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## **When vicarious learning rewards the originating firm: An exploratory study of the learning opportunities available to the licensor**

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### **Abstract**

Why should companies engage in licensing-out? While conventional wisdom mostly focuses on the financial and commercial benefits available to the licensor, this paper points to the learning opportunities entailed in licensing agreements. We develop an exploratory study and analyze a dataset of 433 deals. We identify all cases in which two parties invert their roles in a second licensing round, as a result of the vicarious learning opportunities exploited by the licensor; and we compare this sub-sample with all the licensor-licensee dyads in which the licensor never licenses back a technology from its initial licensee. Preliminary results are consistent with a learning scenario, thus prompting further empirical research.

## **When Vicarious Learning Rewards the Originating Firm: Exploring Learning Opportunities Available to the Licensor**

### **ABSTRACT**

Why should companies engage in licensing-out? While conventional wisdom mostly focuses on the financial and commercial benefits available to the licensor, this paper points to the learning opportunities entailed in licensing agreements. We develop an exploratory study built around a longitudinal cross-industry database of 558 licensing deals and we apply the vicarious learning framework to analyze the learning opportunities exploited by the licensor, as a result of engaging with a particular licensee in the first place. We investigate the licensor-licensee dyads on several dimensions, capturing their profiles and the different learning opportunities exploited; we also compare dyads that invert their role in a subsequent round to dyads that do not to understand whether there are difference in terms of learning patterns. Findings offer several insights consistent with a learning scenario, thus prompting further empirical research.

### **Keywords:**

Licensing, vicarious learning, learning benefits, exploratory study.

# **When Vicarious Learning Rewards the Originating Firm: Exploring Learning Opportunities Available to the Licensor**

## **1. INTRODUCTION**

The current increasing environmental uncertainty characterizing the competitive markets encourages firms - when faced with insufficient information from their own experience - to strongly rely on other firms' practices for interpreting their own challenges and situations (Baum et al., 2000; Levinthal & March, 1993). The literature defines this phenomenon as vicarious learning, which occurs when firms (the recipients) attempt to collect new external knowledge by observing other companies' (the originators) strategies, administrative practices, and actions (March, 1991). Through vicarious learning, firms are able to explore new external knowledge while choosing to implement or avoid actions or strategies based on their perceived impact (Cyert & March, 1963).

More recently, some authors (Yang et al., 2010; Yang & Steensma, 2014) have uncovered the potential of a new perspective on vicarious learning. It takes place when the innovator can learn vicariously by observing their imitators which have previously learned from it. According to the authors, the generation of possible re-combinations between the originator's and the recipient's knowledge base leads to potential inventions (Sorenson et al., 2006) and produces a common ground of expertise that can reward the originator by observing its imitator at a later stage. By holding this true, we posit that this new perspective on vicarious learning can help explain firm's engagement in licensing-out.

Licensing is increasingly conceived as an inter-firm partnership that allows firms to tap into other organizations' research outcomes (Arora et al., 2001; Athreye & Cantwell, 2007). In addition, a consistent number of works have put a spotlight on the learning effect of licensing-in (e.g. Arora & Ceccagnoli, 2006; Johnson, 2002; Leone et al., 2015). By recombining externally-sourced and internal knowledge, licensees can foster invention activity (Leone & Reichstein, 2012) and extend their technology search space (Laursen et al., 2010). We advance this stream of literature and suggest that licensing-out may allow the licensor to benefit from the vicarious learning opportunities spelled out by its downstream technology buyers, in such a way that engaging in licensing-out may also be considered a privileged strategy to build a fruitful relationship with learning partners.

Only one paper has so far explored the vicarious learning opportunities in the context of licensing, from the originator to the recipient and from the recipient back to the originator (see Srivastava & Wang, 2015). The authors have demonstrated empirically that licensing-out allows the licensor to improve its future patenting performance as a result of the spill-over effect of the interaction with the recipient organizations (licensees). We extend this contribution and examine the learning process occurring between a specific licensor-licensee dyads, by mapping and analyzing all licensing agreements they mutually engaged in over time. In this sense, we explore the circumstances in which the vicarious learning - activated in the first round - rewards the initial licensor - in the second round. Given the explorative nature of the research question, we set-up an exploratory study (Robson, 2002) to shed light on what has, so far, been considered as the disadvantage of licensing-out - that of losing the technological lead by giving away valuable learning opportunities to the licensee (i.e. Pitkethly, 2001).

Our research design builds on a longitudinal cross-industry database, compiled from 1984 to 2013, including information on 558 licensing agreements disclosed to the US Securities and Exchange Commission (SEC). The focus of our research centered on the learning opportunities that the licensor can seize while engaging in licensing deals. In

particular, we zoom into all the cases where the initial licensor and licensee interchanged their roles in a later year with respect to their original licensing deal. We posit that this particular circumstance underlies an idiosyncratic learning pattern. For this reason, we compare dyads that invert their role in a subsequent round to dyads that do not, to understand whether there are difference in terms of potential and channels of learning. The analysis shows interesting findings, which are consistent with a learning scenario, thus prompting further empirical research.

The contribution of the paper is threefold. First of all, our research contributes to the research on vicarious learning in the context of formal partnerships, such as acquisitions (Baum et al., 2000), strategic alliances (Lubatkin et al., 2001; Tsang, 1999) and, more broadly, internationalization processes (De Clercq et al., 2012), by providing empirical evidence in the case of licensing agreements. Second, the study embraces an original (organizational learning) perspective to analyze the licensing phenomenon by focusing on the learning opportunities available to the licensing parties. In this sense, our arguments propose to shift the analysis of licensing-out from the traditional ‘only seller’ to the ‘seller-and-buyer’ perspective, also termed ‘coupled process’ of open innovation (Gassmann & Enkel, 2004), which points to the benefits generated by firms engaging simultaneously in ‘giving’ and ‘taking’, such as licensing-out and licensing-in activities (Clarysse et al., 2009). Third, while to date scholars have investigated vicarious learning on the basis of a longitudinal patent data collected within a single industry (e.g. Yang et al., 2010), we specifically look at data on licensing agreements among firms operating in a number of industries. This allows a broader generalization of the results and a more in-depth understanding of the vicarious learning phenomenon within licensing deals.

The remainder of the paper is organized as follows. In the theory section we first recall the scope, application and implications of the concept of vicarious learning; we therefore develop the theoretical arguments explaining the learning benefits available to the licensor. For this purpose, we firstly focus on licensing agreements as a critical means to learn from other companies and then shift the attention to the consequences of licensors’ learning vicariously from their licensees. In the exploratory research section, we describe the data collected and the insights from the exploratory analysis of the phenomenon. We then conclude the study by highlighting the implications and directions for future research.

## **2. THEORETICAL FRAMEWORK**

### **2.1 Vicarious learning and inter-firm interactions**

The way firms learn from other firms is a widely debated issue in the literature. In particular, recent attempts have been made to unveil the way firms observe others in order to imitate them and enhance their innovative performance (e.g., Terlaak & Gong, 2008). Scholars define this process as vicarious learning, and it occurs when firms attempt to learn by observing the behaviors and actions of other firms (Cyert & March, 1963; Huber, 1991; Levitt & March, 1988; March, 1991). It has been described as a way to pursue a strategy of inter-organizational imitation (Hauschild & Miner, 1997) or, similarly, as a type of indirect learning (Bingham & Davis, 2012). By implying to learn from others’ experience, it can be considered a form of heuristic search (Cyert & March, 1963); in so doing, it does not require the observer to invest a great amount of resources (Huber, 1991), but only foresees the observation and evaluation of other companies. Such a learning process involves at least two parties: on the one hand the originating firm (also called the innovator), that is the company which has introduced an innovation or, more generally, produced a new technology; on the other hand the recipient firm (the imitator), say the organization which attempts to imitate it and replicate the innovator’s behavior by observation.

Existing studies investigate a variety of issues concerning vicarious learning among firms, such as the different modes of inter-organizational imitation (Haunschild & Miner, 1997), the mechanisms through which such imitation may unfold (DiMaggio & Powell, 1983), as well as the contexts in which it is likely to take place (e.g., acquisitions, market entry, etc.; Beckman & Haunschild, 2002; McKendrick, 2001). Scholars have also attempted to analyze the consequences resulting from this type of inter-organizational learning process. The traditional wisdom, built on the Resource-Based View principles, has emphasized the importance of controlling valuable resources as critical determinants of firms' competitive advantage (Barney, 1991; Pfeffer & Salancik, 1978). Hence, several studies have tried to understand how imitators can reap the benefits of innovator's knowledge spillovers (e.g., Cohen & Levinthal, 1990; Henderson & Cockburn, 1996; Zahra & George, 2002) and, symmetrically, how innovators may prevent them from replicating their sources of competitive advantage (Kogut & Zander, 1992; Lippman & Rumelt, 1982).

Recent literature has instead suggested a new perspective on the phenomenon, which is the consequence of the increasing blurring of boundaries between organizations. It explores how originating firms may benefit from the effects of the vicarious learning processes of recipient firms. Indeed, Yang et al. (2010) demonstrate that originating firms may learn from those organizations which have previously learned from them, thereby opening up a new avenues for conceptualizing the relationship between innovator and imitator. The authors propose that when an originating firm's knowledge spills over and is recombined and used by a recipient firm, a new pool of knowledge is created, which will be inherently based on the originating firm's knowledge base. Given the similarity between these two knowledge pools, the originating firm may find advantageous to learning vicariously from its recipients, thereby having the opportunity to exploit its own knowledge spillovers. Following this, recent research has investigated the conditions under which this mutual vicarious learning is more likely to occur. In particular, Yang and Steensma (2014) acknowledge that the extent to which originating firms learn from their recipients is dependent upon the degree of market uncertainty as well as their risk taking behavior, such that the higher the environmental uncertainty and their risk aversion, the more likely innovators will rely on their imitators for guidance on future explorations. Conversely, a greater risk orientation within dynamic markets would lead originating firms to rely less on what is known and rather emphasize the search for new knowledge domains. This argument is consistent with the idea that firms can strategically encourage external actors to copy their own technology in order to influence industry standards (Spencer, 2003). Similarly, it recalls the value incorporated in the 'selective revealing' strategies (e.g. Alexy et al., 2013; Harhoff et al., 2003; Henkel, 2006), which are aimed at intentionally disclosing internally developed knowledge. In this case, firm consciously make pieces of their own knowledge accessible to external actors, often for free and without contractual requirements. Such strategies are likely to foster firms' technological and market conditions, especially under adverse conditions, such as high partner uncertainty and high coordination costs (Alexy et al., 2013; Chesbrough, 2006).

## **2.2 Vicarious learning and licensing agreements**

The importance of licensing agreements in markets for technology is widely acknowledged. They represent a form of inter-firm relationship most frequently observed and a way to monetize intellectual property, especially in high-technology industries where licensing has been found to be critical for both exchanging knowledge and supporting R&D activities (Anand & Khanna, 2000; Arora & Fosfuri, 2003; Fosfuri, 2006; Walter, 2012). Recently, Rao and Klein (2015) underline that between 1999 and 2009 U.S. companies heavily engaged in cross-border technology licensing, whose receipts and payments of royalties have grown at an average annual rate of about 25 percent. This is particularly true

for technology giants, who are strongly benefitting from actively managing their portfolio of licensing agreements. For instance, as Walter (2012) highlights, IBM had licensing revenues of over \$1 billion in 1998, accounting for more than 10% of its net profits and Texas Instruments earned more than \$1.8 billion in royalties over the years 1986-1993, which mirrors almost its overall cumulative net income during that period. Besides these stunning numbers, what is more interesting in this trend is that big companies (i.e. Microsoft) have started foreseeing the future benefits from the relationship with the licensees and working closely with their counterparts because many of these partnerships spur further ideas and we can head back into the lab and build on those. Microsoft really benefits from these partnerships.” (Parr & Smith, 2005 on Microsoft's licensing strategy<sup>1</sup>).

Licensing literature has gradually paid attention to the learning opportunities available to the licensing parties. However, the authors have so far privileged the analysis of learning opportunities available to the recipient firm, the licensee (e.g. Arora & Ceccagnoli, 2006; Johnson, 2002; Leone & Reichstein, 2012; Leone et al., 2015), who can enjoy the effect of the recombination activity of internally and externally sourced knowledge. These works have overall emphasized the nature of licensing-in as a learning alliance, through which organizations can speed up capability development, such as more efficient internal R&D (Markman et al., 2005) in terms of faster and more productive patenting activity (Leone & Reichstein, 2012), and to mitigate technological uncertainties (Grant & Baden-Fuller, 1995; Lane & Lubatkin, 1998; Leone et al., 2015). Scant attention has instead been paid to the learning potential of licensing from the licensor's perspective. The reasons for this is that licensing-out was primarily driven by the desire to cash-in the “Rembrandts in the Attic” (Rivette & Kline, 1999), that represent a substantial (unused) pie of their patent stock, and also because of the fear of the licensors of losing the technological lead by giving away valuable learning opportunities to the licensee (i.e. Pitkethly, 2001). As a consequence, works have rather been concerned with understanding how licensors could inhibit licensees' attempts to take advantage of their own “accidental” knowledge spillovers (Hill, 1992; Choi, 2002) or how they can advantage of them through contractual safeguards (i.e. grant-back), which however have been proved to lower the licensee' incentive to learn and innovate (Leone & Reichstein, 2012. This latter case could therefore been considered against a learning scenario.

In order to contribute to the debate, we applied the vicarious learning framework to explore and investigate the role and strategic importance of the learning opportunities available to the originating firm by engaging in licensing activity with a particular licensing party. We overall suggest that licensing-out may allow the licensor to benefit from vicarious learning opportunities spelled out by its downstream technology buyers, in such a way that engaging in licensing-out may be considered a privileged strategy to build a fruitful relationship with learning partners. To the best of our knowledge, only one study has tackled the issue of vicarious learning in the licensing context. Srivastava and Wang (2015) empirically demonstrate that licensing-out is correlated with a superior patenting performance, because it allows the licensor to develop a better understanding of its knowledge repertoire and getting insights into the variety of ways in which its technologies are being used and applied by their licensing parties. We advance their contribution by investigating the learning opportunities available at the level of licensor-licensee couples. In this sense, we want to explore the possible patterns of learning that are disclosed upon the signature of a specific contract and that can reward the originator licensor in future. Investigated under this new perspective, licensing-out provides the licensor with a further valuable incentive to

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<sup>1</sup> Microsoft (2008) “Building a Business around a Licensed Technology”, available at <http://news.microsoft.com/2008/07/30/building-a-business-around-licensed-technology/>, last accessed on May 2016.

innovate (i.e. be the originator of a technology) and grant other companies the right to exploit it, as it may result in significant rewards in terms of learning and competitiveness. As such a full-fledged licensing-out strategy requires the licensor to map and grade its technology portfolio (Bianchi et al., 2011), by tapping into internal and external source of technological learning. As a consequence, licensing-out may entail an incredible opportunity for the licensor to build fruitful relationships with the best licensees that can learn from it.

Given the explorative nature of the research question, we set-up an exploratory study (Robson, 2002) to shed light on the learning opportunities the licensor can seize. In particular, we intend to understand whether, to what extent and in which circumstances the vicarious learning opportunities, derived from the licensed technology, reward the originating firm/initial licensor.

### **3. EXPLORATORY ANALYSIS**

Exploratory research is most useful and appropriate when there is very little existing research on the subject matter as well as when the precise nature of the problem is unclear and uncertain. It is a valuable means of finding out “what is happening; to seek new insights; to ask questions and to assess phenomena in a new light” (Robson, 2002:59). Similarly, its purpose is to “tackle new problems on which little or no previous research has been done” (Brown, 2006: 43), thus representing the potential basis of more conclusive research. Among the aims of this research method is therefore the identification of the salient factors or variables that may be relevant to the study of the topic, as well as to clarify the nature of a problem and to look for new insights to generate a deeper understanding of the issue, as is the case of this work. By virtue of its flexibility and adaptability to change, exploratory research can help in determining the research design, sampling methodology, data collection method (Singh, 2007) as well as to serve as a useful base for future theory-building (Stebbins, 2001). When conducting exploratory research, the researcher is therefore expected to be willing to change his/her direction as a result of new data and new insights emerging from the study (Saunders et al., 2007).

So far, the literature on licensing and knowledge transfer has widely benefitted from exploratory studies (see, for instance, Bercovitz et al., 2001; Frankenberger et al., 2014; Hagedoorn, 2003; Kathoefter & Leker, 2012; Siegel et al., 2003; Terpstra & Simonin, 1993), thus highlighting their importance for building a greater understanding of the issues linked to these phenomena.

#### **3.1 Data sources**

We selected licensing agreements as they allow us to identify a clear originator of a technology and the direction of knowledge flows between the licensor and licensee. Consistently, the analysis aimed at unveiling the information likely to show the vicarious learning opportunities underlying the relationship between licensor and licensee.

In order to do that, we rely on a longitudinal dataset including information on licensing agreements among firms from 1984 to 2013, disclosed to the USA EC, and compiled by KTMine<sup>2</sup>. The original dataset contained information on the Agreement Date, Filing Company, Licensor and Licensee, Geographical Area, Exclusivity, and SIC Code of the agreement. The data covers a wide spectrum of industries, including manufacturing and services (e.g. SIC 73<sup>3</sup>) allowing a good representation of technology licensing trends. As it is,

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<sup>2</sup> <http://www.ktmine.com/ip-data/license-agreements/>

<sup>3</sup> SIC code 73 includes companies working in service industries such as Information Retrieval Service (SIC 7375), Computer Facilities Management Services (SIC 7375), Security Systems Services (SIC 7382), etc.

our study answers the call for more empirical studies based on comprehensive datasets of licensing agreements across many industries (Kim & Vonortas, 2006). Furthermore, given that our data extends for more than a decade, we complement existing literature, which mostly offers studies exploring licensing agreements that occurred in a limited period of time (see, for instance, Anand & Khanna, 2000, who examined a sample of licensing agreements over the period 1990-1993; Srivastava & Wang, 2015, analyzed a longitudinal dataset covering the period 2005-2011; Walter, 2012, grounds its study on a ten-year database, from 1990 to 2000).

For all the companies present in these agreements, we proceeded to match them with Orbis (Bureau Van Dijk) in order to retrieve basic company information such as the number of employees, cash flow and R&D investments. Moreover, we extracted all the US and EP patents owned by these companies and granted between 1900 and 2015, as well as all their cited and citing patents.

### **3.2 Data analysis**

We built our analysis on the all the licensor-license entries available in the above mentioned database. Starting from these, we identified all the cases in which a role inversion occurred among the licensor-licensee couples in our sample, i.e. the cases in which a company licensed out a technology to another firm, and then in turn received a license back from its initial licensee in a following year, reaching a total of 89 licensor-licensee entries with a role inversion. By doing so, we excluded those in which the inversion occurred between subsidiaries belonging to the same corporate company, and those in which the original agreement was a cross-licensing deal as, in this particular case, we could not identify a clear technology originator. Of the inversions, 61 entries start with a one-way licensing agreement and followed on with a cross-licensing agreement between both companies, whereas the remaining 28 have a one-way license also for the reversal. In addition, as we are aware that inversion may be driven by contractual commitments (Choi, 2002; Leone & Reichstein, 2012), we also tried to detect how many of these inversions are in fact possibly related to a grant-back provision included in the initial licensing. We were able to find clear indication of this occurrence in 20% of the cases, therefore leaving rooms for an interesting alternative explanation consistent to a vicarious learning scenario.

In order to compare all the inversion dyads with non-inversion dyads, we then proceeded to retrieve all the agreements from the original database where one of the licensors or licensees from inversion dyads was present, but that had no inversion between licensor and licensee in later years. This brought us to an overall dataset including 558 licensing agreements and 668 licensor-licensee couples, giving a total of 1039 agreement-licensor-licensee combinations. Of these, 305 included a licensor-licensee couple with inversion, and another 734 where no inversion ever occurred between licensor and licensee.

For the development of the exploratory analysis, we therefore followed these steps: we first examined the licenses that lead to a role inversion between the original licensor and licensee; then we investigated the profiles of the parties involved in the licensing agreements included in our dataset. Third, we attempted to provide an analysis regarding the learning opportunities that are possibly being exploited in such licensing deals, through examination of the sic codes of the license and the licensing couple, as a measure of the explorative/explorative nature of the agreement; their mutual patent citation patterns, which capture the spillover effects of the agreement; and, in the end, their technological convergence, which may be due to the fact that the agreement has provide a privileged gate of access to the knowledge base of the counterpart.

### 3.3 Agreements and industries

The number of inversions and non-inversions in licensing agreements over time is shown in Figure 1 below. There is no definite pattern emerging; however, we can see that inversions are occurring almost in every period of our sample with the exception of a few years, whereas non-reversing licensing deals are occurring across all periods, with a peak in the '90s and early 2000s. No data on inversions and non-inversions were available after 2013.

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Insert Figure 1 about here  
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Regarding the distribution of licensors' and licensees' industries, we have quite a wide variety of industrial sectors present in our sample. Below we offer a graphical representation of the distribution of the main SIC codes for the licensors and licensees (see Figure 2 and Figure 3). The most widely represented industry is the pharmaceutical sector, followed by biological products, commercial, physical and biological research and software. In both licensor and licensee categories, we also have research institutions. Figure 4 allows a comparison of the distribution of the SIC codes between licensors and licensees.

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Insert Figure 2, 3 & 4 about here  
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### 3.4 Licensing parties' profiles

In order to check whether vicarious learning could be underlying the identified licensing agreements, we explored more in-depth the characteristics of the firms engaging in these agreements, both as licensors and as licensees, distinguishing between inversion and non-inversion instances.

For all firms, we considered the data at the moment when the initial licensing deal occurred, i.e. when the partners first started collaborating through licensing.

The first variable which had a difference in this case was the average size of the licensee in inversion and non-inversion cases as shown by Table 1. In particular, our results show that when inversion occurs, the licensor and licensee are more similar in size, as there is no statistical difference between their mean numbers of employees. Instead, in non-inversions, the average employees of the licensor are significantly higher than the average employees of the licensee, indicating that companies tend to invert their roles more often with firms which are of similar size.

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Regarding companies' financial profile, we collected data on cash flow and R&D investments where available (see Table 2 and Table 3). The statistics show that, in inversion cases, licensors and licensees had similar cash flow figures, whereas for non-inversions the licensors had significantly larger cash flow than their licensees. Given that cash flow is frequently used as a stock measure of liquid assets, the results suggest that licensors involved in inversion dyads may be expected to have lower investment capacity than licensees which are not involved in inversion dyads, and for this reason they may be more receptive to outside learning opportunities. This is confirmed by the data on R&D Expenditure for licensors and licensees in inversion and non-inversion dyads. In other words, licensors who invest heavily in R&D seem to be in less reliant on learning partners, while licensors with lower levels of R&D expenditures, are the best candidates to enjoy complementarities between internal and external knowledge sourcing strategies.

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Insert Table 2 & 3 about here  
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Another interesting variable was compiled by taking the licensing stock (cumulative number of licenses the companies had participated in) at inversion year for both licensors and licensees (see Figure 5). Plotting this value against the time to inversion, i.e. the time it takes for the original licensor to capitalize on the learning opportunities available to it, we can see that the licensors in general have more experience than the licensees. Another interesting trend is that as the companies acquire more experience in licensing, it seems to take longer for them to capitalize on learning opportunities, indicating possibly that as companies become more experienced and less flexible, it becomes more complex for them to identify these opportunities.

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### **3.5 Learning opportunities available**

#### **3.5.1 Exploration versus exploitation**

We proceeded to attempt the identification of which learning opportunities were possibly being exploited in these licensing deals. We started from the industrial classification of the licensor, the licensee and the agreement to see whether patterns emerged in the type of knowledge which was at the basis of a reversal. In order to do this, we compared the distribution of the SIC codes of both the licensor and licensee at the 2-digit and 4-digit level, differentiating between the dyads with and without inversion. These SIC codes indicate the technology area in which each company primarily operates and therefore the category with which they are most familiar and in which they are more knowledgeable. This result is summarized in Table 4, and no statistically significant relationship was found between the inversion of a licensor-licensee dyad and the relative knowledge of the two companies.

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However, as shown in Table 5, when we look at the 4-digit SIC code of the actual licensing agreement, compared to the SIC codes of the licensor and licensee, we find that in the case where at least the licensor or the licensee (or both) are familiar with the technology inversion is more likely to occur. If both licensor and licensee are not familiar with the technology, then non-inversion is more likely to occur. Therefore if the technology exchanged is less familiar to both licensors and licensees, it will be more complex to capitalize on learning opportunities through licensing.

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#### **3.5.1 Knowledge spillovers**

A further analysis was conducted examining the licensor and licensee's experience with patenting and licensing deals, comparing their patent stock and licensing stock when

their first exchange occurred. The interesting conclusion from this analysis is that companies appearing in inversion dyads are performing significantly less patenting and licensing activities than the firms who are not participating in inversion dyads. This could mean that in fact these inversion dyads are indeed capturing a different licensing strategy, one which is not based on the maximization of economic rents, which would encourage to increase IP protection and the number of market transactions carried out with the available patents, but rather one based on learning opportunities where fewer select partners are identified, possibly based on the downstream learning opportunities that they could provide on specific technology exchanges.

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When looking at the patent citations patterns, the analysis becomes even more interesting. Patent citations count represents the typical proxy for knowledge flows between companies (Jaffe & Trajtenberg, 1999, 2002), as it captures the interconnection between the focal firm's and its peers' patent stock. Cited patents represents the related prior art, which the company builds upon; citing patents represent the subsequent codified knowledge spurred by the focal patent of the company. We examined whether the licensor and the licensee ever cited each other at all in the time span considered.

Findings suggest that as a whole just under 20% of the companies engaged in licensing agreements sign a contract with a partner whose patents cite or are cited by the focal firm, whereas the remaining 80% don't license to companies they have cited or by whom they have been cited. T-tests on this variable show us that companies in inversion dyads are significantly less likely to cite each other than companies in non-inversion dyads. This suggests that vicarious learning through licensing deals could be an alternative strategy with respect to vicarious learning through patent citations. Indeed this alternative strategy seems to be specifically used, as we saw before, when companies' knowledge pools are more distant. In this sense, licensing can be a tool to exploit vicarious learning opportunities between firms that can be identified as a result of previous licensing activity and not through a company's more traditional patenting and citation activities.

Further analysis shows that this relationship also holds for patent citing performed prior to the licensing agreement, whereas there is no statistical significance between companies' citing activities following the licensing agreement for inversion and non-inversion dyads. This further points to the possibility that licensors may actually discover their licensee's knowledge stock through the initial licensing deal, and that they may then decide to either cite their licensee's patents or license-in their technology in future.

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### **3.5.1 Technological profile convergence**

The final analysis performed focused instead on the technological classes in which the licensors and licensees filed patents over the years. Past research suggested licensees tend to patent more in the technological field in which they have acquired a patent (Leone & Reichstein, 2012), which demonstrates that licensing is a learning channel for the licensees. Therefore, we examined how the licensor and licensee's patent portfolios were matched and whether they converged following the initial licensing deal, thus possibly indicating the partners were learning from each other. Interestingly, we can see that in fact when two partners end up inverting their roles, they are more likely to patent in the same main patent class. This may indicate that their pools of knowledge need to be somewhat similar to enable

a fruitful two-way exchange of technology. However, looking at the cases in which the patent classes were initially not identical, but that converged to the same class following their initial licensing, we see that inversions occurred less frequently when the patent classes of licensor and licensee converged. Therefore, similarly to what was concluded with citations, it would seem that inversions can occur when licensor and licensee's technology classes do not converge, as a complementary strategy to performing R&D within the firm and patenting the results.

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#### **4. DISCUSSION AND CONCLUSION**

Grounding on the organizational learning literature, we propose an exploratory study to apply the vicarious learning principles to licensing agreements. Firms learn vicariously when they observe other firms' strategies, administrative practices, and actions, with the aim of imitating the most successful ones or avoiding those which failed. Despite existing research shows vicarious learning as a frequent practice adopted by firms in a variety of formal partnerships (e.g. acquisitions, strategic alliances, etc.), studies on vicarious learning in licensing agreements are still limited. Exploratory research is particularly helpful when the issue at hand needs to be understood and more deeply explored as its nature is unclear (Robson, 2002). Starting from this, we conceptualize licensing agreements while grounding on the tenets of firms' vicarious learning. More specifically, we suggest that the decision to engage in licensing should take into account the incentive implicitly resulting from the vicarious learning opportunities available to both the licensor and the licensee. In order to do that, we acknowledge the literature focusing on the learning opportunities available to the licensees (see Arora & Ceccagnoli, 2006; Leone et al., 2015) and focus on the licensor perspective. We argue that innovators (i.e. licensors) may find it advantageous to license-out their technology given the opportunity to learn vicariously from their licensees. Grounding on existing research (e.g. Srivastava & Wang, 2015; Yang et al., 2010), we aim at demonstrating that vicarious learning may represent one of the possible reasons for engaging in a licensing agreement in the first place.

We set up an explorative analysis of this phenomenon based on a panel dataset from 1984 to 2013 including information on licensing agreements among firms, disclosed to the USA Securities and Exchange Commission. For the purpose of this study, we started by examining a subset of cases where a licensor-licensee couple exchanged roles in a successive moment or engaged in cross-licensing following the initial, one-way, licensing agreement. For the identified companies we then included all the licensing agreements they took part in, in order to be able to differentiate between licensing partners with which their role was inverted and partners with which this never occurred. The descriptive statistics of the data show that licensors and licensees tend to invert their roles when the initial licensee is in a industrial domain (SIC) less familiar to the licensor. Indeed this is further supported by the fact that licensors and licensees inverting their role are less likely to cite each other's patents, and their main patent classes are less likely to converge following the initial licensing deal. This indicates that licensing could be an additional instrument for vicarious learning between firms, especially when their knowledge bases are more distant and less overlapping. Moreover, companies that invert their roles tend to focus on fewer licensing agreements than

companies who are not in inversion dyads, suggesting they employ a different type of strategy for their licensing deals, one that could be based on identifying key partners for learning rather than based on monetizing results of their R&D activities. These findings support our idea that vicarious learning is a benefit resulting from licensing agreements especially for the exploitation of distant knowledge domains.

This explorative paper mainly contributes to two streams of research. First of all, this study adds to the licensing literature by offering a new theoretical lens to understand the underlying process of licensing-out and to fine-tune the tied relationship between this formal partnership and the learning processes unfolding within the licensing parties (Johnson & Sohi, 2003; Link & Scott, 2002; Peng et al., 2013; Pitkethly, 2001). More specifically, it attempts to foster the understanding of licensing as a new way through which licensors can increase their learning capabilities and innovation, thereby shifting the focus from the ‘only seller’ to the ‘seller-and-buyer’ perspective. As a result, this approach opens up new avenues for conceptualizing licensing agreements as a valuable strategy for simultaneously implementing an exploration-exploitation strategy, leading to increased ambidexterity and superior performance (He & Wong, 2004; Rothaermel & Alexandre, 2009; Stettner & Lavie, 2014). Consistently, it complements prior research on licensing which has mostly assumed the licensor to be a monopolist technology holder (Fosfuri, 2006), thus making the need to consider the interactions with its licensee almost irrelevant. More importantly, such a perspective on licensing has neglected the importance for any firm to constantly keep an eye on the external environment, thus preparing for embracing an open innovation approach to remain competitive in the market. Second, this paper extends recent research on vicarious learning among firms (e.g., Yang et al., 2010; Yang & Steensma, 2014) involved in formal partnerships. We propose a new way of thinking of the reasons that lead firms to license out their technology, by arguing that the vicarious learning resulting from interacting with the licensing party can be a valuable incentive to establish formal partnership. In addition, from an empirical point of view, we extend previous works, which mostly analyze longitudinal patent data collected within a single industry (e.g. Yang et al., 2010). Differently, we collected and examined data on licensing agreements among firms operating in a number of industries, thus allowing a broader generalization of the results and a closer understanding of the vicarious learning phenomenon within licensing deals.

#### **4. 1 Managerial implications**

The paper offers managerial implications for both licensor and licensee. We suggest that both parties involved in licensing should be aware of the benefits related to the licensor’s vicarious learning. From the licensor’s point of view, this virtuous circle of learning may ultimately drive it to choose the “best learning recipients” as future partners, either by further licensing-out some internal technologies or by licensing-in formal technical knowledge from prior and/or current licensees. Put another way, embracing this perspective may help understand why some licensing agreements give rise to further licensing agreements whose parties invert their roles, i.e. the firm that once was the licensor becomes the technology buyer and, vice versa, the former licensee turns out to be the seller. From the licensees’ side, conceptualizing vicarious learning as a critical benefit to licensing-out places the licensee in a favorable position. To the extent that the licensor is able to learn from the licensee, this may lead to increase the probability that the current licensor will buy the current licensee’s technology in the future. Hence, unlike other types of incentives investigated in the literature (e.g. Leone & Reichstein, 2012) which provide a shift toward the licensor and away from the licensee, placing emphasis on the vicarious learning opportunities available to the licensor can also benefit the licensee. Consistently, conceptualizing licensing agreements through this lens

allows to highlight the importance for both licensing parties to build favorable relationships with each other.

#### **4.2 Limitations and future research**

A first direction for furthering the study of vicarious learning in licensing might be to empirically explore how the licensor selects its licensee/s in order to learn from it/them. In particular, researchers may want to use the theory we propose in this work to understand whether the frequency-trait-outcome approach (Haunschild & Miner, 1997) may apply to the analysis of licensing and learning processes.

A potential direction for improving this paper might be to explore whether there is some relationship between the extent to which originating firms unintentionally disclose their knowledge leading to a potential vicarious learning process with their recipients and the extent to which they engage in subsequent ‘selective revealing’ behaviors. Thus, this paper may ground future research interested in understanding whether firms, which have benefitted from vicarious learning, may decide in the future to purposefully reveal their knowledge to externals to foster collaboration with partners and innovative performance.

In addition, this paper raises questions about the extent to which a vicarious learning scenario is likely to shape the position of the originating firm in the network of relationships with its recipients. Hence, it may also lead to unexpected and negative consequences for the originating firms, especially in case it is not able to integrate and assimilate the recipient’s knowledge into its own knowledge base. For instance, this would be the case in which vicarious learning presents an opportunity to recipients to enhance their innovation capability while, at the same time, eroding innovators’ competitive advantage.

Scholars acknowledge that repeated vicarious learning (i.e. when multiple organizations engage in vicarious learning over time) leads to isomorphism in the system, in such a way that most organizations will end up doing similar things and producing similar outcomes (Miner & Anderson, 1999). Despite research also stresses that there are some conditions under which this convergence is less likely (see Miner et al., 2003), future studies may want to address this issue and extend our work by investigating whether licensing agreements result in some within-industry similarity.

Moreover, based on recent research on organizational learning (Bingham & Davis, 2012), it may be that parties involved in licensing agreements engage in different types of learning over time. Scholars have suggested that direct and indirect learning may be used by firms in ordered ways (e.g. Schwab, 2007), concurrently (e.g. Baum & Dahlin, 2007) or partially concurrently (e.g. Chuang & Baum, 2003). Future research may explore whether and how licensing parties may show an orientation toward learning first through indirect learning and then through direct learning or whether there are other forms of organizational learning.

This study points to a further venue for better investigating the link between external and internal learning activities. In his work on external team learning activities and team performance, Bresman (2010) found that, in order to be successful and lead to positive outcomes, vicarious learning needs a sufficient amount of internal learning activities. That is, getting knowledge from observing others is not enough to make sure such knowledge will result in a superior performance. Organizations and their employees should appropriately engage in adjusting, experimenting, and reflecting on the external knowledge in order for it to be exploited and used for the firm’s competitiveness. In this regard, existing research has highlighted the need for a deeper understanding of the mechanisms underlying the transfer of knowledge (e.g. Darr et al., 1995). Accordingly, scholars have started devoting attention to the intra-organizational learning activities that help assimilate, absorb, and use external knowledge (e.g. Ancona & Bresman, 2005). One way to apply this idea to the study of vicarious learning in licensing may be to conduct a qualitative study in order to understand

whether companies engage in particular internal learning processes and whether such processes differently affect their performance.

Moreover, this work does not take into account whether the licensing parties work within a cooperative scenario (i.e. simultaneous competition and cooperation between companies; Luo, 2007), which would assume that vicarious learning is a valuable incentive for both the licensor and the licensee. Differently, when companies find themselves in an ecosystem where roles are strictly defined, then learning from the counterpart may result more in an operational process than a strategic one. For instance, in the automotive industry the knowledge frequently resides within the originator company (e.g. the tier one supplier); therefore, licensing is a good way for companies to collaborate, however the incentives of the licensor to learn work under different conditions. Future research may want to integrate this argument in both the theoretical framework and the empirical analysis.

Finally, this paper does not point to the role that both environmental uncertainty as well as risk aversion may play in affecting licensor's orientation toward learning from its licensees. In line with Yang and Steensma (2014), we already know that vicarious learning is more likely to occur when the licensor is presented with certain market conditions, such as high demand volatility and high competitiveness and this discourse could be further explored in future.

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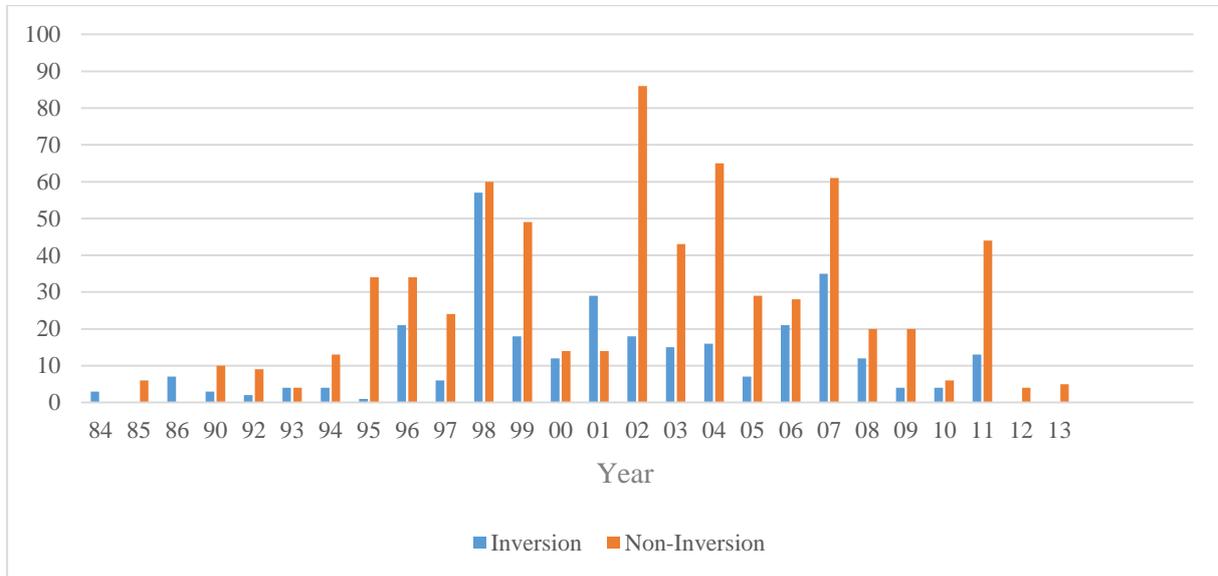
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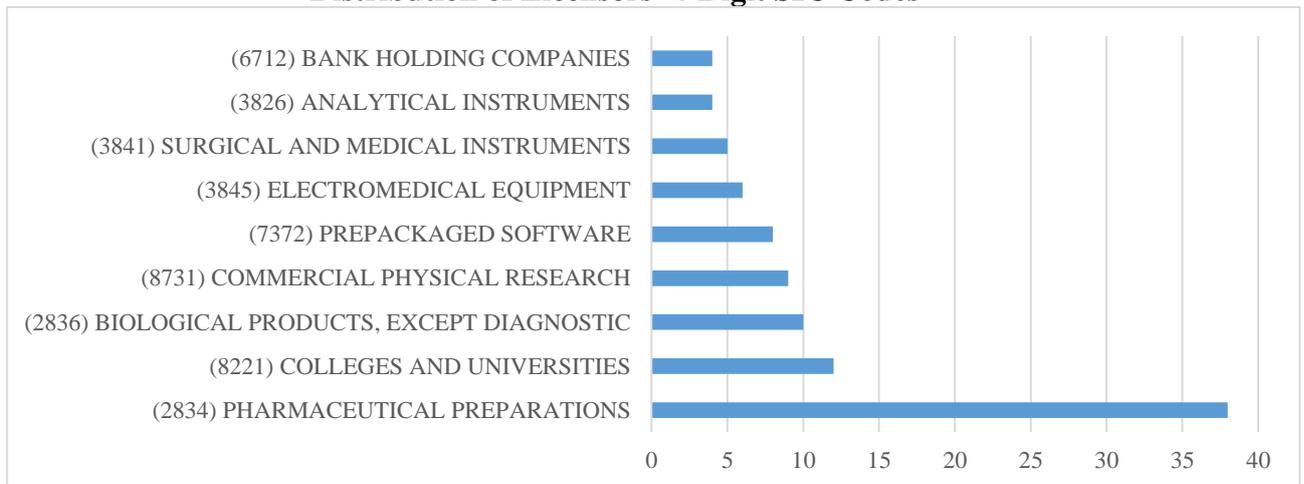
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## 6. FIGURES AND TABLES

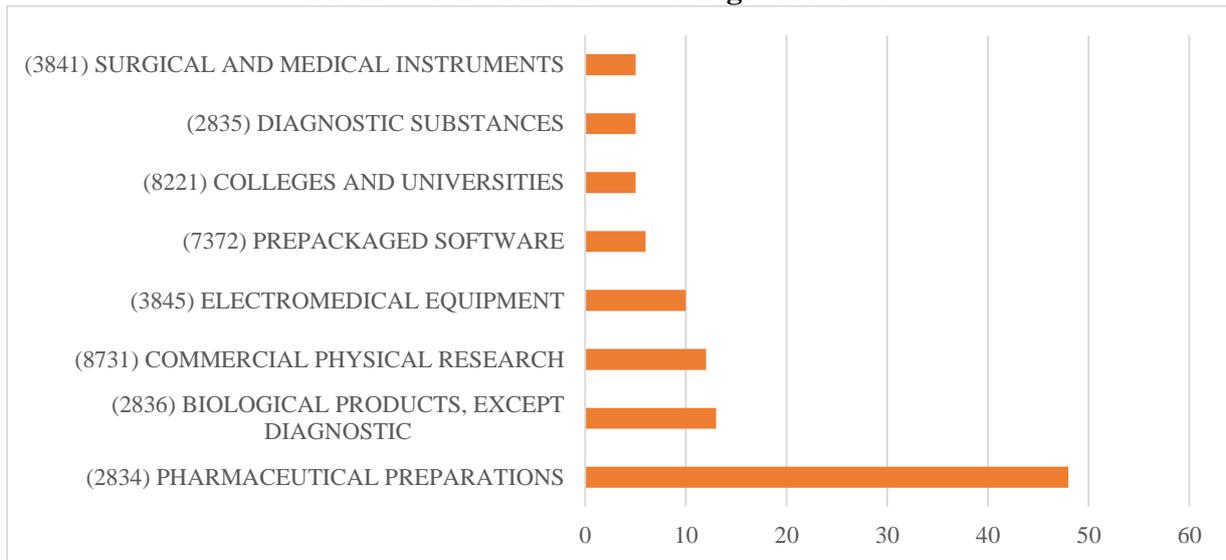
**FIGURE 1**  
**Distribution of the inversion (Y) and Non-Inversion (N) of Licensing Agreements over Time**



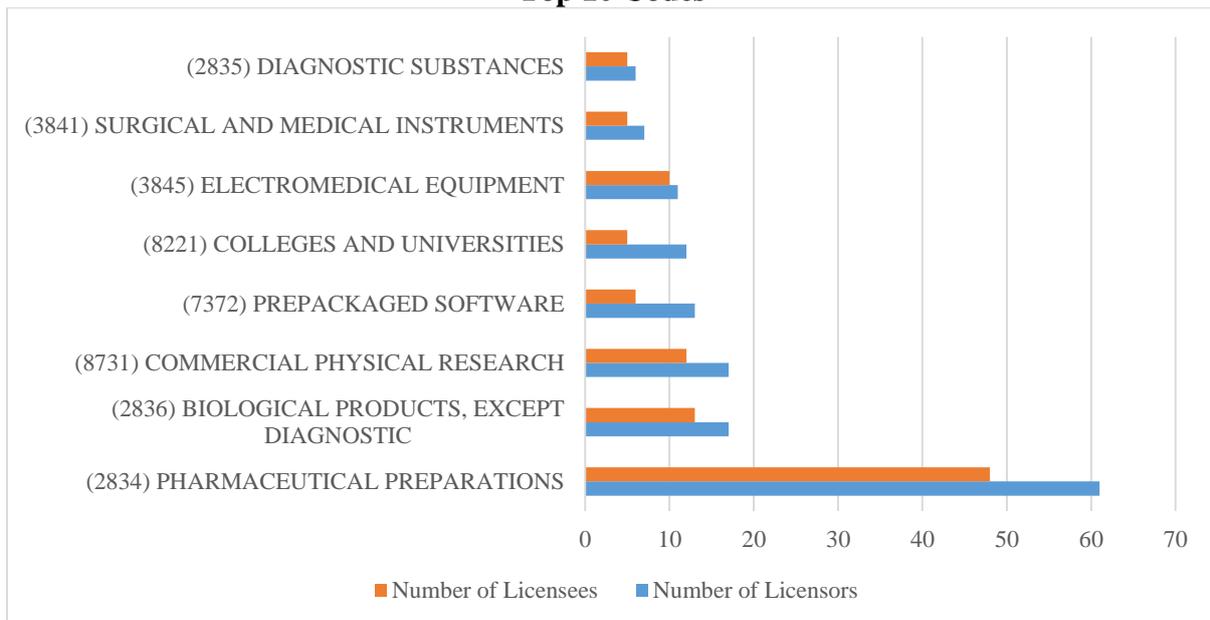
**FIGURE 2**  
**Distribution of Licensors' 4-Digit SIC Codes**



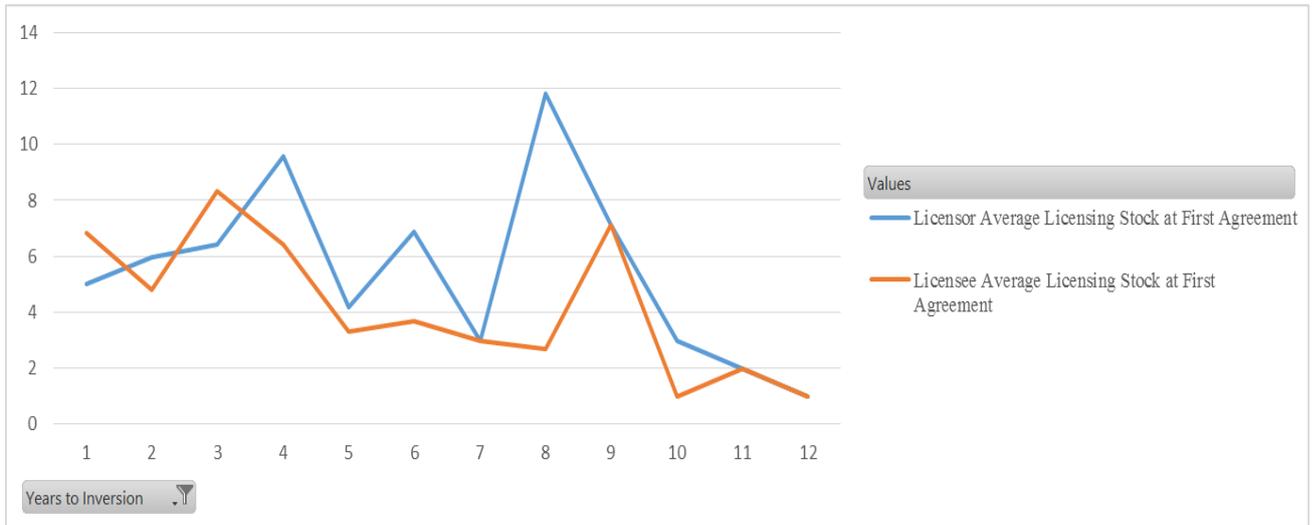
**FIGURE 3**  
**Distribution of Licensees' 4-Digit SIC Codes**



**FIGURE 4**  
**Comparison of the Distribution of Licensors' and Licensees' 4-digit SIC Codes for the Top 10 Codes**



**FIGURE 5**  
**Average Licensing Stock versus Time to Inversion**



**TABLE 1**  
**Companies' Average Employees**

	<b>Licensor</b>	<b>Licensee</b>	<b>T-Test</b>
Inversion	14,742	16,236	Non-Significant
Non-Inversion	51,905	7,518	Significant
T-Test	Non-Significant	Non-Significant	

Source: Orbis

**TABLE 2**  
**Companies' Average Cash Flow**  
**(Values are expressed in millions of \$)**

	<b>Licensor</b>	<b>Licensee</b>	<b>T-Test</b>
Inversion	264.5	333.9	Non-Significant
Non-Inversion	1,981.6	413.8	Significant
T-Test	Significant	Non-Significant	

Source: Orbis

**TABLE 3**  
**Companies' Average R&D Investments**  
**(Values are expressed in millions of \$)**

	<b>Licensor</b>	<b>Licensee</b>	<b>T-Test</b>
Inversion	273.0	225.8	Non-Significant
Non-Inversion	1,180.8	370.6	Significant
T-Test	Significant	Non-Significant	

Source: Orbis

**TABLE 4**  
**Comparison between Licensor's and Licensee's SIC Code for Couples With and Without Inversion**

<b>Inversion</b>	<b>Same 4-Digit SIC Percentage</b>	<b>Different 4-Digit SIC Percentage</b>
N	17.4	82.6
Y	21.1	78.9
<b>Inversion</b>	<b>Same 2-digit SIC Percentage</b>	<b>Different 2-Digit SIC Percentage</b>
N	26.5	73.5
Y	26.7%	73.3%

**TABLE 5**  
**SIC Code of Licensing Agreement Compared to Licensor and Licensee SIC Code for**  
**Inversions and Non-inversions**

Case	Percentage of Total Agreements	Non-inversion (N)	Inversion (I)	T-test (N-I)
Agr SIC = Licensor SIC	23.70%	56.2%	43.8%	Significant
Agr SIC = Licensee SIC	26.30%	59.6%	40.4%	Significant
Agr SIC = Licensor SIC = Licensee SIC	9.60%	55.7%	44.3%	Significant
Agr SIC != Licensor SIC != Licensee SIC	59.50%	77.2%	22.8%	Significant
AGR != (SOR= SEE)	5.10%	100.0%	0.0%	Significant

**TABLE 6**  
**Comparison of Licensing Stock and Patent Stock for Licensors and Licensees**

Inversion	Average Patent Stock Licensor
N	25
Y	15

Inversion	Average Patent Stock Licensee
N	18
Y	11

Inversion	Average Licensing Stock Licensor
N	9
Y	7

Inversion	Average Licensing Stock Licensee
N	8
Y	7

**TABLE 7**  
**Citations Analysis between Licensors and Licensees**

Licensor Citing Licensee at All	Total	Inversion		T-Test (N-Y)
		N	Y	
0	82%	65%	35%	Significant
1	18%	77%	23%	Significant

Licensor Citing Licensee at All	Total	Inversion		T-Test (N-Y)
		N	Y	
0	83%	65%	35%	Significant
1	17%	79%	21%	Significant

Licensor Citing Licensee Before Initial License	Total	Inversion		T-Test (N-Y)
		N	Y	
0	86%	64%	36%	Significant
1	14%	86%	14%	Significant

Licensor Citing Licensee Before Initial License	Total	Inversion		T-Test (N-Y)
		N	Y	
0	83%	65%	35%	Significant
1	17%	80%	20%	Significant

Licensor Citing Licensee After Initial License	Total	Inversion		T-Test (N-Y)
		N	Y	
0	93%	67%	33%	Non-Significant
1	7%	69%	31%	Non-Significant

Licensor Citing Licensee After Initial License	Total	Inversion		T-Test (N-Y)
		N	Y	
0	96%	67%	33%	Non-Significant
1	4%	71%	29%	Non-Significant

**TABLE 8**  
**Main Patenting Technology Class and Convergence**

Comparison between Licensor and Licensee Main Class at First Licensing	Total	Inversion		T-test (N-Y)
		N	Y	
Different Mainclass	37.7%	72.9%	17.1%	Significant
Same Mainclass	63.3%	57.9%	46.1%	Significant

Licensor and Licensee's Main Class Converging Following first Licensing	Total	Inversion		T-test (N-Y)
		N	Y	
Not Converging	69.5%	62.5%	37.5%	Significant
Converging	30.5%	96.5%	3.5%	Significant