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10 October 2018

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Abstract

We examine the role of trademarks in firm longevity and IPO underpricing. We borrow arguments from asymmetric information theory and juxtapose alternative explanations to uncover which approach best describes the underpricing phenomenon with the aid of trademarks relationship to firm longevity. We further argue that TMs that are associated with physical products are more likely to reduce information asymmetries than TMs associated with services. Therefore, we posit that TM activity by firms in the service industries is more likely to increase underpricing while in the case of the manufacturing firm's TM activity is less (or not) likely to result to increased underpricing. We collect 2,275 US IPOs from 1997-2016 and we find that on average the presence of trademarks in a firm's portfolio increases underpricing. We link our results with the extant literature and provide evidence which supports that higher trademark activity is associated with firm longevity and signaling quality through IPO underpricing.

Keywords: Trademark valuation, IPO underpricing, USPTO, information asymmetry, industry analysis.

JEL: G10, G14, G39, O30, O34

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Google, in the filing for its initial public offering, worried that the term "Google" could one day become synonymous with "search"--resulting in both a loss of trademark protection and reduced brand value. Google's trademark--now the most valuable on the planet, according to Brand Finance--is worth an estimated $44 billion, or 27% of the firm's overall value, measured by market capitalization (its stock price multiplied by the number of shares).

[*Forbes, June 15, 2011*]

1. Introduction

Trademarks (TMs) constitute one of the most important activities that companies can incorporate in their business strategy to help consumers identify their innovative products or services. A successful such strategy can generate substantial benefits and increase the firm's value. Further, companies may encompass TMs in their general business strategy to generate and display new brands, labels, names, signatures, shapes of goods and new packaging before the major decision to list in the stock exchange. Box Inc., a Red wood City, California, based company involved in cloud storage and file hosting for personal accounts and businesses was intensifying its effort in 2014 to finalize its offering. Interestingly, the firm chose the previous two years to introduce fourteen trademarks from a total of twenty-three that had historically in order to promote its image in the market. Box Inc was listed on the 23rd of January 2015 and it was heavily underpriced by 65.93% leaving $115.37 million on the table.

Innovation is one of the key drivers that motivates companies to list in order to advance their competitive advantage and therefore increase profitability (Griliches, 1992; Hall, 1996, Cao, Jiang and Ritter, 2015)[1] while several studies have underlined the importance of TMs in firm's innovative activity (Allegrezza and Guarda-Rauchs 1999; Schmoch 2003; Jensen and Webster 2009; Millot 2012). Further, since the seminal works of Schechter (1927) and more recently Healey *et al.* (2007), research has extensively investigated the importance of TMs in corporate events (e.g., Sadner and Block, 2011; Block *et al.*, 2014; Block *et al*., 2015; Bernstein, 2015).

Trademarks can generate revenues in companies aiming to list by achieving recognition from public, by licensing the logos or brand name to third parties, by bringing new technologies onto the markets for products (i.e., product-based commercialization strategies), or by adopting a combination of the two strategies. The literature has not yet examined the impact of trademarks

[1] At the macro level, innovation plays a key role in economic growth and sustainability (Jones, 2005)

formation in capital raised process during the initial public offering. This raises several interesting questions. Do trademarks increase underpricing because of their intangibility? What if trademarks are related to firm longevity and signalling quality through underpricing?

Motivated by the lack of relative empirical evidence on the subject, we address these questions on the role of trademarks in the IPOs process by examining the relationship between emblems and the returns that those public offerings secure to their investors as well as their survivability in the long term. We use a large and comprehensive sample of U.S. IPOs listed over the period from 1997 to 2016.

We borrow arguments from the asymmetric information literature to predict and explain the role of TMs. On the one hand, TMs, as any intangible asset, may be harder to value ex ante than tangible assets. This can increase the information asymmetry among the participating players (mainly firms, investors and underwriters) which could result in higher underpricing. Further, issuers with TM activity, knowledgeable of their higher quality, may be willing to tolerate underpricing to a greater extent differentiating themselves from firms with no TMs to signal their potentially superior long-term post-IPO performance. These firms will exhibit longer life-span so there is higher probability to raise more funds in more privileged terms.

On the other hand, TMs are associated with the firm's brand, related products and services. Therefore, TMs could help to substantially alleviate uncertainty about company potential and dynamics. This latter argument could result in lower underpricing. Given that there are strong arguments both in favor and against underpricing we point to the need to answer this question empirically.

We further argue that TMs that are associated with products are more likely to reduce information asymmetries than TMs associated with services. Therefore, we posit that TM activity by firms in the service industries is more likely to increase underpricing while in the case of the manufacturing firm's TM activity is less (or not) likely to result to increased underpricing.

Our results show that on average a firm with TM activity experiences a 4% increase in underpricing compared to a firm with no TM activity. Interestingly, we also find strong evidence to support our prediction regarding the presence of TMs in the service and manufacturing industries respectively. Almost exclusively our baseline results are driven by firms in the service sector. This implies a sharp contrast between these two sectors. TMs in the manufacturing sector can be more readily valued as the outcome of innovative products; a fact

that can drive down any information asymmetries. On the contrary, while TMs in the service industry can still represent innovative output in the form of services, the market may be more perplexed as to the exact valuation of such intangible assets. To our knowledge, this is the first study that contrasts the value of TMs between service and manufacturing firms.

We do claim that TM activity by firms, when controlling for all other factors, can have a significant contribution to IPO returns. To this end, one can argue that our results are potentially biased. Therefore, to control for potential bias in our results we sought for potential variables that can be used as instruments. Our only viable instrument is the industry's Market to Book Ratio. While our results are qualitatively similar, such an instrument may not be the ideal candidate. Therefore, to further provide robustness we perform propensity score matching techniques where in essence identify firms without TMs that are similar to firms with TMs. Results from this analysis also corroborate the baseline results.

Additional results from the firm's TM portfolio size complement our baseline results. In the case of the service industry's firms the size of the TM portfolio does not matter; the mere presence of TMs is enough to increase underpricing for these firms. In the case of the manufacturing industry, firms with an average-sized portfolio appear to have higher underpricing compared to firms without TMs and firms with few or many TMs. We argue that for these firms, asymmetric information may be larger as they may not yet able to transcend their products' quality in the same fashion as more TM-experienced firms.

In an important departure from prior studies, we thoroughly examine TMs as the outcome of establishing identifiability for material goods, services as well as firms. From the firm's viewpoint TMs show promise in analyzing (1) links between technological activity and marketing advantages; (2) international patterns of sectoral specialization, (3) rates and directions of product innovations in different industrial sectors, (4) evolution of economic organizations and structures, not only in terms of entry and exit of firms, but also in terms of firm growth, differentiation, and diversification. In this context, firms consider their IPO as part of their strategic portfolio linked to both their innovative and competitive stance and decision making. There are multiple reasons for such a strategy: attracting capital, customers, investors, executives and workers, input suppliers and finally establishing institutional credibility and political support. From the society's viewpoint, TMs are also important for at least three reasons: (1) they confer an exclusive right of using a brand helping companies to appropriate the returns

of investing in new products or improve existing ones; (2) they are an important aspect of contemporary culture world-wide; and (3) they are a source of qualitative and quantitative information on socio-economic activity.

This study makes important contributions to the IPOs and financial intermediation literature. First, it provides new evidence on the effect of trademarks, by shedding light on innovative activities of companies in the prior listing period and their determination of success after going public. Specifically, we find that firms that involve on trademark activity are more underpriced in comparison to their peers without trademarks. We show that the evidence of quality is undervalued during the formation of the finalized offer price providing support to Hall (1993) and Hall and Hall (1993) which suggest that investors might be myopic in pricing the future cash flows from innovations, leading to undervaluation. Huberman and Regev (2001) and Hirshleifer, Hsu, and Li (2012) show that investors with limited attention may fail to reflect innovation information into stock prices, leading to undervaluation. Second, to our knowledge, this is the first study to explicitly account for the long-term performance of companies which involve on trademark creation prior listing. Third, our study offers new insights on the influence of TM introduction on the probability of failure and survivability of initial public offering (IPO) firms. Our findings also have important implications for issuers. For instance, we provide justification that companies should demonstrate creativity prior going public and ability to convert creativity through capital raised into successful projects. This is consistent with the notion that the success of the trademark in the market signals the quality of its services.

Our study is related to the works of Heeley, Matusik and Jain (2007), Krasnikov, Mishra and Oroso (2009), Sadner and Block (2011), Useche (2014), Bernstein (2014), Vismara (2014), Block *et al.* (2015), Cao, Jiang and Ritter (2015), Gounopoulos and Pham (2018), Heeley, et al. (2007), Useche (2014), Vismara (2014) and Cao *et al.* (2015) who empirically examine the relationship between innovation, entrepreneurial firms and business outcomes. We update their work using a comprehensive sample of new listings and offer new evidence on the associated relationships between TM creation and activity the IPO initial aftermarket return and especially survivorship in the long term. Chemmanur *et al.* (2018) on a recent study investigates the role of trademarks in the financing, valuation, and performance of Venture Backed IPOs. We extend their work by exploring TMs in the entire sample of IPOs. In addition, we investigate the longevity of those firms and show that firms going public with TMs may be indicating their

innovative character using underpricing as a signal of their prospects. The economic intuition suggests that the quality signal transmitted via the underpricing of the IPO will be received as endorsement by financial intermediates and the market to mitigate adverse selection costs of funding in the post IPO period.

The rest of the paper is organized as follows. Section 2 discusses the literature and our theoretical predictions. Section 3 outlines our econometric specification. We describe our data construction and sample in Section 4. We present our results and robustness tests in Section 5. Finally, Section 6 concludes the paper.

2. Conceptual Framework

2.1. Trademark Basics

A trademark is a type of Intellectual Property (IP) that is employed by firms to differentiate their products and services, reduce search costs and establish consumer loyalty. It can, among others, take the form of word, phrase, symbol or combination thereof.[2] A firm that wishes to obtain a TM in the US needs to file its application at the USPTO and therefore undergo an examination process.[3] Investment in TMs is regularly treated as an operational expense under SG&A and under certain circumstances as intangible assets.[4]

TMs are the most widely used type of IP protection as it is available both to small and large firms at a relatively low cost (Graham et al 2013; Hall et al 2014) while, according to the US National Science Foundation (2012), constitute one of the most important IP mechanisms for innovative and R&D intensive firms. Further, firms spend considerable effort and money developing their own TMs as part of their marketing strategy (von Graevenitz 2013) and their importance rests on the achieved degree of company identifiability and commercialization.

Given the importance of TMs for firms, the related scholarly literature has increased substantially over the last twenty years. One of the first strands of this research was to examine the indication of their role and how closely linked to the introduction of new products. In other words, they are likely to be associated with entry or improved versions of established products.

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[2] For the full definition se See 15 U.S.C. § 1127.

[3] There are several conditions that a trademark needs to meet to be awarded. For instance, it must have an identifiable form that can be represented in a graphical way. Signs, words, icons and three-dimensional shapes are all acceptable forms of TMs (Mendonça *et al.* 2004). Second, upon registration the firm needs to provide proof of sales of products or services associated with the trademark. For more see Graham *et al.* (2013).

[4] Intangible assets also include patents, brand name, franchise and economic goodwill.

OECD classifies initial product development as an indication of innovation (Faurel *et al.* 2017). Mendonça *et al.* (2004) presents corroborative evidence. Amara *et al.* (2008) also provide support towards this argument; employing a sample of 2625 Canadian firms, they conclude that TMs are complementary to patents. Patents are the type of IP that has been most closely linked to innovation activity (see Pakes and Griliches 1980; Griliches 1981; Trajtenberg 1990). Therefore, this strong association between patents and TMs is the cornerstone of innovation activity. Finally, Flikkema *et al.* (2014) also provide support to the above discussion by showing that 60% of Benelux TMs are associated with more innovation.

A major related strand of this literature has examined whether TMs contribute to the firm's market value. For a sample of Australian firms, Bosworth and Rogers (2001) find an insignificant relationship between TMs and market value. While in a later study, for UK firms, Greenhalgh and Rogers (2007) conclude that TMs contribute to firm's market value; the interpretation they offer correlates TMs with firm's innovation. Sandner and Block (2011), Fosfuri and Giarratana (2009), Krasnikov et al. (2009), and Block *et al.* (2014b), Llerena and Millot (2013) Thoma (2015) in a similar spirit, examine samples of firms from different periods and countries and find a positive effect of TMs on firm value.

Several other studies have examined the contribution of TMs in various economic and business activities. Block *et al.* (2014) and Zhou *et al*. (2016) show that TMs are associated to new firms' access to venture capital and to assessing venture capital valuation. Seethamraju (2003) find that for a sample of US firms, TMs are associated with increased sales while Griffiths *et al.* (2011) find that TMs contribute to firm's profits.

While the above studies have expanded our understanding of the role of TMs to economic activity and value, until now there is no empirical study that examines the role of TMs to a firm's IPO underpricing. In the following section, we discuss on the possible roles and interactions of TMs with underpricing and possible other firm dimensions.

2.2. Trademarks and IPO underpricing

An IPO is a mechanism which ranks high in every company' strategy as far as providing identifiability, serving to attract better executives and input providers, as well as more loyal customers. IPOs then can be reckoned, to perform a chorus role in further establishing the company image to the public conscience. TMs can help towards this direction as in collaboration

with an IPO can broaden the image of the company and solidify awareness about the firm, enhancing the creation of a brand name. However, the direct role of TMs in IPO underpricing is more nuanced. Asymmetric information theories can point towards several corollaries regarding IPO underpricing, relevant to the information emanating from the existence of TMs.

One the one hand, firms for which "relevant" value information is more widely spread among investors should experience less underpricing (Rock, 1986; Michaely and Shaw, 1994; Luo, 2008).[5] This effect is enhanced if TMs tend to reduce the asymmetry between issuers and investors as well as informed and uninformed investors. In this order, issuers with higher exposure to intangibility need the cash to mitigate financial risk. In a recursive argument, TMs tend to reduce information asymmetries and thus underpricing so that enough cash is generated to hedge their position in the Balance sheet structure. Moreover, firms with TMs may seek a more credible specification of their value by underwriters since the intangibility of their assets prescribes for a stronger need for cash as collateral and liquidity requirement.[6]

On the other hand, the higher the uncertainty about the value of the firm the higher is the expected underpricing (Ritter, 1984; Beatty and Ritter, 1986; Beatty and Welch, 1996; Benveniste et al, 2003; Ljungvist and Wilhelm, 2003; Schenone, 2004; Healey et al, 2007).[7] TMs as intangibles will tend to increase the ex-ante uncertainty about the true value of the firm. Chemmanur *et al.* (2018) argue that TMs play a role as asymmetric information dissipater in the setting of the offer price, which is an expectation from the underwriter's point of view of the first day closing price. It reduces the discount imposed by underwriter as it predicts superior post IPO performance.

Further, IPO underpricing theory is able to provide another argument in support of higher underpricing in the presence of TMs. Namely, underpricing as a means of signaling firm quality. When issuers have better information about their true value compared to investors, they have an incentive to accept higher underpricing in order to separate themselves from lower quality firms and succeed to raise funds in more privileged terms in later equity issues (SEOs). Firms with TMs have an insider's view of the true value of these assets especially when TMs do not appear

[5] For instance, Heeley *et al.* (2007) argue that patents is the key to reducing asymmetric information during an IPO. In our case TMs can also act in a similar fashion.

[6] Rajan and Servaes (1997) as well as Loughran and Ritter (2004) point out the role of analysts in the IPO underpricing puzzle. Overoptimism by analysts can feed on TMs and vice versa so underpricing is the mechanism to make TMs more effective.

[7] For instance, Chemmanur et al. (2010) emphasize the supportive role that institutional investors play in the aftermarket and that underpricing is the mechanism to enhance this role

on the balance sheet (Ibbotson, 1975; Grinblatt and Huang, 1989; Welch, 1989; Luo, 2008; Francis et al, 2010). Underwriters wish to keep all stakeholders satisfied, especially fund managers. They can count on the firm's identifiability and a possible unsatisfied clientele for IPO shares, pushing first day closing price up. Finally, fund managers participating in the book building process, have an incentive to keep the offer price low for firms difficult to price such as firms with TMs (Welch, 1992; Choudhry and Nanda, 1996; Asquith *et al.*, 1998; Krigman et al, 1999; Ljungvist *et al.*, 2004).

From the above, one can argue that the intangibility aspect of TMs and the possibility that their value is not explicitly accounted for on the Balance Sheet, even at cost, creates a setting where contradicting theoretical arguments predict a different relationship between TMs and IPO underpricing. For the remainder of our paper we pursue empirically this question to infer which of the above arguments is more prevalent.

Finally, we posit that the strength of each of the above arguments is likely to differ across industries. From a simple point of view, it can be reasonably assumed that some consumers are investors and all investors are consumers. Hence, a firm with TMs is a better recognizable entity compared to its counterparts lacking TMs, all else equal. However, this is more likely to occur when TMs are associated with tangible products compared to intangible – i.e. services. Therefore, we argue that TMs associated with firms in product-based industries can reduce the asymmetric information between owners and investors and therefore underpricing. On the contrary, TMs associated with services are not likely to reduce any ex ante information asymmetry and therefore increase IPO underpricing.

2.3 Trademarks and firm longevity

We examine the impact of trademark activity in firm's longevity following the competing explanations of underpricing, emanating from the asymmetric information literature. In this way we can put alternative propositions, within this strand of the literature, to test and fill an important gap in the relevant empirical research.[8]

[8] There are many factors on which the survival probability depends. Following the literature, both size and age of the firm have a positive impact on firms' survival in the market (Dunne and Hughes, 1994). Additionally, industry level characteristics such as market size, growth rate, ownership advantages and growth strategies constitute a cornerstone for firms' longevity (Mata and Portugal, 1994; (Mata and Portugal, 2001). While we do control for such factors in our analysis, these are beyond the scope of our paper.

A large number of studies indicate that innovation plays important role in business survival, (Hall, 1987; Ericson and Pakes, 1995; Esteve-Pérez et al., 2004; Cefis and Marsili, 2005; Geroski, 1995; Audretsch, 1995; Buddelmeyer et al., 2010; Tsvetkova et al., 2014; Ugur et al., 2016; Kim and Lee, 2016). Although these studies have found a clear positive effect between innovation and firms' longevity there are also several studies that indicate insignificant or conflicting relationship. Li et al. (2010), using data on 870 software companies, relate R&D capital expenditures on labs and equipment with lower hazard rates. Mahmood (2000), using a US sample of startup companies, finds that R&D intensity have insignificant effects in 11 out of 17 estimations based on a log logistic model. The above studies point to the growing need to filter innovation, not just by the evolution of the product itself but also by the development around it, which makes it more recognizable and valuable to the customers. This incremental type of innovation can be measured fairly well through the company's TM activity.

TM activity as it is related to firm value and longevity presents an extremely valuable opportunity to analyze underpricing in the context of the aforementioned asymmetric information and signaling theories. These theoretical arguments based mostly on the winners curse and information revelation theories could be juxtaposed to the signaling theories following the work of Allen and Foulhaber (1989), Grinblatt and Huang (1989) and Welch (1989) who argue that issuers incur costs (underpricing) to reveal their quality and benefit from future SEOs when the quality would have been revealed. Firm longevity related to the investment in trademarks (additional cost to the firm) could provide a positive argument towards the superiority of the signaling approach *vis-a-vis* the contending theories. IPOs do reveal all those firms' competitive advantage in the medium to long run. A period long enough, to compensate for the incurred costs, rendering underpricing the outcome of an optimizing behavior on the part of the issuer and the underwriter. Indeed, the longer the anticipated life of an issuing firm the higher the optimal underpricing that can be accommodated.

3. Econometric Setup

To examine our empirical question, we first estimate the following equation:

$$\ln(Underpricing_i + 1) = a_0 + a_1 TMGranted_i + Controls_i + \varepsilon_i \qquad (1)$$

Where *Underpricing* equals to the difference between the closing price and offer price divided by offer price.

TMGranted is our variable of interest and takes the value of 1 if firm *i* has at least one trademark granted by the year before the IPO and 0 otherwise; for robustness, in alternative specification, we instead consider *TMFiled* which takes the value of 1 if firm *i* has filed for at least one trademark by the year before the IPO and 0 otherwise.

If $\alpha_1>0$ then based on the arguments in the previous section, information asymmetry dominates any visibility caused by TMs. However, if $\alpha_1<0$, then TMs' role as mechanism of identifiability dominates any asymmetric information effects that are caused by firm's TM activity.

The *Controls* include control variables traditional to the IPO underpricing literature. *FirmAge*, which is the number of years the firm is operating, has been employed in the literature as a proxy of risk; i.e. younger firms are more likely to be risky investments (Ritter, 1984, 1991; Carter et al., 1998).

IPO *Proceeds* is the amount in millions of US dollars; a large value of *Proceeds* could imply greater visibility of the firm to investors and therefore result in lower underpricing.

Earnings takes the value of 1 if the year prior to the IPO the firm discloses earnings and 0 otherwise. The literature has not concluded to a clear sign of this variable to IPO underpricing as profitability in one year may not be a credible indicator to long-term post-IPO performance especially in light of exogenous shocks (Trueman et al. 2000).

Leverage is the ratio of total liabilities over total assets before the IPO. Studies have shown that firms relying on debt to be less inclined to 'allow' a high underpricing (Jensen, 1986).

UnderwriterRank is collected by Loughran and Ritter (2004) and takes the value of 1 if the underwriter is prestigious and 0 otherwise. Carter and Manaster (1990) show that IPOs with prestigious underwriters are more likely to result to underpricing. This finding's intuition is that established underwriters are less likely to be involved with IPOs of questionable quality.

Overhang is calculated as the ratio of shares retained by pre-IPO shareholders to the equity given up in IPO. A large value of *Overhang* could imply that underpricing bears no costs to the pre-IPO shareholders (Bradley and Jordan, 2002).

We also include *Revisions* which is the change of the IPO offer price from the midpoint

of the initial filing price range. Any change is likely to indicate new information revealed to the underwriter by the time of listing (Hanley, 1993; Cornelli and Goldreich, 2001)

We further include year dummies and various industry-related dummies. Specifically, *Internet* takes the value of 1 if the firm is classified as an internet firm and 0 otherwise.[9] *Technology* takes the value of 1 if the firm belongs to SIC codes that technology intensive industries (for the detailed classification see Table A1 of the Appendix). *Nasdaq* takes the value of 1 if the firm's IPO was in NASDAQ and 0 otherwise. Further, we include dummies that take into account the first-digit of the SIC industry each firm belongs to.

Our baseline estimation is Ordinary Least Squares (OLS). While we do include a rich set of controls, there are may still be unobservables that are correlated with TM activity. To this end, an alternative econometric strategy would be to obtain an instrument that influences trademark activity but not directly influences the firm's IPO underpricing. This task is daunting given that TM activity and the firm's all other activities are closely intertwined. We follow Cao *et al.* (2015) and instrument with the industry's average Market to book ratio.[10] We should stress two important points. First, given that we need to have a considerable number of industry observations to construct this variable, we are forced to give up observations and subsequently end up with a smaller sample of firms for this part of the analysis. Second, and more importantly, this instrument is not likely to be ideal given the nature of the TM activity.

Due to the latter point, we also perform propensity score matching in the spirit of Rosenbaum and Rubin (1983) following the algorithms set by Becker and Ichino (2002). The propensity score method in essence matches the firms that have at least one TM prior to IPO (i.e. treated firms) with a firm, or firms, that do not have a TM (i.e. control firms) based on the rest of the control variables in the specification. To provide robustness that our results are not driven by different matching methods, we perform the three most common ones (Zhao 2004); that is, through means of the nearest neighbor, kernel and stratification.

To examine whether TM activity contributes differently to each group of industry (product-based vs. service-based), we distinguish firms by their first digit SIC classification. We assign firms to the manufacturing/product sectors as those that belong in the Agriculture, Forestry and Fishing, Mining, Construction, and general Manufacturing and those to the service

[9] As Internet firms are classified those with business description sections in Thomson Financial SDC containing any of the words "Internet", "Online", "eBusiness", "eCommerce", and "Website"

[10] In their study they use this variable to instrument for patent activity.

sectors that belong in the Transportation, Communications, Electric, Gas and Sanitary service, Retail Trade, Finance, Insurance and Real Estate, general Services and Public Administration. We then re-estimate the regressions by distinguishing between the two groups and include interaction terms to examine any statistical significance between the two groups.

4. Data

4.1. Data construction

We constructed our sample based on the population of US IPOs announced between 1997 and 2016 from the Securities Data Company (SDC). We obtain accounting and aftermarket data from Compustat and the Center for Research in Security prices (CRSP). We also collected TM data from Orbis. Orbis collects and maintains TM data for the firms in its dataset. Recent studies have employed TM data from Orbis; for instance, Sandner and Block (2011) use the data to compile the TM stock for listed firms to examine their contribution to market value. We collect bibliographic information on TMs from the Office of the Chief Economist at the USPTO (Graham et al. 2013).[11] To cross-verify the integrity of the Orbis database we also hand-collect the information on TMs from the firms' prospectuses filed for their IPO.

In line with the existing literature (Loughran and Ritter, 2002) we eliminate IPOs with offer price less than 4 dollars per share or Proceeds of less than 5 million USD. Further we disregarded IPOs that correspond to American depository receipt (ADR), leverage buyout (LBO) or real estate investment (REIT). We further exclude limited partnerships, unit offer, financial institutions, close-and funds and corporate spin-offs. We also exclude IPOs with underpricing larger than the 95th percentile. Our final sample includes 2,275 US listed firms.

4.2 Data description

Table 1 displays the summary statistics of our dependent and independent variables. From the outset we see that most of firms had not filed for a TM until the IPO; only 24% of firms had filed for a TM prior to the IPO's date. Given that this may seem counterintuitive, we further examined the firms' prospectuses and found no reference to TM activity. Moreover, previous studies do find for a large share of listed firms to have no TM activity. For instance, in

[11] The Office has recently made patent and trademark information publicly available in bulk. For more, see: https://www.uspto.gov/learning-and-resources/ip-policy/economic-research/research-datasets

their sample, Sandner and Block (2014) find that approximately 40% of VC-funded firms had not filed for a TM.

Moving on to our dependent variable, the average firm experienced a 14.08% underpricing; more importantly firms with TMs have on average 6.8 percentage units more than firms without TMs. This first comparison yields the first insight that the presence of TMs is associated with higher underpricing compared to firms without. It provides support in favor of asymmetric information and any signal that the firm wishes to transcend to the market.

In Panel B we examine the independent variables used in the econometric estimations. Our focus is on the comparison between firms with and without TMs. Of the ten variables, three are statistically different at the 1% while two more at the 10% level. Intuitively, *Revisions* are higher for the firms with TMs as they are likely to be revised upwards more than for the firms without. Further, while the difference is borderline significant, firms with TMs are less likely to have a profitable year prior to IPO – a result that corroborates the risky aspect of TM-related activity as such firms pursue new product and higher investment on visibility.

Firms with TMs are also more likely to have a prestigious underwriter and also more likely to be classified as technology firm and listed in NASDAQ. Since these differences are notable, we include them in the econometric specifications to flesh out the role of TMs in underpricing. More importantly however, from comparing the *Proceeds* and *Leverage*, the two groups appear to be of similar size and of similar leverage. Therefore, the likelihood of filing for TM is not likely to depend on size or the financial fundamentals of the firm.

To alleviate any concerns about multicollinearity, we display the pairwise correlations of all the variables used in the baseline specification in Table 2. As it is evident no independent variable has a considerable positive or negative correlation with any other variable. Thus, from this analysis there is no cause for concern.

Table 3 presents the overall IPO distribution by issue year and industry for survived and failed firms. Panel A presents a sample overview. It also reports subsamples with the listed and delisted IPOs. A company is considered survived as long as it is continually traded for a 5-year period following the IPO and accordingly failed when it becomes delisted due to any reason in this given period. Our initial sample consists of 2275 firms. From these, at the final date of our sample (December 31, 2016) 939 remain listed and 1336 have been delisted. For the 5-year

period after the IPO to be satisfied for our survival consideration we stop including IPOs as of December 31, 2011 so that this subsample consists from 1676 firms. Approximately 57,9% of these firms have survived and 42.1 % have failed. Panel B reports the sample distribution of surviving and failed firms over the period 1997-2011 by issue year. The percentage of surviving companies is growing over the years. For instance, the survival rate of firms that go public with issue year 1997 is on average 54,1%. In contrast the percentage of surviving companies with IPO year 2011 appears to have increased to 70,1%. Additionally, the IPO activity has diminished over the crisis period 2008-2009.Panel C provides summary statistics by industry. From the 2275 firms, 1414 operate in the service sector and 861 in manufacturing. Notably, at the end of 2016 on average 28,2% of the companies that belong to the service sector where been delisted. Respectively, in the manufacturing sector the percentage is limited to 17.2%. In addition, from the 57.9% of the firms that have survived, 36 % are operating in the service sector and 21.9% in Manufacturing.

Table 4 presents the distribution of survived firms with TMGranted and those without TMs for our sample constructed for the period 1997-2011. It also provides the cumulative percentage of failed firms by issue year and by sector. For instance, we show in panel A that for non-TM firms the cumulative percentage of failure is 8.9% during the first year, 25.7% for the year following IPO, 43.1% and 55.6% for the third- and fourth-year end 61% for the fifth year. On the contrary for TMGranted firms the cumulative percentages of failure are much smaller correspondingly, 3%, 3%, 6%,13,3% and 16,6%. Notably, firms with trademark activity have by far lower failure rates. Panel B reports information for the sample of 1676 companies for the five-year period from the day of the IPO. The cumulative rates of failure for firms with TMGranted in the service sector are 2%, 0,6%, 1,4%, 2,2% and 2,5 compared to 5,1%, 12,7%, 18,3%, 22,8%, and 25,7% for non-TM firms. Similarly, in the manufacturing sector non-TM firms have higher failure rates equal with 2,1%, 4,8%, 7,6%, 9,7%, 11,6% compared to companies with TMGranted who have 2%, 0,6%, 1,1%, 1,6%, 2,3% for the same time period of five years following the IPO. On average, in the service sector the distance in the failure rate between non-TM and TMGranted firms is higher compare to the manufacturing sector. Overall our results suggest that IPO firms with granted trademarks before the issue date exhibit better survivability compared to the companies with non-trademark activity.

In order to shed more light to the post IPO performance for TM active firms compared to the non-active ones we provide in Table 5 evidence that firms with trademarks issue new shares in SEOs with better terms, i.e. lower underpricing (see last column of the table).

Table 5 demonstrates univariate analyses of SEO for both groups of firms those with TMGranted and those with no TMs. From our initial sample, 998 firms use SEOs to raise new equity. TM active firms exhibit on average lower volume of primary and total proceeds per firm which possibly indicates that TM active firms have better profitability and hence use less equity financing.

5. Results

5.1 Trademarks and IPO Underpricing

Table 6 displays results for Equation 1. Column 1 estimates Equation 1 via OLS. First of all, all the control variables have the expected signs from previous studies even though they are not always significant. From here, we turn our attention to the role of TM activity.

The coefficient of *TMGranted* shows that firms with TMs granted prior to their IPO have on average 4.1% more underpricing than firms without. Column 2 instruments *TMGranted* with the industry's average market to book ratio. Given that due to data unavailability we are unable to construct this instrument for the entire sample these results should be interpret cautiously. The coefficient is even larger than in Column 1. In Columns 3 and 4 we estimate similar regressions to Columns 1 and 2 where instead of *TMGranted* we consider *TMFiled* as the treatment dummy. The coefficients here are a little smaller in magnitude while they are still significant. This could indicate that in the case where firms have just begun their TM activity prior to their IPO, the market may not readily evaluate the importance of TM activity for the particular firm.

To further alleviate endogeneity concerns, in Table 7 we consider propensity score matching techniques. Columns 1-3 display the results where we consider *TMGranted* as the treatment dummy; each column considers a different matching method; i.e. means of the nearest neighbor, kernel and stratification respectively (Zhao 2004). The coefficient of *TMGranted* ranges from 0.04 to 0.049 and is always significant at the 1% level. These results support the outcome from the OLS analysis in the previous Table and indicate that the role of *TMGranted* is not likely to be attributed to confounding factors.

Columns 4-6 display the results where we consider *TMFiled* as the treatment dummy in a similar format as the previous three columns. The coefficient of *TMFiled* ranges from 0.021 to 0.039; further, in the case of the nearest neighbor, the coefficient is not statistically significant at the 10%. These results corroborate those of the previous table where they show that *TMGranted* is a stronger predictor of increased underpricing than *TMFiled*. Nonetheless, if we take cumulatively all the results into consideration, they show that TM activity in general is associated with increased underpricing.

To examine our second conjecture on whether firms with TMs in the service sector have different underpricing compared to firms in the manufacturing sector, we re-estimate Equation 1 in Table 8 while distinguishing between service and manufacturing firms. In Column 1 we consider firms in the service sectors while in Column 2 firms in the manufacturing sectors. *TMGranted* is associated with a 7.3% increase in underpricing in the case of the service sector while, in the case of the manufacturing sector, *TMGranted* coefficient is much smaller and statistically insignificant.

To examine whether the coefficient of *TMGranted* is statistically significant between the two sectors, we take into account the entire sample and include in Equation 1 a Service dummy which takes the value of 1 if the firm belongs in the service sector and 0 otherwise and the interaction *Service*_x_*TMGranted*. The interaction term shows that *TMGranted* increases the underpricing by 5.7% more in the service sector than in the manufacturing sector. This coefficient is significant at the 1% level.[12]

To provide further robustness that the above results hold for both the service and manufacturing sectors, we again perform propensity score matching for the *TMGranted* variable for both samples. Table 9 – Columns 1-3 display the results for the service sectors and Columns 4-6 the results for the manufacturing sector. The results corroborate the findings from the previous Table.[13]

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[12] One can argue that firms that belong in the "Transportation, Communications, Electric, Gas and Sanitary services" SIC industry classification could be distinctively different from all other firms in the service sectors, due to the size of potential physical assets. For this reason, in Table A.2. we re-estimate Table 5 by excluding these firms from the analysis. Results remain similar.

[13] To provide further robustness, Table A.3. performs propensity score matching where we expand the firms that can potentially be matched with the firms that have TMs in each sector. That is for the firms that have TMs in the service sector, we allow them to be matched with firms that do not have TMs granted by both the service and manufacturing sectors; analogously, for the firms that have TMs granted in the manufacturing sector. Results are qualitatively similar.

In Table 10 we examine whether the volume of TMs contribute differently to underpricing. In this case we replace in Equation 1 the treatment variable *TMGranted* with *TMsBetwen1and2*, *TMsBetwen3and8* and *TMsMoreThan8*.[14] Column 1 considers all firms in the service sector. The coefficient of *TMsBetwen1And2* shows that firms with one or two TMs before IPO have 7% more underpricing than firms without any TMs. The coefficients of *TMsBetwen3and8* (or *TMsMoreThan8* show a similar difference between firms with the level of TMs and firms without. This analysis shows that for the service sector, there are no obvious non-linearities in the size of the TM portfolio and underpricing. This is further corroborated by Column 2 where we consider only the firms in the service industry that have TMs prior to IPO; by default, we exclude *TMsBetwen1And2* to avoid the dummy variable trap. In this case neither *TMsBetwen3And8* nor *TMsAbove8* are statistically different than zero supporting the previous results. In Column 3 we include all manufacturing firms, *TMsBetwen1And2* and *TMsMoreThan8show* are not different from zero. However, firms with average sized TM portfolio (more than two and less than nine) have one average 4.2% more underpricing than firms with no TMs. This indicates that these firms experience higher underpricing than firms without any TMs or firms with a different size of TM portfolio (Column 4 corroborates the latter result). Therefore, for this subset of manufacturing firms, TMs play a positive role in underpricing as in the case of the service firms. This could indicate that for these firms, asymmetric information is larger than for manufacturing firms that either have little to no TM activity or firms that have a sizeable TM portfolio.

Our overall results point to the positive role of TM activity in underpricing. This role however is by and large attributed to firms in the service sector with a notable exception for manufacturing firms with average sized TM portfolios.

5.2. Trademark activity, firm longevity and signaling quality

Thus far our baseline results point to the signaling hypothesis of trademark activity. Support for this hypothesis should imply that such firms with TM activity are more likely to perform better in the post-IPO period. This task is taken up in the final section of the results of

[14] *TMsBetwen1and2* takes the value of 1 if the firm has been issued between one and two trademarks before IPO and 0 otherwise. *TMsBetwen3and8* takes the value of 1 if the firm has been issued between three and eight TMs before IPO and 0 otherwise. *TMsMoreThan8* takes the value of 1 if the firms has been issued more than 8 TMs before IPO and 0 otherwise.

this paper. We do collect data on the survivability of our firms in the sample. In particular we collect in years, the time that each firm remains public.[15] We then examine the hazard rate of exiting the stock market following the Cox proportional hazard model (Cox 1972):

$$h_{Exit}(t, TMGranted_i, Controls_i) = h_0(t)exp(\beta o + \beta_1 TMGranted_i + \beta_2 Controls_i)$$

where h_{Exit} is the probability that the firm *i* exits the stock market (gets delisted) at period *t* (counted in years, from the firm's IPO month), given that it has not been previously delisted. The rest of the variables are defined similarly to Section 3. Our interest here is on β_1. A negative $\beta_1$sign of would show that firms with TM activity prior to IPO, have a lower hazard of being delisted. This would provide support for our aforementioned results.

Starting with the graphical analysis, Figure 1 compares Nelson-Aalen cumulative hazard estimates for firms with TM and w/o TM activity. Firms with TMs have a smaller hazard of exiting throughout the entire time span. Figure 2 compares the Kaplan-Meier survival estimates for both groups and shows similar results. Firms with TM activity are more likely to survive throughout the entire period. For instance, in the 15th year after the IPO, firms with TM activity are roughly 20% more likely to have survived than firms without TM activity.

Our econometric analysis is presented in Table 11. Column 1 considers all firms. Firms with TM activity prior to IPO have a 1-exp(-0.692)=50% less hazard to get delisted from the US stock market than firms w/o TMs. This difference is statistically significant at the 1% level. This result is in line with the outcome from table 5 and provides prima facie support for the signaling quality theory of IPO underpricing, since firms which will stay longer in the secondary market will have more opportunities to raise capital by issuing new shares in better terms. The context of issuance in SEO underpricing terms should compensate firms for too much underpricing at the IPO.

We also distinguish between firms in the service and manufacturing industries. Both types of firms with TM activity have a similar difference with their non-TM counterparts. This shows that presence of TMs is related to a reduction in the hazard of being delisted. To account for any censoring issues, in Columns 4-6, we exclude firms with IPO year on or after 2012. The

[15] Of these, 374 have TM activity prior to IPO.

difference in the hazard rates is now even bigger in favor of firms with TMs while remaining significant at the 1% level.

6. Conclusion

TMs are an important business tool that firms employ to protect their innovative products and services and increase their visibility in the market. Unsurprisingly, numerous studies have examined their role in a variety of corporate events and finance metrics. However, to this date we do know little about their role in IPOs and in particular in IPO underpricing. A notable exception is the recently published working paper by Chemmanur *et al.* (2018) where they examine the role of TMs in the probability of exiting via an IPO and post-IPO market valuation. In our study we dwell deeper into the role of TMs as an information mechanism and explicitly examine the relationship between TMs and IPO underpricing.

Given the intricacies of both TMs, as intangible assets and what they represent in terms of innovation and differentiation, and IPOs, as a funding mechanism and market signal, we borrow arguments from information theory to predict the sign of the relationship. We posit that there are strong arguments both in favor and against increased underpricing. Empirically, we find asymmetric information to dominate any visibility attributed to TMs; as a result, for the average firm the presence of TMs increases underpricing. We further argue that firms with TMs are likely to signal their higher value by tolerating higher underpricing. We find support for this argument as such firms have a lower hazard of being delisted and raise capital with better terms in later financing.

Our results are also heterogeneous by type industry. Investors and consumers may not be able to readily associate TMs with innovative services as opposed to physical products. Consistent with our theoretical arguments, we find that indeed it is the service sector that primarily drives this positive relationship TMs and IPO underpricing. A notable exception that also contributes to this relationship is firms in the manufacturing sector with average sized TM portfolios.

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Table 1. Summary Statistics by trademark activity.

	Full Sample (N= 2275)				IPOs with TMs (N = 533)				IPOs without TMs (N=1742)				P-value of T - Diff
	Mean	Median	Min	Max	Mean	Median	Min	Max	Mean	Median	Min	Max	
	s.d.				s.d.				s.d.				
Panel A – IPO underpricing													
ln(Underpricing+1)	14.08	6.95	-97	114.2	19.3	14.71	-91	109.4	12.49	5.14	-97	114.2	00.0
	23.49				25.1				22.75				
Panel B– IPO characteristics													
Proceeds	184.16	80.00	5.10	21767.22	212.11	78.00	6.00	16006,88	175.60	81.225	5.10	21767,22	0.29
	708.44				1009,55				586.34				
Revisions	-1.07	0.00	-83.33	56.25	-0.18	0.00	-69.23	56.25	-1.34	0.00	-83.33	40	0.08
	13.45				14.08				13.24				
Earnings	0.48	0.00	0.00	1.00	0.45	0.00	0.00	1	0.49	0.00	0.00	1.00	0.09
	0.50				0.49				0.50				
Leverage	0.63	0.36	0.00	81.50	0.66	0.33	0.00	26.22	0.63	0.38	0.00	81.50	0.77
	2.21				1.50				2.37				
FirmAge	17.31	9.00	0.00	224.00	17.05	10.00	0.00	158.00	17.40	8.00	0.00	224.00	0.77
	24.34				21.03				25.27				
UnderwriterRank	0.52	1.00	0.00	1.00	0.60	1.00	0.00	1.00	0.49	0.00	0.00	1.00	0.00
	0.49				0.48				0.50				
Internet	0.84	0.00	0.00	1.00	0.08	0.00	0.00	1.00	0.08	0.00	0.00	1.00	0.86
	0.27				0.27				0.27				
Technology	0.31	0.00	0.00	1.00	0.47	0.00	0.00	1.00	0.27	0.00	0.00	1.00	0.00
	0.46				0.49				0.44				
Nasdaq	0.66	1.00	0.00	1.00	0.75	1.00	0.00	1.00	0.63	1.00	0.00	1.00	0.00
	0.47				0.43				0.48				
Overhang	4.30	2.82	0.00	88.63	4.55	3.27	0.00	88.63	4.22	2.68	0.00	76.37	0.31
	6.66				6.36				6.75				

Notes: This table reports descriptive statistics for a sample of 2,275 U.S. IPOs announced from 1 January, 1997 to 30 Nov, 2016 along with the sub-samples of IPOs with and without TMs activity. All IPOs come from the Securities Data Company (SDC) database. The statistics provided include the mean, median, minimum, maximum and standard deviation for the dependent variables and all control variables used in the subsequent regressions. The presentation of each variable concludes with a test for difference in the sub-sample means. Panel A describes our main measures of IPO pricing, i.e. *underpricing* and *revisions*. Panel B describes the IPO firm characteristics which we control for in our analysis. Share price data is from CRSP; accounting data is from Compustat. All variables are defined in Appendix A.

Table 2. Pairwise Correlations.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Underpricing	1.00											
TMGranted	0.12	1.00										
FirmAge	-0.07	-0.01	1.00									
Proceeds	-0.01	0.02	0.13	1.00								
Earnings	-0.04	-0.04	0.10	0.04	1.00							
UnderwriterRank	0.07	0.09	0.10	0.16	0.02	1.00						
Revisions	0.42	0.04	-0.05	0.04	0.04	0.10	1.00					
Overhang	0.11	0.02	-0.05	-0.01	-0.04	0.10	0.09	1.00				
Leverage	-0.04	0.01	-0.01	-0.02	0.01	-0.03	-0.06	-0.03	1.00			
Nasdaq	0.10	0.11	-0.22	-0.16	-0.15	-0.33	0.00	0.00	0.02	1.00		
Technology	0.19	0.18	-0.17	-0.02	-0.10	0.03	0.13	0.11	-0.04	0.19	1.00	
Internet	0.15	0.00	-0.14	0.05	-0.07	0.00	0.12	0.08	-0.01	0.12	0.23	1

Notes: This table reports pairwise correlations of variables used in the study. The sample includes 2,275 U.S. IPOs announced between 1997 and 2016. IPO deals are retrieved from the Securities Data Company (SDC) Database with aftermarket and accounting data obtained from CRSP and Compustat databases, respectively. TM data comes from the Orbis database and from the United States Patent and Trademark Office (USPTO). All variables are defined in Appendix A.

Table 3. IPO distribution by issue year and industry.

Panel A: Distribution of IPOs, 1997-2016

	From the IPO date to November 2016		From the IPO date to five years after the offering	
	N	*%*	*N*	*%*
Failed	1,336	58,7	706	42.1
Survived	939	41.3	970	57.9
Total	2275	100.00	1,676	100.00

Panel B: Distribution by issue year

Year	All IPOs	Failed		Survived	
	N	*N*	*%*	*N*	*%*
1997	198	91	45.9	107	54.1
1998	141	69	48.9	72	51.1
1999	202	108	53.5	94	46.5
2000	168	81	48.2	87	51.8
2001	44	14	31.8	30	68.2
2002	45	17	37.8	28	62.2
2003	51	22	43.1	29	56.9
2004	150	53	35.3	97	64.7
2005	120	40	33.3	80	66.7
2006	148	52	35.1	96	64.9
2007	146	57	39	89	61
2008	19	6	31.6	13	68.4
2009	40	16	40	24	60.00
2010	111	32	28.9	79	71.1
2011	87	26	29.9	61	70.1
2012	98	-	-	-	-
2013	168	-	-	-	-
2014	216	-	-	-	-
2015	108	-	-	-	-
2016	15	-	-	-	-
Total	2275	-	-	-	-

Panel C: Distribution by industry

Industry	From the IPO date to November (1997-2016)						From the IPO date to five years after the offering (1997-2011)					
	All IPOs		Failed		Survived		All IPOs		Failed		Survived	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Service	1,414	62,1	773	34.00	641	28.2	1,076	64.2	473	28.2	603	36.00
Manufacturing	861	37,9	470	20.6	391	17.2	600	35.8	233	13.9	367	21.9
Total	2275	100.00	1243	54.6	1032	45.4	1,676	100	706	42.1	970	57.9

Notes: The table presents the distribution of the overall sample by year and by sector for two groups of IPO firms: survived and failed firms. Survived firms are those that are still trading (delisting code of 100). Failed firms are those that are delisted due to acquisitions (delisting code from 200 to 299) and for negative reasons (delisting code greater than or equal 300). *N* denotes the number of observations. Delisting is tracked for five years after the IPO.

Table 4. Survival distribution of IPO firms which have at least one granted trademark and those with no granted trademark.

Panel A: Survival distribution by issue year (1997-2011)

Year	TM Granted	Number and percentage of IPO firms		Cumulative number and percentage of failed firms									
				Within 1 year		Within 2 years		Within 3 years		Within 4 years		Within 5 years	
		N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
1997	Yes	30	48.60	1	3	1	3	2	6	4	13.3	5	16.6
	No	167	51.40	15	8.9	43	25.7	72	43.1	93	55.6	102	61
1998	Yes	20	48.60	0	0.00	2	10	2	10	3	15	3	15
	No	125	51.40	17	13.6	36	28.8	54	43.2	59	47.2	68	54.4
1999	Yes	40	48.60	3	7.5	7	17.5	8	20	9	22.5	9	22.5
	No	161	51.40	29	18	63	39.1	81	50.3	89	55.2	98	60.8
2000	Yes	37	36.80	0	0.00	3	8.1	6	16.2	9	24.3	11	29.7
	No	130	63.20	21	16.1	43	33	57	43.8	62	47.6	69	53
2001	Yes	11	26.67	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	No	34	73.33	2	5.8	6	17.6	7	20.5	15	44.1	15	44.1
2002	Yes	10	23.33	0	0.00	1	1	2	20	2	20	3	30
	No	35	76.67	4	11.4	6	17.1	10	28.5	12	34.2	14	40
2003	Yes	15	56.41	0	0.00	0	0.00	2	16.6	3	20	5	33.3
	No	36	43.59	3	8.3	8	22.2	8	22.2	12	33.3	17	47.2
2004	Yes	47	61.05	1	2.1	2	4.2	5	10.6	8	17	9	19.1
	No	104	38.95	3	2.8	9	8.6	26	25	40	38.4	45	43.2
2005	Yes	28	52.11	1	3.5	1	3.5	3	10.7	5	17.8	8	28.5
	No	93	47.89	5	5.3	14	15	22	23.6	27	29	33	35.4
2006	Yes	27	63.86	0	0	3	11.1	3	11.1	6	22.2	7	25.9
	No	122	36.14	5	4	18	14.7	28	22.9	40	32.7	46	37.7
2007	Yes	32	57.14	0	0.00	1	3.1	4	12.5	6	18.7	10	31.2
	No	113	42.86	8	7	18	15.9	28	24.7	39	34.5	47	41.5
2008	Yes	5	57.14	0	0.00	0	0.00	0	0.00	0	0.00	1	20
	No	14	42.86	1	7.1	4	28.5	4	28.5	4	28.5	5	35.7
2009	Yes	8	43.33	0	0.00	0	0.00	0	0.00	1	12.5	1	12.5
	No	32	56.67	1	3.1	5	15.6	9	28.1	12	37.5	15	46.8
2010	Yes	29	43.33	0	0.00	0	0.00	1	3.4	2	6.8	3	10.3
	No	84	56.67	7	8.3	11	13	14	16.6	25	29.7	31	36.9
2011	Yes	25	43.33	0	0.00	1	4	3	12	4	16	5	20
	No	62	56.67	1	1.6	9	14.5	13	20.9	16	25.8	21	33.8
1997-2011	Yes	364	21.7	6	1.6	20	5.4	41	11.2	62	17	80	21.9
	No	1312	78.3	122	9.2	293	22.3	433	33	545	41.5	626	47.7

Panel B: Survival distribution by industry (1997-2011)

Industry (two-digit SIC code)	TM Granted	Number and percentage of IPO firms		Cumulative number and percentage of failed firms									
				Within 1 year		Within 2 years		Within 3 years		Within 4 years		Within 5 years	
		N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Service	Yes	192	11.4	3	2	10	0.6	23	1.4	36	2.2	42	2.5
Service	No	884	52.8	86	5.1	213	12.7	306	18.3	382	22.8	431	25.7
Manufacturing	Yes	172	10.3	3	2	10	0.6	18	1.1	26	1.6	38	2.3
Manufacturing	No	428	25.5	36	2.1	80	4.8	127	7.6	163	9.7	195	11.6
Total firms with trademarks	Yes	364	23.4	6	4	20	0.12	41	2.5	62	3.8	80	4.8
Total firms without trademarks	No	1,312	76.6	122	7.2	293	17.5	433	25.9	545	35.2	626	37.3
Total firms		1676	100	128	11.2	313	17.17	474	28.4	607	36.3	706	42.1

Notes: The table presents the comparison of the distribution and cumulative failure rates by issue year and industry between the two groups of IPO firms: those with a *TMGranted* and those who don't. The cumulative number and percentage of failed firms are examined for five years after the offering. *N* denotes the number of observations.

Table 5. The Role on TMs on SEO proceeds and underpricing.

TM Granted	Number of firms	Number of SEO	SEO/firm	SEO primary proceeds per firm	SEO total proceeds	SEO underpricing
Yes	293	645	2.20	1.06	1.44	0.04
No	705	1,728	2.45	1.33	1.55	0.23
Total	998	2373	2.37	-	-	-

Notes: The table presents the distribution of univariate analyses of SEO for both groups of firms those with *TMGranted* and those with no TMs.

Table 6. Role of TM activity in IPO underpricing.

	Dependent Variable: $\ln(Underpricing + 1)$			
VARIABLES	(1)	(2)	(3)	(4)
TMGranted	0.041***	0.310***		
	(0.011)	(0.0575)		
TMFiled			0.035***	0.320***
			(0.012)	(0.0605)
FirmAge	-0.000	-0.000241	-0.000	-0.000185
	(0.000)	(0.000159)	(0.000)	(0.000156)
Proceeds	-0.000	-1.34e-05***	-0.000	-1.32e-05***
	(0.000)	(4.34e-06)	(0.000)	(4.24e-06)
Internet	0.030	0.0207	0.030	0.0182
	(0.021)	(0.0262)	(0.021)	(0.0262)
Earnings	0.003	-0.00274	0.004	-0.00170
	(0.010)	(0.00945)	(0.010)	(0.00944)
Nasdaq	0.013	0.0190*	0.013	0.0195*
	(0.009)	(0.0115)	(0.009)	(0.0113)
Technology	-0.003	0.0109	-0.003	0.0103
	(0.017)	(0.0149)	(0.017)	(0.0147)
UnderwriterRank	0.021**	0.0225**	0.021**	0.0207**
	(0.010)	(0.0103)	(0.010)	(0.0104)
Revisions	0.005***	0.00558***	0.005***	0.00565***
	(0.000)	(0.000343)	(0.000)	(0.000339)
Overhang	0.001*	0.00131*	0.001*	0.00112
	(0.001)	(0.000722)	(0.001)	(0.000708)
Leverage	-0.001	-0.00180	-0.001	-0.00170
	(0.001)	(0.00205)	(0.001)	(0.00214)
Observations	2,275	1,425	2,275	1,425
R-squared	0.162		0.161	
Year FE	YES	YES	YES	YES
SIC FE	YES	YES	YES	YES

Notes: Columns 1 and 2 include *TMGranted* as focal independent variable. Column1 is estimated via OLS. Column 2 instruments *TMGranted* with the industry's average Market-to-Book Ratio. In Columns 3 and 4, for robustness, instead of considering *TMGranted* we consider the dummy *TMFiled*. As with the two previous columns, Column 3 is estimated via OLS Column 4 instruments *TMFiled* with the industry's average Market-to-Book Ratio. In all columns, standard errors reported in parentheses are adjusted for heteroskedasticity. An asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 7. Role of TM activity in IPO underpricing. Propensity Score Matching.

	Dependent Variable: $\ln(Underpricing + 1)$					
	Treatment Variable: *TMGranted*			Treatment Variable: *TMFiled*		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Nearest neighbor	0.049**			0.021		
	(0.024)			(0.018)		
Kernel		0.045***			0.039***	
		(0.013)			(0.013)	
Stratification			0.040***			0.033***
			(0.013)			(0.013)
Observations	2,275	2,275	2,275	2,275	2,275	2,275

Notes: Propensity score techniques. In Columns 1-3 we select the *TMGranted* dummy based on the control variables of Table 2; that is, *FirmAge, Proceeds, Internet, Earnings, Nasdaq, Technology, UnderwriterRank, Revisions, Overhang* and *Leverage*. In Columns 4-6, for robustness, we select *TMFiled* based on the aforementioned variables. Columns 1 and 4 employ the nearest neighbor method, Columns 2 and 5 the kernel and Columns 3 and 6 the stratification method (Zhao 2004). An asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 8. Role of TM activity in IPO Underpricing by industry.

	Dependent Variable: $\ln(Underpricing + 1)$		
VARIABLES	(1)	(2)	(3)
TMGranted	0.073***	0.013	0.015
	(0.016)	(0.014)	(0.014)
Service			-0.011
			(0.010)
TMGranted_x_Service			0.057***
			(0.020)
FirmAge	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Proceeds	-0.000	-0.000*	-0.000
	(0.000)	(0.000)	(0.000)
Internet	0.038*	0.062**	0.035*
	(0.022)	(0.031)	(0.020)
Earnings	0.010	-0.011	0.002
	(0.013)	(0.013)	(0.010)
Nasdaq	0.014	0.021	0.017*
	(0.011)	(0.013)	(0.009)
Technology	-0.004	0.026	0.007
	(0.020)	(0.016)	(0.013)
UnderwriterRank	0.025*	0.017	0.020**
	(0.015)	(0.012)	(0.010)
Revisions	0.006***	0.004***	0.005***
	(0.001)	(0.000)	(0.000)
Overhang	0.002	0.001	0.001**
	(0.001)	(0.001)	(0.001)
Leverage	-0.010	-0.001	-0.001
	(0.006)	(0.001)	(0.001)
Observations	1,414	861	2,275
R-squared	0.158	0.178	0.159
Year FE	YES	YES	YES

Notes: All Columns are estimated via OLS. Columns 1 considers only firms in the services sectors; Column 2 considers only firms in manufacturing sectors. Column 3 considers the entire sample and includes an interaction of *TMGranted*Service=TMGranted_x_Service*. *Service* takes the value of 1 if the firm belongs in the service sector and 0 otherwise. In all columns, standard errors reported in parentheses are adjusted for heteroskedasticity. An asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 9. Role of TM activity in IPO underpricing. Propensity Score Matching.

	Dependent Variable: $\ln(Underpricing + 1)$ Treatment Variable: *TMGranted*					
	Only Firms in the Service Sectors			Only Firms in the Manufacturing Sectors		
METHOD	(1)	(2)	(3)	(4)	(5)	(6)
Nearest neighbor	0.090**			-0.014		
	(0.036)			(0.024)		
Kernel		0.075***			0.012	
		(0.017)			(0.016)	
Stratification			0.074***			0.013
			(0.019)			(0.015)
Observations	1,414	1,414	1,414	861	861	861

Notes: Propensity score techniques. In all Columns we select the *TMGranted* dummy based on the control variables of Table 2; that is, *FirmAge, Proceeds, Internet, Earnings, Nasdaq, Technology, UnderwriterRank, Revisions, Overhang* and *Leverage*. In Columns 1-3, we only consider firms in the service sectors; in Columns 4-6 we only consider firms in the manufacturing sectors. In Columns 1 and 4 we employ the nearest neighbor method, Columns 2 and 5 the kernel and Columns 3 and 6 the stratification method (Zhao 2004). An asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 10. Role of TM volume in IPO Underpricing by industry.

	Dependent Variable: $\ln(Underpricing + 1)$			
	Only Firms in the Service Sectors		Only Firms in the Manufacturing	
	All Firms	Firms with TMs prior to IPO	All Firms	Firms with TMs prior to IPO
VARIABLES	(1)	(2)	(3)	(4)
TMsBetwen1and2	0.071***		-0.002	
	(0.025)		(0.015)	
TMsBetwen3and8	0.075***	0.003	0.042**	0.051**
	(0.022)	(0.030)	(0.017)	(0.023)
TMsMoreThan8	0.073***	-0.014	-0.005	0.001
	(0.022)	(0.033)	(0.053)	(0.058)
FirmAge	0.000	0.000	-0.000	-0.001
	(0.000)	(0.001)	(0.000)	(0.001)
Proceeds	-0.000	-0.000***	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Internet	0.038*	0.098**	0.065**	-
	(0.022)	(0.046)	(0.031)	(-)
Earnings	0.010	0.002	-0.012	-0.023
	(0.013)	(0.024)	(0.013)	(0.029)
Nasdaq	0.014	-0.043	0.020	-0.015
	(0.011)	(0.027)	(0.013)	(0.029)
Technology	-0.004	0.018	0.024	-0.003
	(0.020)	(0.027)	(0.017)	(0.028)
UnderwriterRank	0.025*	0.013	0.016	0.016
	(0.015)	(0.028)	(0.013)	(0.024)
Revisions	0.006***	0.008***	0.004***	0.005***
	(0.001)	(0.001)	(0.000)	(0.001)
Overhang	0.002	0.000	0.001	0.002
	(0.001)	(0.002)	(0.001)	(0.002)
Leverage	-0.010	0.002	-0.001	0.002
	(0.006)	(0.007)	(0.001)	(0.003)
Observations	1,414	273	861	260
R-squared	0.158	0.333	0.181	0.168
Year FE	YES	YES	YES	YES

Notes: All Columns are estimated via OLS. *TMsBetwen1and2* takes the value of 1 if the firm has been issued between one and two TMs before IPO and 0 otherwise. *TMsBetwen3and8* takes the value of 1 if the firm has been issued between three and eight TMs before IPO and 0 otherwise. *TMsMoreThan8* takes the value of 1 if the firms have been issued more than 8 TMs before IPO and 0 otherwise. In all columns, standard errors reported in parentheses are adjusted for heteroskedasticity. An asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 11. Estimation of Cox proportional hazards model of probability of delisting.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
TMGranted	-0.692***	-0.697***	-0.698***	-0.804***	-0.802***	-0.835***
	(0.0730)	(0.0980)	(0.112)	(0.0796)	(0.106)	(0.123)
FirmAge	-0.00226*	-0.00352*	-0.00248	-0.00230	-0.00389*	-0.00237
	(0.00132)	(0.00188)	(0.00193)	(0.00140)	(0.00201)	(0.00201)
Proceeds	-0.000326**	-0.000323*	-0.000300	-0.000246	-0.000221	-0.000237
	(0.000146)	(0.000178)	(0.000278)	(0.000155)	(0.000193)	(0.000253)
Earnings	-0.113**	-0.0359	-0.265***	-0.114*	-0.0293	-0.292***
	(0.0565)	(0.0704)	(0.0978)	(0.0602)	(0.0744)	(0.106)
UnderwriterRank	-0.133**	-0.196***	-0.0327	-0.159**	-0.222***	-0.0449
	(0.0608)	(0.0758)	(0.101)	(0.0648)	(0.0796)	(0.110)
Revisions	-0.000712	-0.00256	0.00277	-0.000177	-0.00175	0.00317
	(0.00214)	(0.00280)	(0.00343)	(0.00234)	(0.00302)	(0.00379)
Overhang	-0.00360	-0.0109**	0.00876*	-0.00125	-0.00817	0.00955*
	(0.00372)	(0.00509)	(0.00495)	(0.00384)	(0.00513)	(0.00505)
Leverage	-0.00427	0.0607	-0.00822	-0.00174	0.0708	-0.00625
	(0.0114)	(0.0441)	(0.0143)	(0.0120)	(0.0468)	(0.0156)
Nasdaq	0.192***	0.287***	0.00162	0.246***	0.356***	0.0297
	(0.0721)	(0.0896)	(0.129)	(0.0788)	(0.0990)	(0.136)
Technology	0.268***	0.372***	0.0333	0.259***	0.399***	-0.0884
	(0.0832)	(0.102)	(0.141)	(0.0881)	(0.107)	(0.151)
Internet	0.0963	0.0681	0.0757	0.166	0.122	0.0645
	(0.109)	(0.114)	(0.240)	(0.117)	(0.121)	(0.245)
Observations	2,263	1,405	858	1,666	1,069	597

Notes: The table illustrates the estimation of Cox proportional hazards model of probability of delisting. Column 1 considers all firms. The overall sample is reduced by 12 firms as these firms exited at the year of IPO (t=0). Column 2 considers all firms in the service sector and Column 3 all firms in the manufacturing sector. To avoid any censoring issues in Columns 4-6 we run similar regressions by restricting the sample to firms with IPO year prior to 2012. IPO year fixed effects are included in all specifications. In all columns, standard errors reported in parentheses are adjusted for heteroskedasticity. An asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Figure 1. Survival function of IPO firms by TM activity.

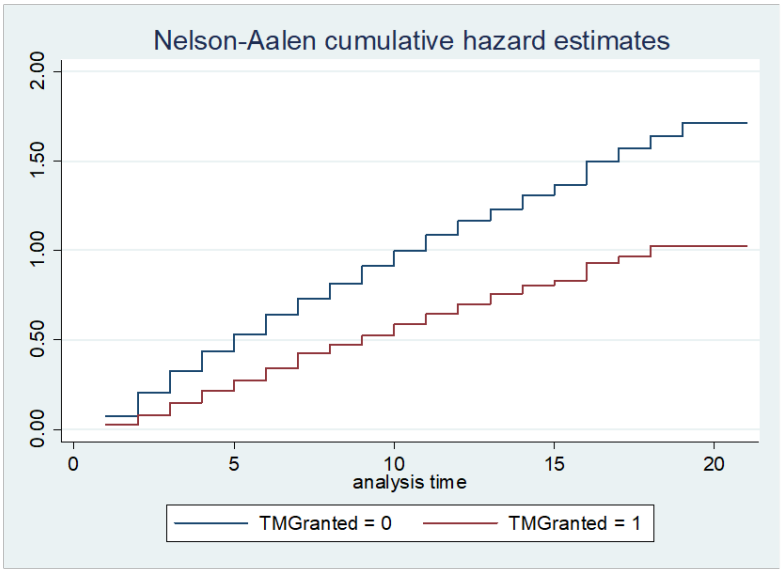
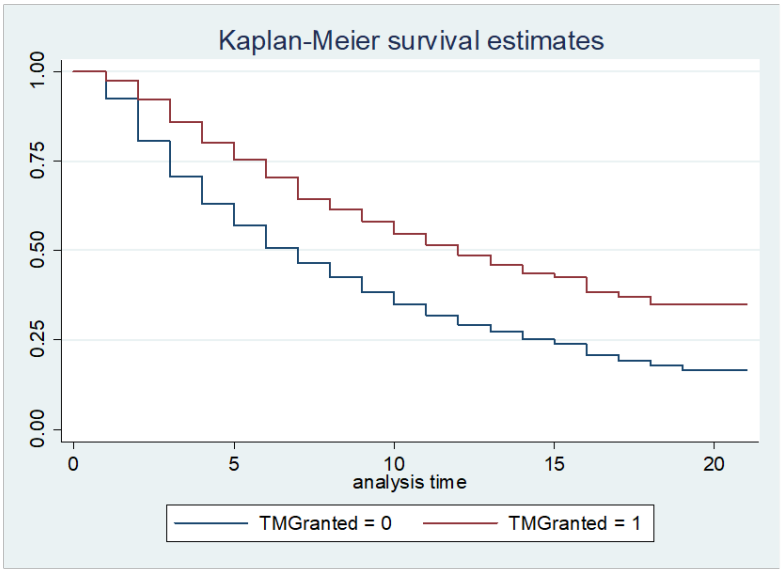


Figure 2. Survival estimates of IPO firms by TM activity.



APPENDIX

Table A.1. Variable names and definitions.

Variables	Definition
Dependent Variable:	
Underpricing	First day return is the difference between the closing price and offer price divided by offer price. Data provided from CRISP.
Treatment Variables:	
TMGranted	Dummy variable set to 1 for firms with at least one Trademark (TM) before the IPO procedure, else 0.
TMFiled	Dummy variable set to 1 for firms with at least one Trademark (TM) before the IPO procedure, else 0.
TMsBetwen1and2	Dummy variable that takes the value of 1 if the firm has been issued between one and two TMs before IPO and 0 otherwise.
TMsBetwen3and8	Dummy variable that takes the value of 1 if the firm has been issued between three and eight TMs before IPO and 0 otherwise.
TMsMoreThan8	Dummy variable that takes the value of 1 if the firms has been issued more than 8 TMs before IPO and 0 otherwise.
Control Variables:	
FirmAge	The number of years from the firm's initial incorporation to the IPO date. This information is acquired from Field-Ritter database.
Overhang	The ratio of shares retained by the old shareholders divided by the shares issued.
Proceeds	Amount of money equal to the number of shares issued times the offer price.
Revisions	Change of the IPO offer price from the midpoint of the initial filing price range.
Earnings	Dummy variable that takes the value of 1 if the year prior to the IPO the firm discloses earnings and 0 otherwise.
Leverage	The ratio of total liabilities to total assets in the year before the IPO.
UnderwriterRank	Dummy variable that takes the value of 1 for Underwriters of with rank greater than eight as provided in the Loughran and Ritter (2004) database and 0 otherwise.
Internet	Dummy variable that takes the value of 1 for firms that are classified by Thomson Financial SDC as operating with internet in their business description. This information is drawn via the terms "Internet", "Online", "eBusiness", "eCommerce".
Technology	Dummy variable that takes the value of 1 for firms with SIC codes 3571, 3572, 3575, 3577, 3578 ,3661, 3663, 3669, 3671, 3672, 3674, 3675, 3677, 3678, 3679 ,3812, 3823, 3825, 3826, 3827, 3829 ,3841, 3845, 4812, 4813 ,4899, 7371, 7372, 7373, 7374, 7375, 7378 else 0.
Nasdaq	Dummy variable that takes the value of 1 to 1 for NASDAQ-listed firms, else 0.

Table A.2. Role of TM activity in IPO Underpricing by industry

	Dependent Variable: $\ln(Underpricing + 1)$		
VARIABLES	(1)	(2)	(3)
TMGranted	0.067***	0.013	0.013
	(0.016)	(0.014)	(0.014)
Service			-0.005
			(0.010)
TMGranted_Service			0.055***
			(0.020)
FirmAge	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Proceeds	-0.000	-0.000*	-0.000
	(0.000)	(0.000)	(0.000)
Internet	0.024	0.062**	0.023
	(0.022)	(0.031)	(0.020)
Earnings	-0.002	-0.011	-0.006
	(0.013)	(0.013)	(0.009)
Nasdaq	0.016	0.021	0.018**
	(0.011)	(0.013)	(0.008)
Technology	0.010	0.026	0.016
	(0.020)	(0.016)	(0.013)
UnderwriterRank	0.043***	0.017	0.030***
	(0.012)	(0.012)	(0.009)
Revisions	0.006***	0.004***	0.005***
	(0.001)	(0.000)	(0.000)
Overhang	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Leverage	-0.008	-0.001	-0.001
	(0.006)	(0.001)	(0.001)
Observations	1,207	861	2,068
R-squared	0.181	0.178	0.175
Year FE	YES	YES	YES

Notes: This Table reports regression results of IPO underpricing. All Columns are estimated via OLS. Columns 1 considers only firms in the services sectors; Column 2 considers only firms in manufacturing sectors. Column 3 considers the entire sample and includes an interaction of *TMGranted*Service=TMGranted_Service*. *Service* takes the value of 1 if the firm belongs in the service sector and 0 otherwise. In all columns, standard errors reported in parentheses are adjusted for heteroskedasticity. An asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table A.3. Role of TM activity in IPO underpricing by industry.
Propensity Score Matching. Expand control sample.

Dependent Variable: $\ln(Underpricing + 1)$
Treatment Variable: *TMGranted*

	Exclude Firms in Manufacturing Sectors with TMs prior to IPO			Exclude Firms in Service Sectors with TMs prior to IPO		
METHOD	(1)	(2)	(3)	(4)	(5)	(6)
Nearest neighbor	0.048*			0.040		
	(0.025)			(0.025)		
Kernel		0.076***			0.013	
		(0.017)			(0.016)	
Stratification			0.076***			0.012
			(0.021)			(0.015)
Observations	2,015	2,015	2,015	2,002	2,002	2,002

Notes: Propensity score techniques. In all Columns we select the *TMGranted* dummy based on the control variables of Table 2; that is, *FirmAge, Proceeds, Internet, Earnings, Nasdaq, Technology, UnderwriterRank, Revisions, Overhang* and *Leverage*. In Columns 1-3, we consider all firms in the service sectors and firms in the manufacturing sectors without TMs; in Columns 4-6 we consider all firms in the manufacturing sectors and firms in the service sectors without TMs. In Columns 1 and 4 we employ the nearest neighbor method, Columns 2 and 5 the kernel and Columns 3 and 6 the stratification method (Zhao 2004). An asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.