high-tech firms (Higgins et al., 2011; Pisano, 2006; Useche, 2014). Given their limited financial track record, these firms must rely on alternative signals to convey their long-term growth prospects. Prior research highlights the role of intellectual property, including patents (Black Arkles et al., 2024; Useche, 2014; Vismara, 2014), trademarks (Fisch et al., 2022), and other knowledge-related indicators (Colombo et al., 2019; Gorry and Useche, 2018; Higgins et al., 2011). However, while patents have been widely recognized as signals of technological strength and commercialization potential, the role of scientific publications remains less understood. Do they provide a credible signal to investors, or does their value depend on their quality and industry context?

This study explores how the quantity and quality of corporate patents and publications shape firm valuation in IPO markets. We examine whether basic and applied research contribute differently to investor decision-making and whether their signaling power varies across industries. By doing so, we shed light on the interplay between corporate science, intellectual property, and financial market dynamics. We focus more precisely on how scientific publication, patents and underling quality can be signals for IPO investors. Even though the influence of scientific publication in the market value of public companies is recognized, their role in IPO valuation remains poorly understood. Arora et al. (2018) and Simeth and Cincera (2016), for example, found evidence that scientific publications are positively associated with stock market valuations. Scientific publications have been found to attract investors to large R&D companies due to the peer review process and the barriers associated with publishing in prestigious scientific journals (Arora et al., 2018; Baruffaldi et al., 2023; Hsu et al., 2021; Pellens and Della Malva, 2018; Simeth and Cincera, 2016) Together, these processes serve as a certification of the quality, originality and scientific integrity of a firm’s research. However, most of the corporate science literature provides no evidence on the value of scientific publications for small and medium-sized enterprises (SMEs), and there is no previous research on their potential value for European stock markets.

For this paper, we built an original database linking data from different sources: (i) the EURIPO database® (managed by Universoft) for IPO information, (ii) scientific publications from Scopus (elsevier), (iii) patent data from the Orbit patent database®. We assembled a sample of 1457 high-tech companies that went public on the major European stock exchanges namely Euronext, Deutsche Börse (Germany), the London Stock Exchange (United Kingdom), and Nasdaq OMX between 2002 and 2015. We focus on European companies going public for three main reasons. First, we examine the role of scientific publications as signals for IPO investors in Europe. Despite the acknowledged influence of scientific publications on the market value of US public companies, their impact on IPO valuation remains poorly understood. Scientific publications have been observed to attract investors to large US public R&D companies because of the peer review process and the prestige associated with publication in prestigious scientific journals (Arora et al., 2018; Baruffaldi et al., 2023; Hsu et al., 2021; Pellens and Della Malva, 2018; Simeth and Cincera, 2016). However, as claimed before, the majority of corporate science literature lacks evidence on the value of scientific publications for small and medium-sized enterprises (SMEs), and there is no previous research on their potential value for European IPO investors. Second, it is often argued that SMEs in high-tech sectors in Europe face challenges in achieving robust growth, hindering their transformation into large, leading innovators, as is more common in the United States (Useche, 2015; Veugelers and Cincera, 2010). This provides a compelling rationale for focusing on European firms during their IPOs. Examining how corporate science attracts investors at this critical stage and helps shape their success trajectories provides valuable insights into overcoming barriers to growth, including financial constraints, and fostering innovation in European high-tech sectors. Third, as knowledge-intensive firms, high-tech firms have much to gain from disclosing their research activities. There is limited evidence on how European firms use their corporate research to generate both private and societal benefits, in particular by enhancing their ’innovation capacity’ and ’absorptive capacity’ (Tijssen, 2004). However, the disclosure of research activities by high-tech companies is crucial (Rotolo et al., 2022). It serves as a powerful signal that influences investors’ perceptions, enhances innovation capacity, contributes to the development of intellectual property, attracts customers and partners, and fosters ongoing links with external scientific networks - factors that collectively influence IPO success and long-term competitiveness.

In examining the relationship between corporate science and firm valuation in IPO markets, our results reveal that patents—representing applied science and technological advancements closer to the final product—serve as a strong and consistent signal to investors. We find a robust and positive relationship between patent count and firm valuation, indicating that firms leveraging applied science attract greater investor confidence. In contrast, publications, which represent basic science and fundamental research, display a more complex relationship with firm valuation. While the quantity of publications tends to have a less consistent effect on valuation, their quality, as indicated by citation counts, serves as a robust signal to investors. This suggests that investors perceive highly cited research as a marker of scientific credibility and long-term potential. Our analysis also reveals a substitution effect between the number of patents and publications, as indicated by a negative and significant interaction term. However, high-quality patents and publications show significant complementarity in science-intensive industries. Together, these findings underscore the complex interplay between basic and applied corporate science, and firm valuation in the IPO market, highlighting the critical role of signaling in shaping investor perceptions.

The outline of this paper is as follows. Section 2 reviews the theoretical background and hypothesis development, focusing on the value of corporate science as market signals for IPO investors (2.1) and the potential complementarity or substitutability between applied and basic research in IPO markets (2.2). Section 3 details the methodology and dataset, with subsections covering independent variables and moderators (3.1), control variables (3.2), and descriptive statistics (3.3). Section 4 presents the econometric results and discussion. Section 5 addresses strategies to deal with endogeneity issues and provides robustness checks. Finally, Section 6 presents the discussion and concluding remarks, including managerial and policy implications, as well as limitations and avenues for future research.

2 Theoretical Background

2.1 Corporate Science as market signals for IPO investors

The relationship between corporate science and firm performance and innovation has been thoroughly explored in prior literature. Past research has shown that technology companies with a strong focus on R&D harness scientific and technical knowledge to create both incremental and groundbreaking technological innovations (Tijssen, 2004). Moreover, corporate research has been shown to generate both private and social benefits by enhancing a firm’s "innovation capabilities" and their "absorptive capacity" (Cockburn and Henderson, 1998; Cohen and Levinthal, 1990; Gambardella, 1992; Tijssen, 2004). Investment in scientific research and publications helps to identify and develop promising new inventions within a firm’s research workforce. Such investment also enhances the firm’s reputation, supports intellectual property (IP) and commercialisation strategies, facilitates the assimilation and adaptation of external knowledge and technology, and enables ongoing links with external scientific networks (Arora et al., 2018; Henderson and Cockburn, 1994; Rosenberg, 1990; Rotolo et al., 2022; Simeth and Raffo, 2013). Blind et al. (2022) also suggest that the publication of scientific results plays a role in protecting a firm’s freedom to operate by acting as a deterrent to competitors trying to secure patents in the same technological field

Patents, in contrast, are increasingly seen as strategic assets for signaling a firm’s value to potential investors (Heeley et al., 2007; Higgins et al., 2011; Useche, 2014) and for assessing the economic and private value of scientific research and new inventions (Hall et al., 2005; Kogan et al., 2017; Nicholas, 2008). As legal rights, patents provide the patent holder with exclusivity over a protected technology, which increases the potential for profits in downstream markets. Patents signal not only technological leadership but also the potential for market dominance and high future returns. This makes them important indicators of a firm’s future profitability and innovation trajectory. Patents are observable indicators of a company’s R&D activities, demonstrating a commitment to innovation and the ability to create protectable intellectual property. By securing patents, firms communicate to investors that they possess unique technologies or processes, which could potentially strengthen their market position and provide a competitive advantage in their industry. Moreover, the size and scope of a firm’s patent portfolio can reveal the breadth of its research efforts, as well as its strategic focus on securing dominant positions in competitive markets.

Importantly, patents also function as a form of certification. Previous literature argue that the patent office serves as a ’certification component’ of the research. The examination process carried out by the patent office is deliberately designed to provide certification by rejecting inventions that do not meet the necessary standards for patentability. The patent offices act as a mediators, enhancing the credibility and clarity of the information conveyed by patents (Hsu and Ziedonis, 2008; Long, 2002; Useche, 2014)

Previous research has also demonstrated that scientific publications, particularly those from large, publicly traded companies with significant R&D investments, can attract the attention of stock market investors (Arora et al., 2018; Pellens and Della Malva, 2018; Simeth and Cincera, 2016). However, there is limited evidence on the role of corporate scientific publications as signals for IPO investors, highlighting a gap in the literature that warrants further exploration. Similar to large companies, corporate publications can signal the quality of a firm’s R&D activities to IPO investors. According to Baruffaldi et al. (2023) the peer review process and the barriers to publishing in prestigious scientific journals make these publications effective in drawing investor interest. These mechanisms serve as a certification of the quality, originality, and scientific integrity of a firm's research, enhancing its credibility and appeal to IPO investors.

In conclusion, the existence of certification mechanisms, which can be observed both in the peer review process of scientific journals and in the patent examination process at the patent office, plays a role in enhancing the credibility and reliability of signals that convey the quality and value of a firm's scientific publications and patents.

Building on these arguments, we hypothesize that:

H1: Corporate scientific publications (basic science) are signals for IPO investors.

H2: Corporate patents (applied science) are signals for IPO investors.

In addition to the quantity of corporate scientific output, the quality of research may serve as a critical signal to potential investors during a firm's Initial Public Offering (IPO). While previous studies have emphasized the signaling role of patents as indicators of innovative capacity (Useche, 2014; Fisch et al., 2022), the depth and impact of this research, as captured by forward citations, can provide more nuanced information about the firm's long-term potential and technological leadership. The literature has shown that publication quality is judged primarily within the scientific community based on the rigor of the research, the novelty of the findings, and the impact of the publication as reflected in citation counts by other academic works. Influential publications are typically recognized within their epistemic community for their contributions to knowledge rather than their direct applicability in the market (Gittelman and Kogut, 2003).

Basic research, often characterized by its exploratory nature and contribution to fundamental scientific knowledge, may not have immediate commercial applications but plays a crucial role in establishing a company's scientific credibility. Forward citations to company publications reflect the recognition and influence of the company's research within the scientific community. A high number of forward citations suggests that the company's basic research is not only novel but also valuable to other researchers, potentially indicating robust intellectual capabilities and a strong pipeline for future innovation. Recent research by Arts et al. (2025) finds that publications introducing novel scientific ideas tend to attract more citations over time, reflecting their influence and relevance within the scientific community. This pattern aligns with the identification of high-impact publications, as these works are more frequently referenced in subsequent research, shaping future scientific directions. High quality publications can signal several positive attributes to potential IPO investors and convey several positive attributes about the company: scientific credibility and serious research through rigorous peer-reviewed work, which enhances the company's reputation; high quality publications can also suggest a commitment to cutting-edge research and novel scientific ideas. High-quality publications can also demonstrate the expertise of the research team, the attractiveness of the company for partnerships through established networks in academia, and the viability for future exits through acquisitions or partnerships. Together, these elements underscore the company's growth potential and long-term investment attractiveness.

H3: The quality of basic research is a signal for IPO.

While high publication quality suggests that the company is engaged in cutting-edge research, it may not provide the same immediate assurance of profitability or competitive positioning that strong patent quality can deliver. Thus, investors may view patents as a more direct indicator of market success than publications. Applied research focuses on translating scientific knowledge into practical applications, often resulting in patents that protect proprietary technologies.

However, patent quality is highly heterogeneous, with some patents representing groundbreaking innovations while others have limited technological or commercial relevance (Higham et al., 2021). Among patent indicators, forward citations serve as a widely recognized measure of technological significance and commercial potential (Arts et al., 2025; Hall et al., 2005; Trajtenberg, 1990). Patents that are frequently cited by subsequent patents suggest that the firm's innovations are foundational for further technological advancements, possibly influencing entire industries. For IPO investors, highly cited patents can signal that the firm holds valuable intellectual property that can generate competitive advantages, revenue through licensing, or market leadership in key technological domains. This enhances investor confidence in the firm's ability to monetize its innovations and achieve sustainable financial performance post-IPO.

H4: The quality of applied science is a signal for IPO investors.

2.2 Are applied and basic research complements or substitute for IPO markets?

Previous literature has shown that the simultaneous capacity of the firm to publish and patent may create synergies in terms of market valuation (Gittelman and Kogut, 2003; Hsu et al., 2021; Huang and Murray, 2009). Hsu et al. (2021) found that the positive relation between Chinese firms' academic publication and stock market valuations is more pronounced when these firms have stronger patent records. Hsu et al. (2021) suggest that the conjunction between corporate publications and patents might lead to a positive synergy in market valuation for three main reasons: First, the combined capacity of publishing and patenting at the inventor level might increase firm's employees reputation as well as the quality and influence of their research. Second, companies with a more robust track record in publishing may possess higher-quality human resources for effectively bringing their technologies to the market. Third, technologies that are patented and based on fundamental scientific principles are harder for others to replicate, making them a potential basis for competitive advantage.

H5a: Corporate basic research and applied research act as complements for IPO investors

H5b: The quality of corporate basic research and applied research act as complements for IPO investors

However, previous literature also suggests that corporate publications and patents may be substitutable signals for potential investors. On the one hand, the positive synergies mentioned above may be reduced or even cancelled out by potential conflicts, as highlighted by Blind et al. (2022). The combination of publication and patenting may give rise to conflicts, particularly in relation to specific technologies or inventions. This is because the publication of specific scientific findings contributes to the existing body of prior art, thereby reducing the likelihood of successful patent applications within the scope of the publication. On the other hand, patents and scientific publications can be substitutes for IPO investors because they both serve as signals of a company's innovation and technological capabilities. For example, patents represent the protection of intellectual property and often indicate that the company has developed valuable technology. Scientific publications, on the other hand, demonstrate the company's willingness to share knowledge and findings with the scientific community. In both cases, they are substitutable signals of innovative capacity. We therefore hypothesise that:

H6a: Corporate basic research and applied research act as substitutes for IPO investors.

H6b: The quality of corporate basic research and applied research act as substitutes for IPO investors

In the analysis of the value corporate science as a signal for IPO investors, it is useful to take into account the differences that can arise across industries. Through an examination of the relative risks in each sector when it comes to knowledge spillovers, Simeth and Cincera (2016) explains how the value of corporate science for stock market investors differs across sectors. They find that scientific publications are associated with positive returns in science-based sectors such as the instruments sectors, and to some extent also in pharmaceutical and biotechnology sectors. However, they find a negative but nonsignificant tendency in the information and communication technology (ICT) sectors. The authors suggest that this may be due to the higher risk of knowledge spillovers in the ICT sector, which may reduce the value of scientific publications for firms in this sector. In this context, we claim any potential complementarity between *basic research and applied research should be stronger for more* science-based sectors.

3. Dataset description

3.1 Independent variable and moderators

To construct our dataset, we identify firms that completed an initial public offering (IPO) in Europe between 2002 and 2015, focusing on stock exchanges in the region's largest economies from EURIPO database, which provides detailed prospectuses and firm-level data on European IPOs (Vismara et al., 2012). The final sample includes 1,457 IPOs listed on key European markets[1], namely Euronext (which at the time unified the Belgian, Dutch, French, and Portuguese stock exchanges), Deutsche Börse (Germany), the London Stock Exchange (United Kingdom), and Nasdaq OMX (which then incorporated the stock exchanges of Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, and Sweden). We also include firms listed on the national stock exchanges of Austria, Cyprus, the Czech Republic, Greece, Hungary, Ireland, Italy, Luxembourg, Malta, Poland, Slovakia, Slovenia, and Spain.

IPO data was manually linked to scientific publications from the Scopus database and patent data from the Questel Orbit Intelligence patent database. To ensure data accuracy and consistency, we applied a rigorous cleaning process, which resulted in the removal of 53 companies from the original EURIPO dataset. Following established procedures for mitigating name-based matching errors (see Simeth and Cincera, 2016), we standardized firm names by correcting misspellings and

[1] In line with prior studies (e.g., Ritter, 1991), the EURIPO database exclude cases where firms were admitted to trading without issuing new equity, as well as re-admissions, cross-listings, and IPOs by investment entities.

removing corporate structure abbreviations (e.g., “Plc.”) to enhance the accuracy of publication and patent data linkage. Firms with ambiguous names that could not be reliably linked to their respective records were either excluded from the sample or subjected to additional manual verification.

To construct our dependent variable, we follow the literature and use the Tobin's Q is defined as the ratio of the market value of assets to the book value of assets on the day of the IPO. Specifically, the market value is calculated as the sum of the book value of assets and the market value of common stock minus its book value. Tobin's Q is regarded as an important measure of firm valuation.

3.2 Independent variable and moderators

The main independent variables in the study are: (1) the total stock of patent applications with a 'priority date' at the time of the IPO, referred to as "# Patents," and (2) the total stock of publications in which at least one author is an employee of the focal firm, referred to as "# Publications." Both variables are measured over the five years preceding the IPO to capture the most up-to-date information available at the time of the IPO.

In addition, we account for the quality of the patent and publication stocks in the five years preceding the IPO. Quality indicators are constructed using forward citations per document, which measure the average number of forward citations. These indicators are referred to as "Patent Quality (Av. Citations)" and "Science Quality (Av. Citations)," respectively.

3.3 Control variables

To minimize the risk of alternative explanations and reduce potential confounding effects, we include a comprehensive set of control variables. Firm size is controlled using a log-transformed variable of total assets in the year prior to the IPO, adjusted for inflation. Age at IPO is measured as the difference between the firm's legal incorporation date and the effective IPO date, with a log transformation applied for scale normalization. Relative Offer Size is defined as the proportion of shares offered in an IPO relative to the total number of shares outstanding before the IPO. This variable helps assess the dilution effect on existing shareholders. Leverage is measured as the ratio of a firm's total debt to its total assets. It reflects the extent to which a firm relies on borrowed funds to finance its operations and growth, providing insight into its financial risk.

Secondary Ratio represents the percentage of the total offer consisting of shares sold by existing shareholders rather than newly issued shares. This variable helps capture the balance between existing stakeholder interests and the introduction of new equity during the IPO process. Finally, we control for IPO year, industry segment, and stock market effects to account for broader macroeconomic and industry-specific factors that may influence IPO outcomes.

3.4 Descriptive statistics

Tables 1 and 2 presents the descriptive statistics of our main variables. Table 1 presents descriptive statistics for the key variables, with Tobin's Q as the dependent variable and measures of scientific publications and patents as the main independent variables. The average Tobin's Q is 4.68 (std. dev. 3.49), ranging from 0.00296 to 10, indicating substantial variation in firm valuation among the 1,457 IPO firms. Firms exhibit significant heterogeneity in research and patenting activity: the average number of scientific publications is 2.48 (std. dev. 17.72, max 377), and the average number of patents is 4.33 (std. dev. 25.58, max 627), suggesting that while most firms engage minimally in these activities, a few are highly research-intensive. Log-transformed values (log +1) reduce skewness, yielding mean values of 0.31 for publications and 0.56 for patents. Patenting is more prevalent than publishing, with 29.3% of firms holding at least one patent compared to 17.4% with at least one publication. Citation-based quality measures show that the average number of citations per patent is 0.64 (std. dev. 2.83, max 62), while the average number of citations per publication is 0.34 (std. dev. 1.37, max 24.96), indicating that while some firms produce highly cited work, most have a lower citation impact. Control variables reveal a wide dispersion in firm characteristics. The average firm age at IPO is 9.34 years (std. dev. 9.20, max 29), total assets average 15.52 million euros (std. dev. 3.10, max 24.23), and relative offer size (IPO proceeds relative to firm value) averages 0.47 (range: 0.12–1.05). Leverage averages 29.94% (range: 0%–87.06%), highlighting diverse financing structures. The secondary ratio, which measures the proportion of shares sold by existing shareholders, averages 0.24 (std. dev. 0.35, max 1), suggesting varying degrees of ownership retention at IPO.

- Please insert Table 1 about here –

Table 2 presents the average number of scientific publications and patent applications across industrial sectors, highlighting significant sectoral differences in firms' engagement with research and intellectual property protection. Health Care stands out as a science-intensive sector, with the highest average number of publications (7.97) and a relatively high patent count (7.75), reflecting its strong reliance on research and innovation, particularly in pharmaceuticals and biotechnology. Utilities, with an exceptionally high average number of publications (48.31) but a modest patent count (2.59), suggests extensive engagement in scientific research, particularly in energy and environmental studies. This pattern may be driven by publicly supported firms such as EDF and Gaz de France, which have strong publication records but rely less on patenting. Industrials and Technology emerge as patent-intensive sectors, with Industrials demonstrating strong patent activity (9.27) alongside a moderate number of publications (3.29), consistent with the manufacturing and engineering industries' emphasis on innovation. Similarly, Technology exhibits a relatively high patent count (4.79) but a lower number of publications (1.12), suggesting a stronger focus on proprietary technological advancements rather than open scientific dissemination. Consumer Goods shows a relatively balanced mix of publications (3.70) and patents (3.08), indicating active engagement in both research and intellectual property protection. In contrast, Consumer Services, Telecommunications, and Financials report relatively low levels of both publications and patents, suggesting that these sectors may rely less on formalized R&D outputs or capture innovation through alternative means such as trade secrets or business model innovations. Overall, the sectoral differences underscore the varying roles of scientific research and patenting across industries, reflecting distinct innovation strategies and intellectual property practices. Table 3 display the correlations between the key variables. The table shows that several variables are correlated at statistically significant levels but none of them suggest that multicollinearity may be an issue, as the majority of the coefficients are below the threshold of 0.7.

- *Please insert Table 2 about here* –

- *Please insert Table 3 about here* –

Figure 1 presents the average number of scientific publications and patents produced in the five years preceding the IPO. The data reveal notable fluctuations in both indicators over time, yet a clear upward trend is evident. Notably, the increase in the average number of patents is particularly pronounced, suggesting that firms intensify their focus on applied innovation as they approach the public market. While the trend for publications is also positive, its slope is less steep than that of patents, indicating a relatively stronger emphasis on proprietary technological advancements in the lead-up to an IPO. These findings imply that European firms strategically leverage their intellectual property portfolios—particularly patents—to enhance their appeal to investors and improve their IPO prospects.

Figure 2 illustrates the trends in average citations per publication and per patent over the five years preceding an IPO for European firms from 2002 to 2015. A sharp divergence emerges in 2008, with the average number of citations per publication peaking at 1.60, while patent citations decline to 0.08. Despite fluctuations, the overall trend suggests a gradual increase in the predicted quality of publications, whereas the predicted quality of patents exhibits a slight downward trajectory over time. These patterns may reflect shifting priorities in firms' innovation strategies, where academic knowledge production gains prominence, while patenting activity faces potential declines in impact or perceived value.

- *Please insert Figure 1 about here* –

- *Please insert Figure 2 about here* –

4 Results and discussion

Table 4 presents the results of OLS regressions estimating the effect of scientific publications and patents on Tobin's Q, controlling for firm characteristics and including multiple fixed effects (industry, year, and stock market). The first three columns (I–III) report OLS estimates, whereas the last three columns (IV–VI) present results obtained through the limited-information maximum likelihood (LIML) approach[2]. The results highlight a significant positive relationship between patents and firm valuation. The log-transformed patent count is strongly associated with Tobin's Q across all specifications where it is included (Columns II, III, V, VI) supporting our argument that applied research measured through patents is a signal for IPO investors (H2). The coefficient remains robust and significant, with estimates ranging from 0.431 ($p < .01$) in Column II to 0.539 ($p < .05$) in Column VI, suggesting that a higher patent count is consistently linked to higher firm valuation. Conversely, the effect of scientific publications on Tobin's Q appears inconsistent. In Column I, the coefficient for publications (log-transformed) is positive and significant (0.196, $p < .05$), suggesting a potential positive relationship between scientific output and firm valuation. However, once the number of patents is accounted for in Column III, the effect of publications becomes statistically insignificant, indicating that patents may play a more dominant role in signaling value to investors. Moreover, in the LIML specifications (Columns IV and VI)[3], the coefficient turns negative, though remains insignificant, further suggesting that the relationship between publications and firm valuation lacks robustness across model specifications. Given these results, we find no consistent evidence that corporate scientific publications serve as a reliable signal for IPO investors. Therefore, we reject H1, as the findings do not support the hypothesis that basic science significantly influences firm valuation in the presence of patents.

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[2] We employ an IV strategy through LIML estimation to address potential endogeneity problems that may arise due to simultaneity or unobserved factors influencing both scientific efforts and firm valuation. Specifically, factors such as unmeasured firm characteristics or management decisions could simultaneously affect both the number of scientific publications/patents and the firm's IPO valuation. To address this concern, we use Limited Information Maximum Likelihood (LIML) estimations, considering sector-specific patent applications, publications, and firms' experience in conducting scientific research as instruments. These instruments are crucial because they provide a source of variation in scientific efforts that is independent of the firm's valuation process, thereby mitigating the risk of biased estimates in the presence of endogeneity.

[3] The IV diagnostic tests suggest that the instruments used in the models are valid and strong. The Hansen J-statistic p-values (0.7153, 0.217, and 0.9662) are all above conventional significance thresholds, indicating that the overidentifying restrictions are not rejected and that the instruments are likely exogenous. The Cragg-Donald Wald F-statistics (895.508, 130.481, and 53.931) are substantially higher than common critical values (e.g., Stock-Yogo thresholds), suggesting that weak instruments are unlikely to be a concern. Additionally, the Kleibergen-Paap rk LM statistics are highly significant (p-values = 0.0000), confirming that the models are not underidentified. Lastly, the Durbin-Wu-Hausman tests yield high p-values (0.5178, 0.7399, and 0.8946), suggesting no significant endogeneity concerns, implying that OLS estimates may be consistent.

- Please insert Table 4 about here –

The findings in Table 5 illustrate the impact of science and patent quality on Tobin's Q, estimated using both OLS and LIML methodologies. Firm characteristics and multiple fixed effects (industry, year, and stock market) are included as controls. Specifically, Columns VII–IX report OLS estimates, while Columns X–XII use the limited-information maximum likelihood (LIML) approach. The results reveal a significant positive relationship between science quality (measured by average citations of scientific publications) and firm valuation. In Columns VII and IX, the coefficient for science quality is positive and significant (0.147, $p < .01$ in Column VII and 0.141, $p < .01$ in Column IX), supporting the hypothesis that higher-quality scientific output signals value to IPO investors (H3). In Column X, when considering LIML estimations, the coefficient remains positive (0.185) but is not statistically significant. The Durbin-Wu-Hausman test for Model X, with a high p-value of 0.8067, suggests no significant endogeneity, implying that OLS estimates may be consistent in this case. We then proceed to validate H3.

For patent quality (measured by average citations of patents at IPO), a significant positive relationship with Tobin's Q is found in all models, with the strongest result in Column XII (coefficient = 0.379, $p < .05$). This suggests that patents with higher citations are viewed more favorably by IPO investors, supporting our hypothesis that patent quality serves as an important signal for firm valuation (H4). When considering potential endogeneity for Models XI and XII, the p-values are significantly lower (0.0013 and 0.0482), indicating that endogeneity is a concern. These results justify the use of the IV estimation approach for these models. While the instruments appear valid (as indicated by diagnostic tests), IV estimation becomes particularly critical in Models XI and XII, where endogeneity is present, ensuring more reliable and unbiased estimates in favor of H4.

- Please insert Table 5 about here –

In Table 6, we examine the relationships between corporate basic research (publications) and applied research (patents), testing for complementarity and substitution effects. The results reveal a clear substitution effect between the quantity of publications and patents, with a negative coefficient for the interaction term (# publications × # patents), suggesting that higher levels of one type of research output are associated with lower levels of the other, which rejects H5a and supports H6a. This result holds across all specifications. In contrast, the relationship between the quality of publications and patents, however, is more complex. In Model XVIII, the interaction between the quality of patents (measured by average citations) and the quality of publications (also measured by citations) is positive, albeit weakly statistically significant for the average IPO company. Following the literature, we then test for potential complementarity between high-quality basic and applied research in science-intensive industries[4]. As shown in Table 7, these sectors, characterized by above-average publication output, may benefit from the synergy between the two types of research, with high-quality scientific contributions in both areas reinforcing firm valuation, which support H5b and rejects H6b. These findings highlight the nuanced relationship between basic and applied research, depending on the context and sectoral characteristics.

- Please insert Table 6 and 7 about here –

[4] In Table 7, Column XIV, we code SI as 1 to classify utilities and healthcare as the most science-intensive sectors, with average publication counts of 7.9 and 48, respectively. In Column XV, all other sectors are coded as SI=0. In Column XVI, we additionally classify consumer goods as a science-intensive sector (SI=1), while in Column XVII, the remaining sectors continue to be coded as SI=0.

5 Discussion and concluding remarks

This research highlights the complex relationship between corporate research outputs—both in terms of quantity and quality—and firm valuation in the context of European IPOs. While our results confirm the significant influence of patent quality on firm valuation, we find no consistent evidence that corporate scientific publications serve as a reliable signal for IPO investors. Specifically, the data do not support the hypothesis that basic science, as measured by publications, significantly affects firm valuation when patents are also considered. However, we do find evidence suggesting a substitution effect between the quantity of publications and patents. This suggests that investors may view these as interchangeable signals of a firm’s research capabilities rather than distinct indicators of innovation potential. In the context of IPOs, investors may prioritize patents over publications when assessing a firm's innovation capacity and future growth prospects. However, at lower levels of patenting activity, publications may serve as a substitute.

Firms, particularly those with limited resources, may strategically focus more on patenting, especially as they approach the public market. This trend aligns with broader shifts in investor behavior, where patents are increasingly regarded as signals of commercial viability, while the value of basic research (typically reflected in publications) has diminished. As Arora et al. (2018) argue, the reduced emphasis on basic science in investor decision-making has led firms to reallocate resources toward applied innovation. Similarly, Black et al. (2024) document a post-SOX regulatory shift where patents gained prominence as indicators of firm quality, while R&D expenditures, often associated with basic science, lost relevance.

However, the dynamics of research output are not solely shaped by quantity. The quality of publications and patents plays a crucial role, particularly in sectors where research excellence is tightly linked to future growth. Our results show that high-quality patents, measured by citations, are positively correlated with firm valuation, reinforcing the idea that patents serve as strong signals to investors regarding a firm's innovation capacity and long-term success. This finding suggests that firms with superior patent quality are perceived as more likely to succeed post-IPO.

The relationship between the quality of publications and patents is more nuanced. We observe a weakly significant positive interaction between the quality of patents and publications, which is more pronounced in science-intensive sectors. In these industries, firms that excel in both domains—basic and applied research—tend to benefit from a complementary effect, where high-quality publications and patents enhance each other's impact. This suggests that in certain sectors, firms may gain a competitive advantage by excelling in both types of research. In contrast, in other sectors, firms may focus more heavily on one form of research, with less need for balance between the two.

These findings contribute to the growing literature on corporate research and its role in firm valuation. They emphasize that the value of research output depends not only on its quantity and quality but also on the sector in which the firm operates. For instance, as Simeth and Cincera (2016) discuss, larger firms listed on the stock market may have different strategic incentives and constraints, further highlighting the need for a sector-specific understanding of research output dynamics.

5.1 Managerial and public policy implications

The findings of this study offer several important implications for both managers of firms preparing for IPOs and policymakers seeking to understand the evolving dynamics of innovation and firm valuation.

First, our study shows that patents, especially high-quality ones, serve as a crucial signal of a firm's innovation potential and long-term prospects. For firms with limited resources, focusing on patenting activities may be a more effective strategy than investing in scientific publications. This approach aligns with the growing investor preference for applied innovation signals, particularly in sectors where patents hold more weight in assessing a firm's future growth.

Second, the observed substitution effect between the quantity of publications and patents suggests that firms should optimize their resource allocation by focusing on one research output depending on their strategic goals and sector. In many cases, patents offer a more direct route to investor attention. Managers should weigh the relative importance of basic research (publications) and applied research (patents) to determine the most efficient use of resources, aligning their focus with investor expectations.

Third, the value of research outputs is sector-dependent, with science-intensive industries benefiting from complementary research in both basic science (publications) and applied innovation (patents). Managers in these sectors should consider integrating both types of research outputs to enhance their signaling effect to investors. In contrast, firms in less science-intensive sectors may prioritize patents as a more effective signal for IPO investors. Developing a sector-specific research strategy is key for aligning with investor preferences and enhancing firm valuation.

The paper also provides valuable insights for policymakers and practitioners. They should actively promote more transparent reporting on the relationship between research and patenting activities within companies. Enhanced transparency will ensure that investors, including those in smaller companies, have access to comprehensive and clear information on the dynamics that influence stock market premiums. By fostering this transparency, investors can better assess the strategic focus of firms and the value of their innovation outputs, which in turn will help them make more informed decisions.

To support this, policymakers should consider implementing programs that educate investors, financial analysts, and company managers about the complex interplay between short-term and long-term research strategies. These programs could include workshops, industry reports, and tools that help stakeholders understand how different types of research—such as publications and patents—interact and contribute to a firm's overall valuation. Such initiatives can bridge knowledge gaps and provide a more nuanced view of how research outputs signal future growth potential.

This enhanced understanding could lead to more informed investment decisions, allowing investors to better evaluate the long-term prospects of firms and their innovation strategies. In turn, this would benefit companies by creating a more accurate and stable valuation environment. By improving the communication and understanding of research activities, policymakers can help drive more efficient capital allocation, encourage long-term innovation, and support the growth of firms, particularly in the early stages of their development.

5.2 Limitations and avenues for future research

The main limitation of our paper stems from the inherent challenges of addressing endogeneity concerns in the strategic context of market signals and the non-random selection of IPO firms. We employ an instrumental variables (IV) approach to address these issues, recognising that IPO firms are not randomly selected and may not be representative of science-based firms engaged in publication. Despite our efforts, the persistence of unobserved heterogeneity remains a significant challenge. Previous literature has highlighted the difficulty of controlling for all information available to investors about a firm and its history at the time of its IPO. This limitation is accentuated by the impossibility of controlling for every relevant piece of information, making it almost impossible to identify the direction of bias even when including a comprehensive set of omitted variables (Clarke, 2005; Mayston, 2009). As a result, caution must be exercised in interpreting the causality implied by our results, recognising the inherent limitations associated with unobservable factors that may influence our findings.

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Tables

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
q_10	1,457	4.684177	3.486389	.0029644	10
# Publications	1,457	2.482498	17.7221	0	377
# Patents	1,457	4.334935	25.5809	0	627
# Publications (in log +1)	1,457	.3110326	.8231617	0	5.934894
# Patents (in log+1)	1,457	.5558021	1.043922	0	6.44254
At least one publication	1,457	.1743308	.379524	0	1
At least one patent	1,457	.2930679	.4553256	0	1
Patent quality (Av.citations)	1,457	.6413235	2.827341	0	62
Science quality (Av.citations)	1,457	.3398124	1.365879	0	24.96111
Age at IPO	1,457	9.335621	9.196828	0	29
Total Assets	1,457	15.52472	3.095314	.0731287	24.23418
Relative Offer Size	1,457	.4702263	.2816951	.1234978	1.054936
Leverage	1,457	29.93857	29.6739	0	87.05856
Secondary Ratio	1,457	.238941	.3488544	0	1

Table 2: Average number of publications and patents per sector

ICB main super sector	ICB main super sector	Mean # Publications	Mean # Patents
1	Basic Materials	2.185629	1.715152
2	Industrials	3.288235	9.269231
3	Consumer Goods	3.699301	3.077465
4	Health Care	7.972376	7.751381
5	Consumer Services	1.315457	.6498423
6	Telecommunications	.3529412	.0588235
7	Utilities	48.30556	2.588235
8	Financials	.6734694	.6122449
9	Technology	1.124402	4.789474

Table 3 Correlation table

		1	2	3	4	5	6
1	q_10	1.0000					
2	# Publications	-0.0453	1.0000				
3	# Patents	-0.0570	0.5146*	1.0000			
4	# Publications (in log +1)	0.0408	0.6375*	0.4014*	1.0000		
5	# Patents (in log+1)	0.0842	0.3459*	0.5658*	0.5193*	1.0000	
6	Patent quality (Av.citations)	0.0930	0.1023*	0.0852	0.1482*	0.2896*	1.0000
7	Science quality (Av.citations)	0.1192*	0.1947*	0.1176*	0.5350*	0.3341*	0.0926
8	Age at IPO	-0.0656	0.0101	0.0010	0.0379	0.0455	-0.0040
9	Total Assets	-0.3527*	0.1336*	0.1571*	0.1006*	0.0981	-0.0094
10	Relative Offer Size	-0.0962	-0.0455	-0.0207	-0.0412	-0.0248	0.0013
11	Leverage	-0.0213	0.0060	0.0128	0.0611	0.0144	-0.0355
12	Secondary Ratio	-0.2333*	0.0965	0.1177*	0.0355	0.0731	-0.0042
		7	**8**	**9**	**10**	**11**	**12**
7	Science quality (Av.citations)	1.0000					
8	Age at IPO	0.0414	1.0000				
9	Total Assets	-0.0346	-0.0221	1.0000			
10	Relative Offer Size	-0.0168	-0.0163	0.0122	1.0000		
11	Leverage	0.0471	0.0624	0.0932	0.0753	1.0000	
12	Secondary Ratio	-0.0588	0.0874	0.2223*	-0.1379*	0.0085	1.0000

Table 4

VARIABLES	I q_10	II q_10 *OLS*	III q_10	IV q_10	V q_10 *liml*	VI q_10
# Publications (in log)	0.196**		-0.0209	0.151		-0.0795
	(0.0979)		(0.105)	(0.131)		(0.174)
# Patents (in log)		0.431***	0.438***		0.456**	0.539**
		(0.0829)	(0.0890)		(0.204)	(0.267)
Age at IPO	0.00602	0.00537	0.00534	0.00597	0.00535	0.00518
	(0.00903)	(0.00895)	(0.00896)	(0.00903)	(0.00893)	(0.00894)
Total Assets	-0.577***	-0.587***	-0.586***	-0.575***	-0.588***	-0.587***
	(0.0593)	(0.0585)	(0.0594)	(0.0595)	(0.0598)	(0.0598)
Relative Offer Size	-1.524***	-1.603***	-1.605***	-1.526***	-1.607***	-1.624***
	(0.322)	(0.321)	(0.321)	(0.322)	(0.323)	(0.325)
Leverage	0.00461	0.00527*	0.00529*	0.00463	0.00530*	0.00545*
	(0.00303)	(0.00301)	(0.00300)	(0.00303)	(0.00303)	(0.00301)
Secondary Ratio	-0.0482	-0.0966	-0.0972	-0.0478	-0.0995	-0.108
	(0.233)	(0.233)	(0.233)	(0.233)	(0.234)	(0.237)
Constant	14.12***	14.12***	14.11***			
	(0.876)	(0.868)	(0.877)			
Observations	1,457	1,457	1,457	1,457	1,457	1,457
R-squared	0.350	0.360	0.360	0.200	0.212	0.211
Year FE	YES	YES	YES	YES	YES	YES
Business segment FE	YES	YES	YES	YES	YES	YES
Stock Market FE	YES	YES	YES	YES	YES	YES
Hansen J statistic				0.133	0.217	0.002
(p-value)				0.7153	0.217	0.9662
Cragg-Donald Wald F statistic				895.508	130.481	53.931
Kleibergen-Paap rk LM statistic				164.382	115.257	92.238
(p-value)				0.0000	0.0000	0.0000
Durbin-Wu-Hausman endog test				0.418	0.110	0.223
				0.5178	0.7399	0.8946

Note : LIML estimations use instruments that mimic sector-specific patent applications, publications, and experience in conducting scientific research. The IV diagnostic tests suggest that the instruments used in the models are valid and strong. The Hansen J-statistic p-values (0.7153, 0.217, and 0.9662) are all above conventional significance thresholds, indicating that the overidentifying restrictions are not rejected and that the instruments are likely exogenous. The Cragg-Donald Wald F-statistics (895.508, 130.481, and 53.931) are substantially higher than common critical values (e.g., Stock-Yogo thresholds), suggesting that weak instruments are unlikely to be a concern. Additionally, the Kleibergen-Paap rk LM statistics are highly significant (p-values = 0.0000), confirming that the models are not underidentified. Lastly, the Durbin-Wu-Hausman tests yield high p-values (0.5178, 0.7399, and 0.8946), suggesting no significant endogeneity concerns, implying that OLS estimates may be consistent.

Table 5

	VII	VIII	IX	X	XI	XII
	q_10	q_10	q_10	q_10	q_10	q_10
VARIABLES		*OLS*			*liml*	
Science quality						
(Av.citations)	0.147***		0.141***	0.185		0.112**
	(0.0535)		(0.0529)	(0.174)		(0.0543)
Patent quality						
(Av.citations)		0.0758**	0.0734**		0.564***	0.379**
		(0.0368)	(0.0361)		(0.205)	(0.172)
Age at IPO	0.00596	0.00559	0.00573	0.00600	0.00413	0.00479
	(0.00901)	(0.00902)	(0.00900)	(0.00902)	(0.00965)	(0.00925)
Total Assets	-0.571***	-0.569***	-0.572***	-0.572***	-0.574***	-0.575***
	(0.0574)	(0.0569)	(0.0574)	(0.0586)	(0.0581)	(0.0577)
Relative Offer Size	-1.546***	-1.538***	-1.554***	-1.550***	-1.596***	-1.586***
	(0.322)	(0.322)	(0.322)	(0.322)	(0.336)	(0.328)
Leverage	0.00468	0.00502*	0.00498*	0.00467	0.00703**	0.00624*
	(0.00303)	(0.00302)	(0.00302)	(0.00303)	(0.00337)	(0.00320)
Secondary Ratio	-0.0154	-0.0487	-0.0189	-0.00750	-0.0630	-0.0339
	(0.233)	(0.233)	(0.233)	(0.237)	(0.250)	(0.240)
Constant	14.04***	13.99***	14.00***			
	(0.856)	(0.851)	(0.856)			
Observations	1,457	1,457	1,457	1,457	1,457	1,457
R-squared	0.351	0.352	0.354	0.201	0.024	0.135
Year FE	YES	YES	YES	YES	YES	YES
Business segment						
FE	YES	YES	YES	YES	YES	YES
Stock Market FE	YES	YES	YES	YES	YES	YES
Hansen J statistic				0.053	3.064	0.851
(p-value)				0.8177	0.2161	0.6536
Cragg-Donald						
Wald F statistic				88.327	14.539	13.295
Kleibergen-Paap rk LM statistic				96.324	22.358	19.601
(p-value)				0.0000	0.0001	0.0002
Durbin-Wu-Hausman endog						
test				0.060	10.389	3.901
(p-value)				0.8067	0.0013	0.0482

Note : LIML estimations use instruments that mimic sector-specific qualitative applied and basic research (with quality measured by forward citations at IPO) and experience in conducting scientific research. The IV diagnostic tests suggest that the instruments used in the models are valid and provide relevant information. The Hansen J-statistic p-values (0.81771-, 0.2161, and 0.6536) are all above conventional significance levels, indicating that the overidentifying restrictions are not rejected and suggesting that the instruments are likely exogenous. The Cragg-Donald Wald F-statistics (88.30, 14.55, and 13.29) are above typical thresholds, though the latter two are closer to the critical values, potentially raising concerns about weak instruments in some cases. The Kleibergen-Paap rk LM statistics are significant across all models (p-values = 0.0000, 0.0001, and 0.0002), indicating that the models are not underidentified. However, the Durbin-Wu-Hausman endogeneity tests yield varying results. For the model X, the high p-value (0.8067) suggests no significant endogeneity, implying that OLS estimates may be consistent. In contrast, models XI and XII show significant p-values (0.0013 and 0.0482), indicating endogeneity concerns and justifying the use of IV estimation for these cases. Thus, while instruments appear valid, IV estimation is more critical for models two and three, where endogeneity is present.

Table 6

	XIII	XIV	XV	XVI	XVII	XVIII
VARIABLES	q_10	q_10	q_10	q_10	q_10	q_10
		OLS			*liml*	
# Publications (in log)	0.273*		0.196	0.831***		0.672**
	(0.145)		(0.152)	(0.320)		(0.319)
# Patents (in log)	0.560***		0.523***	0.817***		0.844**
	(0.0985)		(0.100)	(0.300)		(0.331)
# Patents (in log)*# Publications (in log)	-0.147***		-0.145***	-0.496***		-0.460***
	(0.0468)		(0.0475)	(0.164)		(0.160)
Science quality (Av.citations))		0.121	0.0527		0.668*	-0.0121
		(0.0830)	(0.0783)		(0.393)	(0.0928)
Patent quality (Av.citations)		0.0708*	0.0379		0.519**	0.0226
		(0.0374)	(0.0302)		(0.216)	(0.0337)
Science quality *Patent quality		0.0105	0.0234		-0.294	0.0581*
		(0.0248)	(0.0227)		(0.205)	(0.0313)
Age at IPO	0.00490	0.00551	0.00434	0.00373	0.0108	0.00245
	(0.00896)	(0.00904)	(0.00900)	(0.00908)	(0.0102)	(0.00913)
Total Assets	-0.583***	-0.572***	-0.581***	-0.568***	-0.575***	-0.570***
	(0.0595)	(0.0574)	(0.0594)	(0.0604)	(0.0583)	(0.0600)
Relative Offer Size	-1.629***	-1.551***	-1.634***	-1.684***	-1.669***	-1.691***
	(0.321)	(0.323)	(0.322)	(0.328)	(0.341)	(0.328)
Leverage	0.00518*	0.00498*	0.00533*	0.00496	0.00657*	0.00523*

	(0.00301)	(0.00302)	(0.00300)	(0.00305)	(0.00342)	(0.00303)
Secondary Ratio	-0.0934	-0.0213	-0.0747	-0.0794	0.0294	-0.0795
	(0.233)	(0.233)	(0.233)	(0.243)	(0.249)	(0.243)
Constant	14.02***	14.01***	13.97***			
	(0.880)	(0.857)	(0.880)			
Observations	1,457	1,457	1,457	1,457	1,457	1,457
R-squared	0.363	0.354	0.365	0.193	0.039	0.201
Year FE	YES	YES	YES	YES	YES	YES
Business segment FE	YES	YES	YES	YES	YES	YES
Stock Market FE	YES	YES	YES	YES	YES	YES
Country FE	No	No	No	No	No	No
Hansen J statistic				1.021	1.736	6.464
(p-value)				0.6002	0.4199	0.2636
Cragg-Donald Wald F statistic				32.796	8.603	20.746
Kleibergen-Paap rk LM statistic				17.400	20.183	98.600
(p-value)				0.0006	0.0002	0.0000
Durbin-Wu-Hausman endog test				5.816	6.927	3.462
(p-value)				0.1209	0.0313	0.1771

Note: LIML estimations use instruments that mimic sector-specific patterns for applying patents, publications, and their interactions, as well as sector-specific qualitative applied and basic research (with quality measured by forward citations at IPO) and experience in conducting scientific research. The Hansen J-statistic p-values (0.6002, 0.4199, and 0.2636) are all above conventional significance levels, indicating that the overidentifying restrictions are not rejected and supporting the validity of the instruments. The Cragg-Donald Wald F-statistics (32.80, 8.60, and 20.75) show strong instrument relevance in the first and third models. However, the second model's F-statistic (8.60) is close to the critical threshold, suggesting potential weak instrument concerns. Despite this, the Kleibergen-Paap rk LM statistics are highly significant across all models (p-values = 0.0006, 0.0002, and 0.0000), indicating that the models are not underidentified. For the model XVII, the high p-value (0.1771) suggests no significant endogeneity, implying that OLS estimates may be consistent. Therefore, in table 5 we explore, OLS regression across different sectors, science intensive SI=1 versus other sectors SI=0

Table 7

VARIABLES	XIV q_10 SI=1	XV q_10 SI=0	XVI q_10 SI=1	XVII q_10 SI=0
# Patents (in log)	1.035***	0.397***	0.909***	0.385***
	(0.213)	(0.116)	(0.167)	(0.130)
# Publications (in log)	0.770**	0.0893	0.361	0.129
	(0.319)	(0.168)	(0.229)	(0.194)
# Patents (in log)*# Publications (in log)	-0.290***	-0.122**	-0.195***	-0.126**
	(0.0898)	(0.0563)	(0.0697)	(0.0629)
Science quality (Av.citations)	-0.106	0.00652	-0.0651	0.0654
	(0.0864)	(0.125)	(0.0880)	(0.130)
Patent quality (Av.citations)	-0.0795	0.0477	-0.0889	0.0504
	(0.0823)	(0.0338)	(0.0761)	(0.0345)
Science quality *Patent quality	0.0455**	0.0423	0.0431*	0.0155
	(0.0216)	(0.0544)	(0.0230)	(0.0552)
Age at IPO	0.00293	0.00369	-0.00510	0.00554
	(0.0200)	(0.0102)	(0.0153)	(0.0112)
Total Assets	-0.811***	- 0.539***	-0.638***	-0.560***
	(0.0922)	(0.0643)	(0.139)	(0.0665)
Relative Offer Size	-1.264	- 1.697***	-1.446*	-1.727***
	(0.867)	(0.346)	(0.824)	(0.356)
Leverage	0.0150**	0.00372	0.0127**	0.00339
	(0.00626)	(0.00337)	(0.00624)	(0.00349)
Secondary Ratio	-0.197	0.0471	-0.142	0.0260
	(0.692)	(0.247)	(0.498)	(0.270)
Constant	17.02***	13.35***	14.24***	13.84***
	(1.379)	(0.959)	(1.810)	(1.007)
Observations	206	1,246	343	1,111
R-squared	0.591	0.326	0.510	0.335
Year FE	YES	YES	YES	YES
Business segment FE	YES	YES	YES	YES
Stock Market FE	YES	YES	YES	YES

Table 8

VARIABLES	XXIII q_10 top_25% ==1	XXIV q_10 top_25% ==0	XXV q_10 top_10%==1	XXVI q_10 top_10% ==0
# Patents (in log)	0.439*	0.527***	0.393	0.528***
	(0.233)	(0.115)	(0.444)	(0.107)
# Publications (in log)	0.445	0.106	0.184	0.234
	(0.328)	(0.180)	(1.034)	(0.162)
# Patents (in log)*# Publications (in log)	-0.187**	-0.128**	-0.171	-0.133**
	(0.0839)	(0.0635)	(0.205)	(0.0531)
Science quality (Av.citations))	0.189	0.00374	0.425	0.0130
	(0.167)	(0.0845)	(0.298)	(0.0799)
cit_per_patY5	0.211***	0.00153	0.298***	0.0103
	(0.0541)	(0.0284)	(0.0691)	(0.0283)
Science quality *Patent quality	-0.0918*	0.0547**	-0.122	0.0360
	(0.0492)	(0.0242)	(0.107)	(0.0226)
Age at IPO	-0.00571	0.00587	-0.0346	0.0112
	(0.0201)	(0.0103)	(0.0365)	(0.00915)
Total Assets	-0.499***	-0.604***	-0.323*	-0.621***
	(0.130)	(0.0664)	(0.193)	(0.0587)
Relative Offer Size	-2.228***	-1.513***	-1.526	-1.612***
	(0.728)	(0.378)	(1.162)	(0.335)
Leverage	0.00420	0.00746**	0.00786	0.00616*
	(0.00683)	(0.00348)	(0.0113)	(0.00316)
Secondary Ratio	-0.102	-0.0861	-0.166	-0.112
	(0.449)	(0.297)	(0.786)	(0.256)
Constant	12.68***	14.36***	9.584***	14.57***
	(2.006)	(0.979)	(3.168)	(0.867)
Observations	379	1,074	161	1,291
R-squared	0.433	0.368	0.505	0.376
Year FE	YES	YES	YES	YES
Business segment FE	YES	YES	YES	YES
Stock Market FE	YES	YES	YES	YES

Figures

Figure 1. Average # of Publications and Patents 5 years before IPO

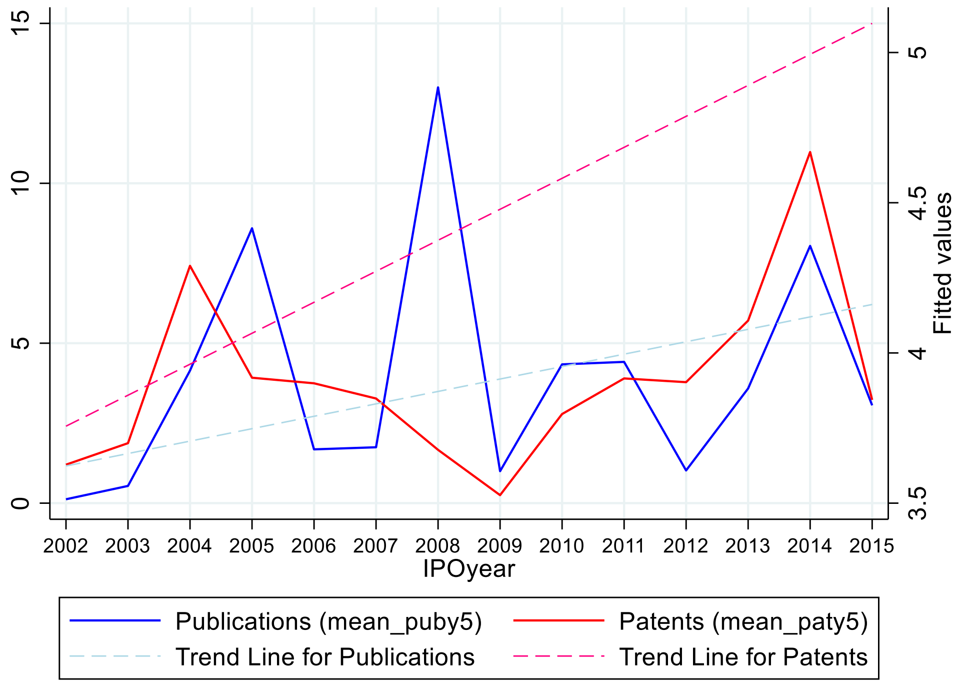

Figure 2. Average quality for Publications and Patents 5 years before IPO