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By: **David R. Williams** and Carlton C. Young

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# Post Financial Crisis Transaction Trends of U.S. Biotechnology Firms

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## ABSTRACT

Transactions announcements can signal the health of an industry. This article examines all biotechnology transaction announcements occurring in the U.S. between 2010 and 2017. A baseline comparison to the pre-financial crisis transaction announcements of 2002 through 2006 is provided. Our study finds a significant rebound in the number of transactions during the time of study and continuing shifts by those on both ends of the transactions.

Keywords: Transaction announcements; Knowledge transfers; Post financial crisis

## INTRODUCTION

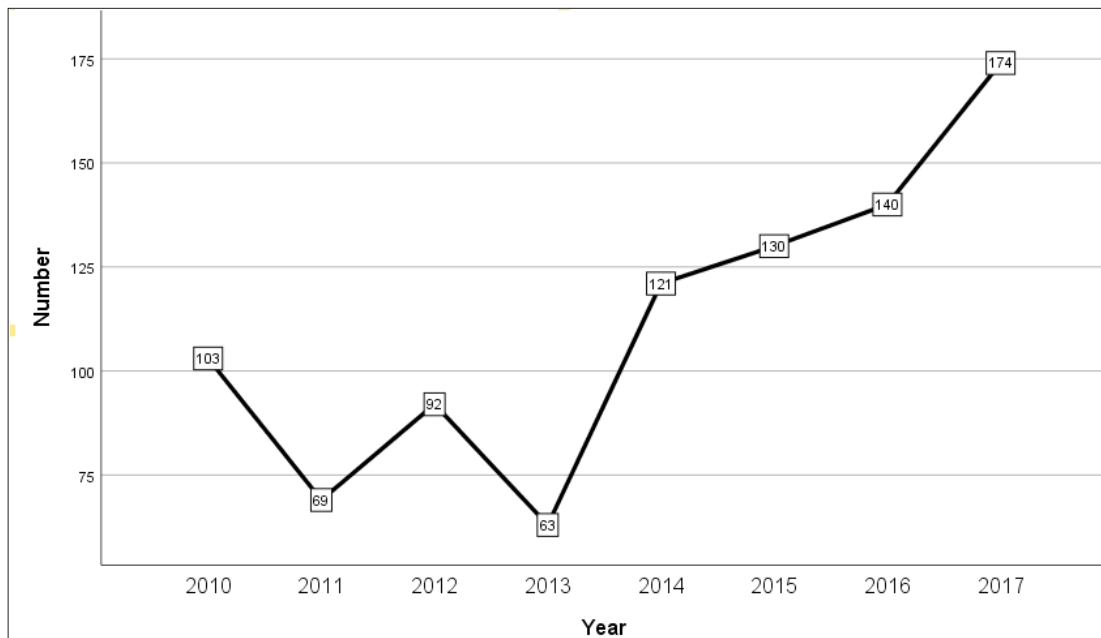
THE TRANSFER OF knowledge and technology in the biotechnology industry has been of interest to practitioners, governments, and scholars for decades [1]. This is due to the continued growth in need to access resources and capabilities in this industry from outside the firm [2–4]. These transfers have taken several different forms (i.e., collaborations, firm acquisitions, etc.) [5], and involved several sectors of society—from the university to the financial industry [6]. It has been noted that these transactions were affected by the financial crisis in the U.S. [7, 8], which lasted from December 2007 through mid-year 2009 [9]. For example, within the biotechnology industry there was a reduction in financing of firms via initial public offerings [10], venture capital investment [11], as well as out-licensing arrangements [12]. These and other financing issues led biotechnology firms in many cases to reduce or discontinue research and development programs during this time [7].

This article examines U.S. biotechnology transaction announcements after the recent financial crisis. The study compares post financial transactions to a five-year pre-financial crisis aggregate. It reviews inter-firm transaction announcement activity surrounding the location (e.g. U.S., foreign), type of firm (e.g. private, publicly-traded, non-profit), and form (e.g. collaboration, firm acquisition, license, etc.) of these transactions. This is important as the fluidity of transactions, in part, may

positively affect the economic health of these firms and the biotechnology industry in the U.S. and abroad [13]. It focuses on biotechnology firms transferring knowledge because: 1) biotechnology represents a paradigm shift in drug discovery and development [14]; 2) there are few transactions from pharmaceutical firms to biotechnology firms; and 3) biotechnology firms typically lack the resources and leverage in transfer negotiations with larger pharmaceutical firms [15].

## METHODS

This article is based on data derived from biotechnology transaction announcements from January 1, 2010 through December 31, 2017. It also at times (when data are available) shows a baseline comparison to pre-financial crisis transactions occurring from January 1, 2002 through December 31, 2006. It uses a database compiled by Levin and Associates. The primary sources for the announcements are from PR Newswire, PE Hub, and Seeking Alpha. The data reflect transactions where the originating firm is a biotechnology firm (i.e., pharmaceutical firms transferring technology or knowledge are excluded). The data reflect transactions only where either the transferor or transferee is a U.S. based firm. For our post financial crisis analyses, there were 897 separate announcements, of which 892 were usable. There



**Figure 1:** Transaction Announcements by Year.

are 370 announcements in the comparison data years (2002-2006).

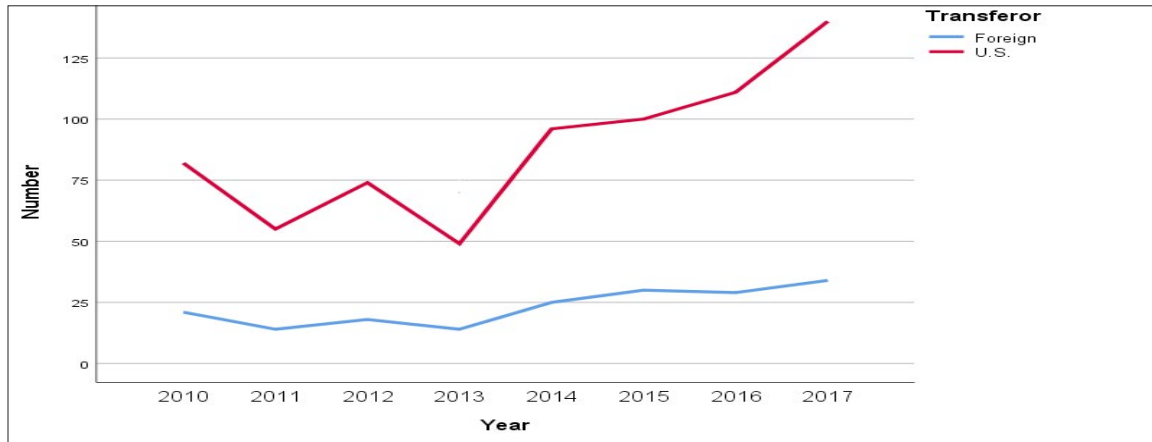
The transactions differ from other sources in that it does not separate different transactions related to a given announcement. For example, if a biotechnology firm announces in one press release that it has entered into multiple licensing arrangements with another firm for multiple products, then this is considered one transaction. In a few cases, there were missing data for which the authors did an Internet search to complete the dataset. Based on a review of the announcement summary or an Internet search of the announcement, the authors categorized all transactions into the following groupings: collaboration agreements, collaboration and licensing agreements, product acquisitions, rights or licenses, merger or reverse merger, full or partial equity acquisition of the firm, spin-off, and sell of business line. Real numbers are presented in the figures. The narrative below uses both real numbers and percentages at times.

## TRANSFERS BY YEAR, LOCATION, AND TYPE

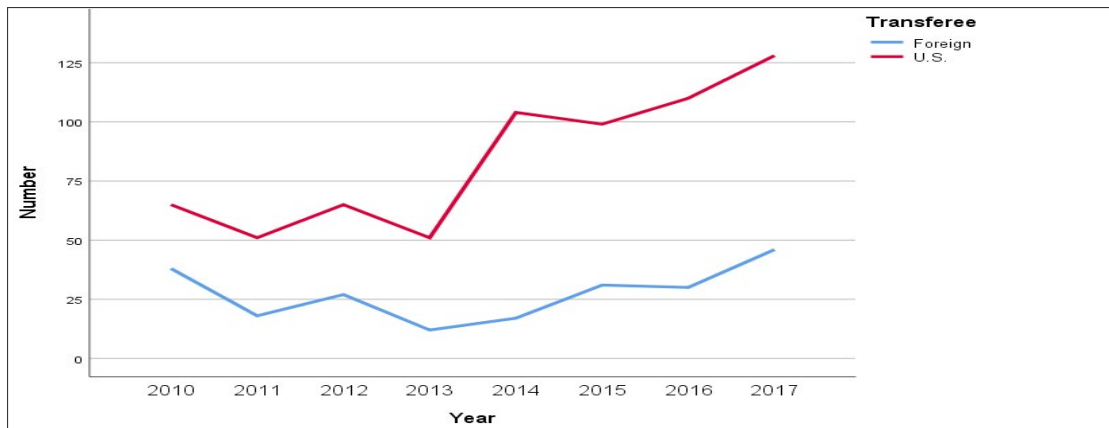
Figure 1 shows the total number of transaction announcements by year. After a swing up and down of up to 40 percent from 2010 to 2013, overall transactions steadily increase by 176 percent from 2013 through 2017 (Figure 1). Hence, the overall transaction market appears

to have significantly rebounded from the financial crisis during the second half of the study. This compares with our baseline comparison years where from 2002 through 2006 there were 67, 89, 76, 68, and 70 transactions, respectively. Additionally, in the baseline pre-crisis years the average year had 74 transactions—compared with 112 transactions on average post crisis—a 51 percent increase in transactions per year on average post crisis.

Figure 2A shows whether the transferring firm (transferor) was a U.S or foreign firm. Overall, 707 (or 79 percent) of the 892 transfer announcements were from U.S. firms transferring knowledge or technology to another firm. The percent of U.S. firms transferring knowledge or technology remained fairly constant at around 77 to 80 percent during this time. Figure 2B shows the transfer by country receiving (transferee) the transfer of knowledge or technology. Overall, U.S. firms received 673 (or 75 percent) of the transfers. This is the same as the baseline pre-crisis years (2002-2006) of 75 percent as well. Unlike U.S. firms transferring technology, there was greater variability in U.S. firms receiving knowledge or technology during the course of study—from 63 percent in 2010 to 86 percent in 2014. This similarly compares to our baseline pre-crisis years in which the U.S. firms saw a low of 66 percent in 2005 and a high of 83 percent in 2003. Additionally, overall, only 488 (or 58 percent) of the 892 post crisis transfer announcements involved U.S. firms both as transferor and transferee. This is to say that 42 percent of the time either the buyer or seller was a foreign firm. The year 2010 was the peak year at 57 percent for both the transferor and



**Figure 2A:** Origin of Firm Generating Transaction.



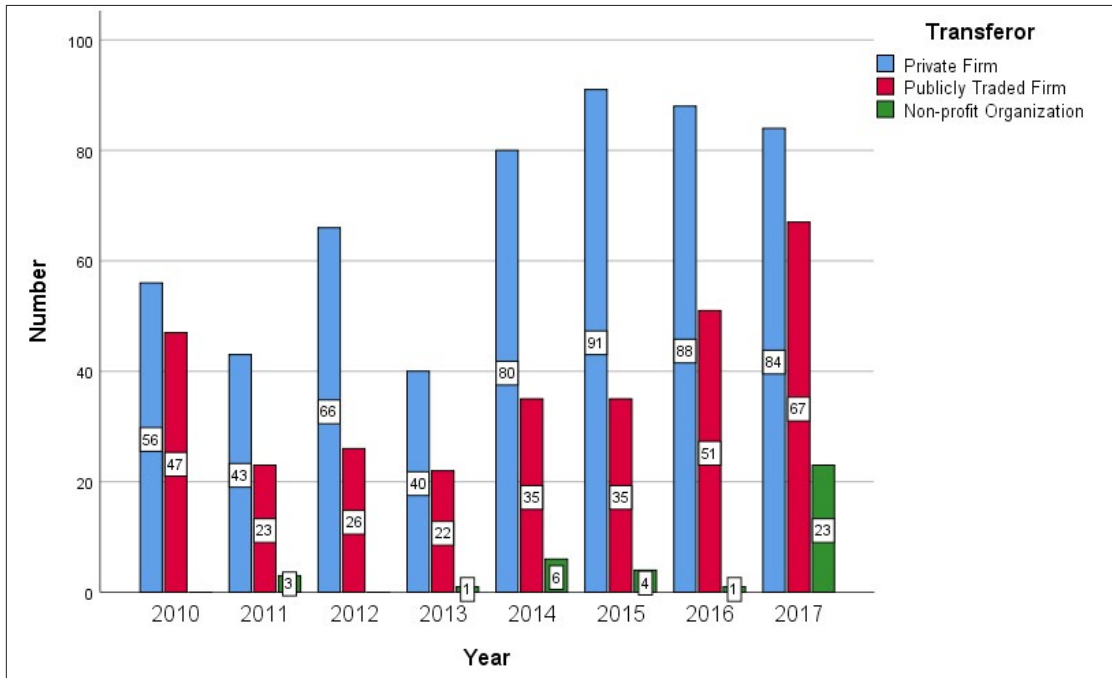
**Figure 2B:** Origin of Firm Receiving Transaction.

transferee to be a U.S. firm, with 2014 being the low year at 35 percent for both firms being a U.S. company.

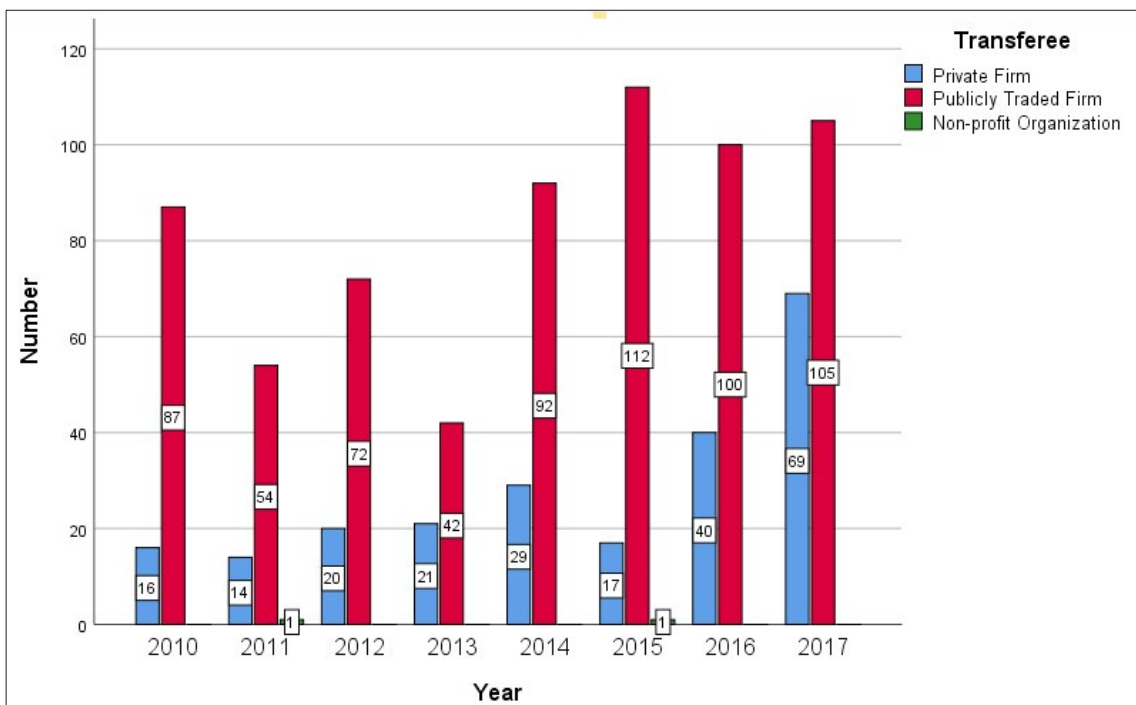
It also is important to know which type of firm (e.g. private, publicly traded, or non-profit organization) is transferring knowledge or technology. Figure 3 illustrates these transactions by type of transferor. As one would expect, overall, 61 percent of the time the firm transferring was a private firm. This is similar as our baseline pre-crisis comparison years of 60 percent. Private firms typically transfer knowledge or technology in order to receive funding for other efforts. This compares with overall transfers of 34 percent and 4 percent for publicly traded firms and non-profit organizations, respectively. Our baseline pre-crisis transfers overall had 38 percent and 2 percent for publicly traded firms and non-profit organizations, respectively. However, there is great variation in transfers by type of firm over time. Private firms showed a low of 48 percent of transfers in 2017 and a high of 72 percent in 2012. This is similar to our baseline pre-crisis comparison of a low

of 53 percent (2003) and a high of 71 percent (2004). In 2015 post crisis publicly traded firms saw a low of 27 percent. The high year was 2010 with 46 percent of transfers. Perhaps most interestingly, non-profit organization had two years (2010, 2012) of no announcements; yet in 2017 represent 13 percent of all announcements as transferors.

Figure 4 shows the type of firm receiving (transferee) the knowledge or technology. Overall, about 25 percent of the time, the firm receiving the transfer was a private firm. This compares with 74 percent of the time the transferee is a publicly traded firm and less than 1 percent of the time the transferee is a non-profit organization. Our baseline pre-crisis years show that 80 percent of the time the transferee is a publicly traded firm, 20 percent of the time the firm is a private firm, and less than 1 percent of the time the firm is a non-profit. For our post financial crisis years, the last three years of the study sees a shift in transferee on a percentage basis. At the expense



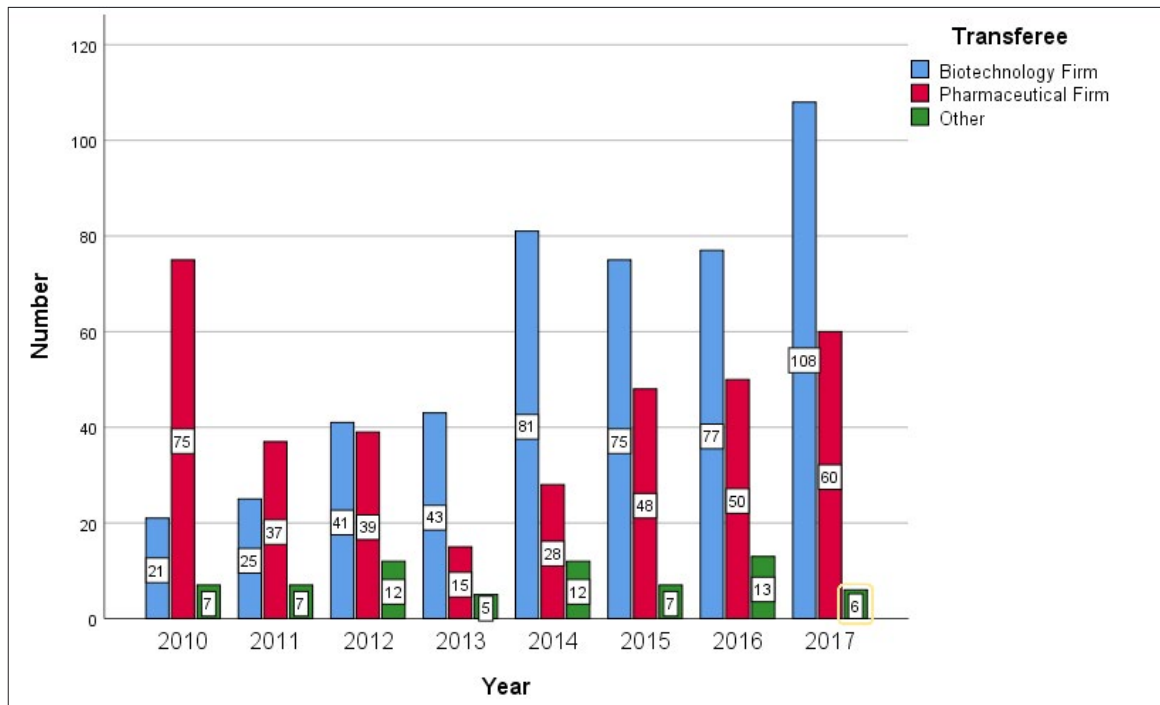
**Figure 3:** Type of Firm Transferring Technology or Knowledge.



**Figure 4:** Type of Firm Receiving Technology or Knowledge.

of publicly traded firms, private firms increase from 13 percent in 2015 to 40 percent in 2017.

Figure 5 illustrates whether the firm receiving the knowledge or technology (transferee) was a biotechnology, pharmaceutical or other type of firm. Other types of



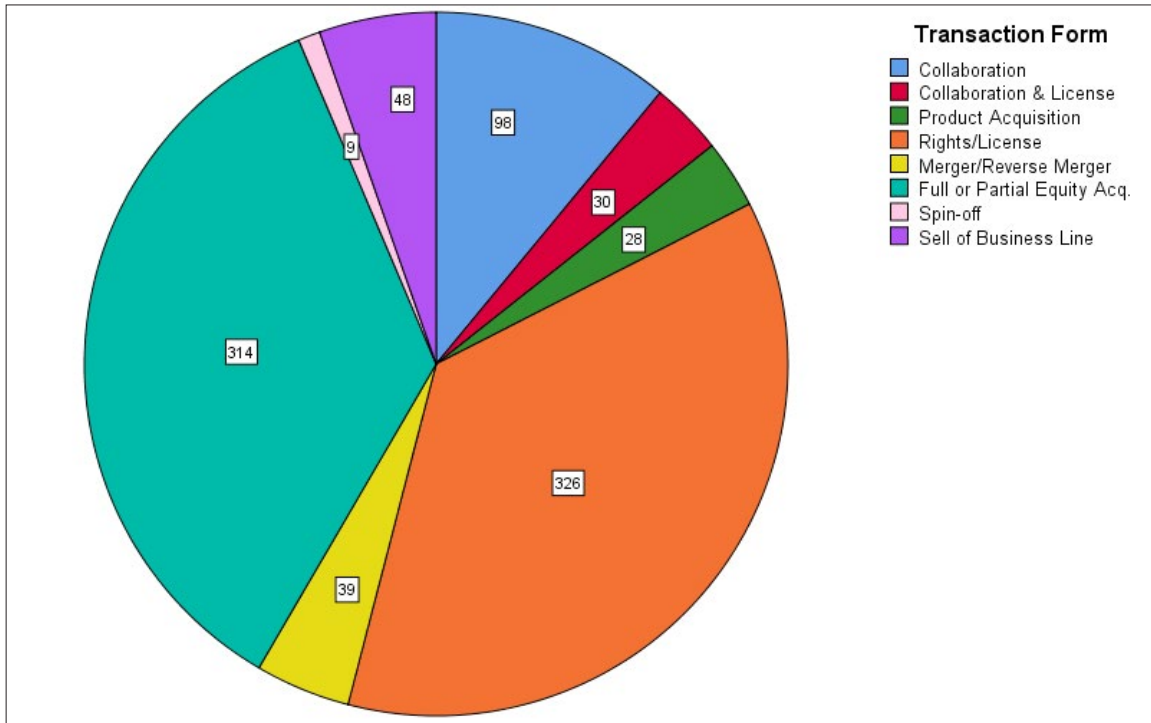
**Figure 5:** Biotechnology Firm or Pharmaceutical Firm Transferee.

firms include medical device makers, informatics firms, and private equity firms. These data are not provided in our baseline comparison years. Overall, biotechnology firms represented 53 percent of the firms, followed by pharmaceutical firms at 39 percent, and other firms at 8 percent. Interestingly, pharmaceutical firms in 2010 represented 73 percent of the transferee firms, but ended at 34 percent in 2017. It should be noted again that the study does not include pharmaceutical technology or knowledge being transferred. Nevertheless, the increase in real numbers and on a percentage basis of biotechnology firms transferring knowledge and technology to other biotechnology firms is significant and shows that the market for biotechnology is changing away from one dominated by pharmaceutical firms as the transferee. Thus, during this time period, there appears to be increasing development of an inter-industry market (i.e., biotechnology-biotechnology) as compared to an inter-sector market (i.e., biotechnology-pharmaceutical).

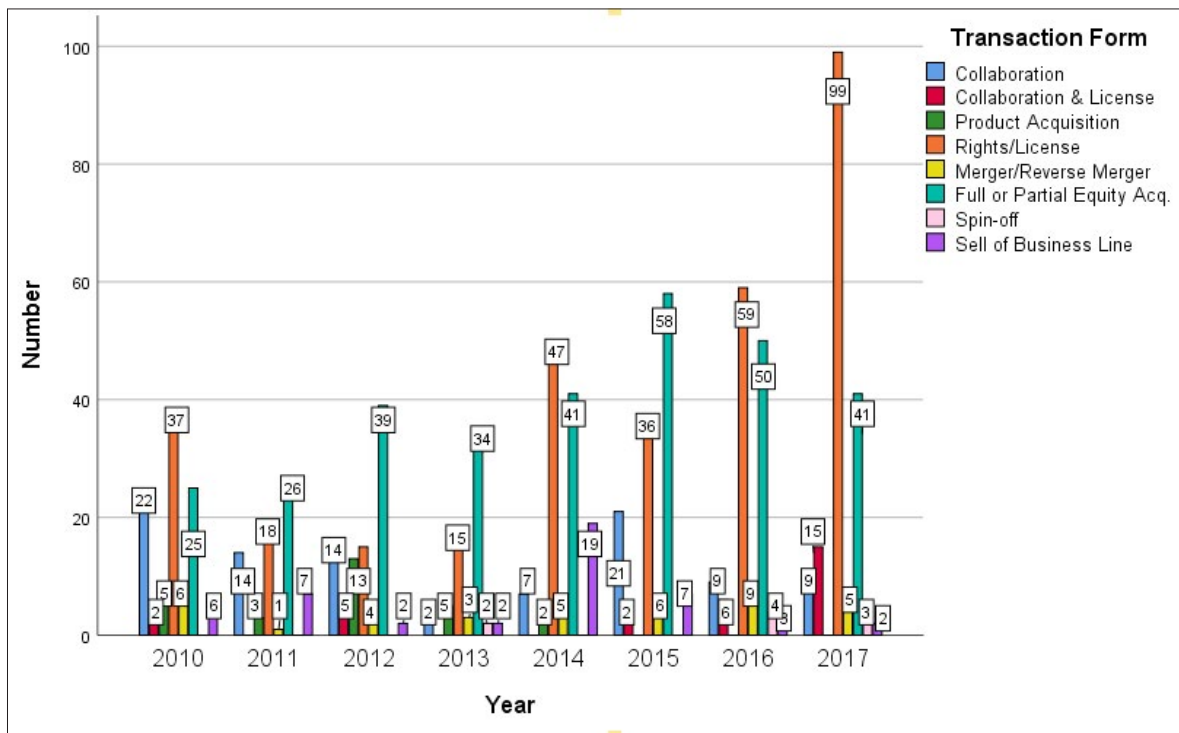
## TRANSFERS BY FORM

Figure 6 illustrates the form of transaction overall and by year. Each transaction announcement summary was read and categorized. The largest category overall post crisis was rights or license agreement announcements. As it was difficult to distinguish at times between a

transfer of rights and a license (i.e., non-exclusive), the two forms were combined. These represent almost 37 percent of all announcements during the eight-year period (2010-2017). An example of this is Halozyme's granting a license for rHuPH20 to Intrexon. This compares with our baseline pre-crisis years (2002-2006) of licensing arrangements representing only 19 percent. Full or partial equity acquisition was the second largest form post crisis. Here, firms typically are acquiring the equity of another firm to gain access to not only technology, but also the tacit (non-codified, know-how) knowledge that resides within individuals [16]. An example of this is Sanofi's acquisition of Genzyme. For our baseline pre-crisis years (2002-2006), acquisitions represent the largest form of transaction at 41 percent. The third highest percentage post crisis resides with collaborations, with this form representing almost 11 percent. An example of this is Isis Pharmaceuticals entering into a collaboration agreement with GlaxoSmithKline to develop and commercialize microRNA therapeutics for rare diseases. Mergers and reverse mergers represent over 4 percent. For our baseline pre-crisis years (2002-2006) mergers and reverse mergers represent 10 percent. The remainder represents collaborations and licensing arrangements, product acquisitions, and spin-offs. These last three areas represent about 7 percent of all transactions collectively post crisis.



**Figure 6:** Form of Transaction (2010–2017).



**Figure 7:** Form of Transaction Over Time.

In examining the form over time, one immediately sees the dramatic increase in licensing arrangements over the last few years of the study. This is shown in Figure 7. Indeed, licensing represents 28 percent, 42 percent, and 57 percent of total transactions per year in 2015, 2016, and 2017, respectively. Percentage-wise, this mainly comes at the expense of full and partial equity acquisitions during this same time period. Whereas, equity acquisitions increase from 24 percent to 54 percent of all transactions from 2010 to 2013, they decline to 24 percent by 2017. Yet, both licensing and equity acquisitions have greater numbers of transactions the last three years of the study than other years, collectively. Both the increase in overall numbers and the shift percentage-wise toward licensing during the later part of the study may be due to an improvement of financial markets (e.g. venture capital, IPO) that are available to biotechnology firms, with licensing typically a more preferred method of financing than equity acquisition.

## CONCLUSION

Market activity at times can be an indicator of the health of an industry. Biotechnology firms have relied on markets in the various forms noted in this article to gain access to knowledge, technologies, and capital. The financial crisis of 2007-2009 in many regards stagnated these markets and thus the biotechnology industry. The present article has shown that to a large extent the market for biotechnology transfers has not only recovered, but also flourished with activity. It has also shown that post financial crisis there has been a recent shift within this market with respect to the growing global nature of these transfers.

Perhaps, the most important aspect relates to the increased activity of private firms and biotechnology firms receiving knowledge and technologies (i.e., being transferees) at a greater rate during the later stages of the study. This, combined with the recent increase in licensing agreements on a percentage basis, points to a more developed biotechnology transactions market and one lessening its reliance upon pharmaceutical firms for financing, with these firms, perhaps, being able to go further to bring products and technologies on their own than in years past [8]. Further research is needed to understand the scope of the apparent lessening of dependence of these firms.

The study is not without limitations. First, although the study is consistent in its method, it is not very fine grained as it examines transaction announcements and does not disaggregate the various elements in each announcement. Likewise, the study does not follow the different segments in the market due to the difficulty to

at times categorize firms that pursue multiple diseases, treatment modalities, or applications. Nor does the study address potential distortions in the market via different segments movements (e.g. gene therapy and cancer immunotherapy). Additionally, the authors did not have access to data during the crisis. It would be interesting to compare these crisis (2007–2009) data to the pre – and post financial crisis results. The study only examines U.S. firms transferring knowledge and technologies and thus, does not study the amount, type, or effect of other countries' transfers on U.S. transfers. Nor did it study transfers originating from pharmaceutical firms. It would be insightful to compare pharmaceutical firm to biotechnology firm transfers over time. Further research is needed in these areas.

Nevertheless, the study verifies that the transaction market has rebounded and matured. It appears to have shifted away from one mainly reliant on established, publicly traded pharmaceutical firms to a transaction market with a more global reach and more driven by biotechnology firms themselves.

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