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Identifying economic ramifications resulting from accepting equity vs. requiring traditional licensing payment methods

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ABSTRACT

The purpose of this study was to analyze the economic ramifications resulting from research universities' acceptance of equity positions in spin-off companies as an alternative to traditional forms of licensing payments. The study was conducted using the most recent three years (i.e., 2011, 2012, and 2013) of the Licensing Activity Survey conducted by the Association of University Technology Managers. Universities that had accepted equity in start-up companies had statistically significantly higher licensing revenue, in all three years, than universities that did not accept equity positions in start-up ventures. However, higher total licensing revenue earned by universities could be attributed to increases in running royalty revenues received in each of those same years. Revenues from cashed-in equity positions fell precipitously in years 2011, 2012, and 2013. Universities may continue to take equity positions in start-up, joint venture companies despite decreasing revenues from cashed-in equity positions because the potential exists to create (a) a positive impact on regional economies, (b) new jobs for the schools' graduates and, (c) windfall profits for equity holders if the companies' technologies or inventions become commercially successful.

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1. Introduction

Historically, Technology Transfer Offices engaged in licensing activities. The most prevalent of these endeavors included offering licensing options and licensing agreements to private industry. Licensing fees may have included a set dollar amount paid up front, monthly or yearly and/or running royalties that would have been assessed based on some percentage of sales or profits. In recent years, technology transfer professionals, with their universities' consent, have added an alternative and potentially lucrative method of receiving payment in exchange for the rights to market technologies or inventions owned by their universities (Di Gregorio & Shane, 2003; Feldman, Feller, Bercovitz, & Burton, 2002; Marion, Dunlap, & Friar, 2012; Powers & McDougall, 2005).

Increasingly, research universities are accepting equity positions in spin-off ventures created to commercialize universities' intellectual property. In the Association of University Technology Managers' (AUTM's) 2013 Licensing Survey, university respondents revealed that 818 startup companies were formed around universities' intellectual property. Many of these newly formed companies remain in close proximity to their partner universities creating jobs for the schools' graduates and stimulating the local economies. Willingness to accept equity in lieu of cash payments, as pointed out in the existing literature (Di Gregorio & Shane, 2003; Feldman et al., 2002; Marion et al., 2012; Powers & McDougall, 2005), may be predicated upon (a) the policies

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and culture of the research universities, (b) the predisposition and experience of the researchers/academic inventors, and (c) the characteristics of Technology Transfer Offices' licensing managers.

1.1. Policies and cultures of universities

In the early years of universities' commercialization efforts, immediately following passage of the Bayh-Dole Patent and Trademark Amendments Act of 1980, many institutions considered equity positions in spin-off businesses to be excessively risky and a method of last resort for accepting payment in exchange for their intellectual property (Feldman et al., 2002). Through their research, however, Feldman et al. (2002) determined that attitudes and policies at research universities had evolved toward a more diversified portfolio of payment options. Feldman et al. (2002) investigated the inclination of Technology Transfer Office professionals to accept equity positions, as an alternative to license agreements, in spin-off companies established for the purpose of commercializing universities' intellectual properties. These researchers analyzed 67 responses to a survey questionnaire sent to the 124 Carnegie I and II research universities that, at that time, had a formal structure for technology transfer. Feldman et al. (2002) concluded that universities were increasingly willing to accept equity, rather than license fees and royalty payments, in companies with the rights to market the universities' new technologies or inventions.

Survey respondents cited three reasons for the shift in policy. First, equity positions could have far more up-side income potential than traditional licensing agreements for universities. As one of the businesses' owners, a university would be entitled to share in all future revenue streams of the new start-up business. In addition, the newly formed company could be acquired by a larger firm or it could sell shares in an initial public offering leading to windfall profits for the owners including the university. The second benefit of putting together an equity deal is that it aligned the interests of the university and the newly formed business. Both the university and the spin-off company would share a common goal of a quick and successful market launch of the new technology or invention. A third benefit of accepting an equity position is that it sets a precedent. A clear signal is sent to other industries and investors that the university is entrepreneurial and ready to create joint venture opportunities for the purpose of commercializing its portfolio of intellectual property (Feldman et al., 2002).

Di Gregorio and Shane (2003) identified university policies that influenced university/industry spin-off activity through a survey of 116 universities, of which 101 responses were received from Technology Transfer Offices' directors. Di Gregorio and Shane (2003) discovered an inverse relationship between the royalty rates paid to academic inventors and the number of start-up companies formed to commercialize universities' intellectual property. When universities were determined to have a policy of sharing a large portion of royalties with academic inventors, start-up activity was low. Conversely, when the inventors' share of royalty payments was paltry, a corresponding up-tick was present in the number of spin-off companies formed. An implication of this research is that universities may be able to amend royalty policy and directly influence start-up activity.

1.2. University researchers/academic inventors

Marion et al. (2012) examined the connection between the degree of commercialization success and the entrepreneurial characteristics of the academic inventor. Data for the investigation came from a census of 400 university patent disclosures, an empirical survey, and in-depth interviews with eight academic inventors identified in the census and survey as most successful at intellectual property commercialization as determined by gross revenue. Through their research, Marion et al. (2012) determined that several factors, all related to universities' academic inventors, were responsible for successfully passing newly developed technologies from universities to the market place through new start-up companies. Successful academic inventors, according to Marion et al. (2012), could generally be described as tenured and productive. They would have previous entrepreneurial experience and would also possess a positive inclination toward commercialization of research. In addition, the most productive inventors excelled in networking with industrial partners and cultivating external resources including knowledge and funding as evidenced by their participation in industry sponsored research agreements (Marion et al., 2012; O'Shea, Allen, Chevalier, & Roche, 2005).

1.3. Technology transfer offices and licensing managers

Although literature on the subject is sparse, one study was identified in which the authors espoused the important role Technology Transfer Offices play in the formation of spin-off companies. Powers and McDougall (2005) identified universities' resources believed to be significant predictors of spin-off company formation. The research team collected and analyzed archival data on 120 universities classified as “research extensive” or “research intensive” as defined by the Carnegie Classification System. Powers and McDougall (2005) discovered that the age of the Technology Transfer Office was a significant predictor of universities' willingness to accept equity positions in spin-off ventures created to commercialize their intellectual property. These researchers also concluded that the amount of research funding received from industry sources, the quality of the faculty, and access to venture capital were also significant predictors of increased spin-off activity. However, one of the original hypotheses, that the importance of universities' patent portfolios would be positively related to the number of start-up companies formed, was not supported by the data.

1.4. Statement of the problem

A problem, from the perspective of the universities, is that federal funding for academic research and development is stagnant. At the same time, universities' administrators have been disappointed in the revenues that have been generated through traditional licensing fees and royalty payments (Klein, de Haan, & Goldberg, 2010). Another problem confronts universities' industry partners. Companies that have licensed the rights to develop and market universities' intellectual properties will have start-up costs, but may have no immediate revenues and therefore, may also be strapped for cash. If licensor universities take equity positions in these start-up companies rather than requiring up-front payments, these businesses can conserve the cash that may be necessary for additional product development and for marketing expenses incurred when new products are launched (Feldman et al., 2002).

1.5. Purpose of the study

The traditional forms of payment, for the rights to market the intellectual property of universities, include licensing fees and running royalties. However, in AUTM's 2013 Licensing Survey, university respondents revealed that 818 startup companies were formed around universities' intellectual property. The purpose of this investigation was to identify any positive or negative economic ramifications resulting from the acceptance of equity positions in spin-off companies as an alternative to the old-style and more predictable forms of licensing payments.

1.6. Significance of the study

Since the passage of the Bayh-Dole Act, approximately 5700 companies have been formed to commercialize universities' intellectual properties (Marion et al., 2012). Today, school administrators, politicians, and business leaders are touting the benefits derived from university spin-off businesses. These businesses have the potential to create windfall revenues for sponsoring research universities as well as the ability to create jobs for the schools' graduates. Spin-off businesses, focused on a single technological innovation, can expedite the time from idea to market. In addition, through changes in culture and new policies covering technological innovation and commercialization, universities participating in alliances and joint ventures with industry are now repositioning to the center of socio-economic development in their respective communities. The commercialization of new university-born innovations and inventions are having a significant, positive impact on regional economies (Hayter, 2013; Nelles & Vorley, 2011; Osiri, McCarty, & Jessup, 2013). However, despite the recent emphasis at research universities on technology transfer and the increasing amount of published research on the subject of commercialization of universities' intellectual property, little consensus is present regarding a specific set of policies and practices that is a demonstrated model for technology transfer success or licensing income maximization.

1.7. Research questions

The research questions addressed in this investigation were: (a) What are the economic advantages and disadvantages for research universities engaged in technology transfer associated with the emerging trend of accepting start-up company equity in lieu of traditional licensing royalties?; (b) What percentages of universities' licensing income is generated from running royalties?; (c) What percentage of universities' licensing income is generated from cashed-in equity?; and (d) What is the difference in the ability of the two types of research universities (i.e., universities that have accepted equity positions in start-up companies and universities that have not accepted equity) to maximize total licensing revenue? The research questions were addressed utilizing data from each of the last three years of the AUTM's Licensing Activity Survey Questionnaire. As such, these research questions were repeated for each of these three years (i.e., 2011, 2012, and 2013). Following these three years of analyses, the extent to which any trends were present was examined.

1.8. Limitations

For over 20 years, the AUTM has conducted its annual Licensing Activity Survey Questionnaire. The Statistics Access for Technology Transfer database is the compilation of survey responses collected from research universities, medical schools, and other research institutions in the U.S. (AUTM, 2015). Therefore, results from this study may not be generalizable outside of North America. Furthermore, respondent institutions differed from year to year. Lastly, the responses from Technology Transfer Office professionals who participated in the AUTM's yearly survey may differ from the answers that would have been provided by those individuals who chose not to complete and return the questionnaire. For example, licensing professionals from research universities that have a record of successfully commercializing their intellectual property may respond to the survey at a different rate than their counterparts at underperforming institutions.

2. Method

2.1. Research design

This study was conducted with a non-experimental, causal-comparative research design (Creswell, 2009; Johnson & Christensen, 2012). The two categorical independent variables for this study were universities that have a policy and a practice

of accepting equity as payment for the right to market a particular technology or invention and universities that, as a strictly enforced policy, only accept licensing fees and running royalties as payment for their intellectual property. In nonexperimental research, no manipulation occurs of the independent variables, which was the case in this empirical investigation.

The quantitative dependent variable in this analysis was total license income received. In this causal-comparative study, the difference in the ability of the two types of research universities (i.e., universities that are willing to accept equity and universities that will not accept equity) to maximize total licensing revenue was analyzed. The disadvantages of using this design include limited control of extraneous variables and lack of manipulation of the independent variable (Creswell, 2009; Johnson & Christensen, 2012).

2.2. Participants

For over 20 years, the AUTM (2012) has conducted their Yearly Licensing Activity Survey. Respondents have included public and private research universities, medical schools, and other research institutions. The AUTM's database, used to reach institutions that were believed to engage in commercialization of their intellectual property, includes approximately 350 institutions that, in the past, have responded to the survey. The database also includes institutions that currently employ or that previously have employed AUTM members. Specifically, the intent of the AUTM's Licensing Activity Survey Committee is that the survey be completed by one of the respondent institutions' Technology Transfer Office officers, intellectual property managers, or licensing professionals. The range of yearly participants who completed and returned the survey questionnaire was between 199 and 202 for the years covered in the study.

2.3. Instrumentation and procedures

Statistical analysis was conducted using data provided by the AUTM. One of the AUTM's primary activities, for each of the last 23 years, has been to conduct their annual U.S. Licensing Activity Survey. The purpose of the survey was to quantify academic technology transfer data. In 2013, the survey was disseminated to 299 U.S. research institutions. Survey recipients included 232 colleges and universities, 61 research hospitals, three national laboratories, and three independent, technology related firms. Of the institutions contacted, 202 institutions returned the survey for a response rate of 68% (AUTM, 2014). The compilation of past survey responses is available in the AUTM's Statistics Access for Technology Transfer database (AUTM, 2015). The Statistics Access for Technology Transfer database was downloaded from the AUTM website into an Excel spreadsheet. The compiled survey data, in the Excel spreadsheet, were loaded into the Statistical Package for the Social Sciences to calculate descriptive and inferential statistics.

3. Results

The average dollar amount of total licensing revenue, calculated using data from the AUTM's 2011 licensing survey, collected by universities that also accepted an equity position in at least one start-up company during the 2011 fiscal year was $16,905,196.87. For those same universities, the average dollar amount of running royalties was $10,603,286.51, which was 63% of average total licensing revenue. The average dollar amount of cashed-in equity was $730,472.16, which was 4% of average total licensing revenue. By comparison, the average total licensing revenue collected by universities that did not accept equity in the 2011 survey year was $6,606,741.27. The “no equity” universities, produced average running royalties of $4,674,646.72, which was 71% of total licensing revenue. Their average dollar amount of cashed-in equity was $84,820.93, which was 1% of total licensing revenue. Readers can refer to Table 1 for the descriptive statistics concerning these variables.

Prior to conducting inferential statistics to determine whether differences were present between universities that accepted equity in start-up companies and institutions that did not accept start-up equity in their ability to maximize total licensing revenue, checks were conducted to determine the extent to which the data were normally distributed. Of the standardized skewness coefficients (i.e., the skewness value divided by its standard error) and the standardized kurtosis coefficients (i.e., the kurtosis value divided by its standard error), all were outside the range of normality, ± 3 (Onwuegbuzie & Daniel, 2002). Accordingly, a nonparametric (i.e., Mann–Whitney's U) independent samples t-test was conducted to answer the research question.

The nonparametric independent samples t-test revealed a statistically significant difference between universities that accepted equity in start-up companies and those universities that did not accept equity in start-up companies in their ability to maximize total licensing revenue, $U = 3340.00$, $p < .001$. This difference represented a small effect size (Cohen's d) of 0.34. (Cohen, 1988).

Table 1
Descriptive statistics for universities that accepted equity or not by type of licensing revenue for the 2011 licensing survey.

Accepted equity or not, license income by category	*M*	*SD*	*SUM*
Accepted equity			
Total licensing income	$16,905,196.87	$38,465,670.05	$1,284,794,962.00
Running royalties earned	$10,603,286.51	$25,722,366.70	$731,626,769.00
Cashed-in equity earned	$730,472.16	$2,081,668.19	$50,402,579.00
Did not accept equity			
Total licensing income	$6,606,741.27	$17,877,325.17	$422,831,441.00
Running royalties earned	$4,674,646.72	$16,474,469.85	$285,153,450.00
Cashed-in equity earned	$84,820.93	$351,627.75	$5,174,077.00

For the AUTM's 2011 licensing survey data, universities that had accepted equity in start-up companies had statistically significantly higher licensing revenue than universities that did not accept equity positions in start-up ventures.

The average dollar amount of total licensing revenue, calculated using data from the AUTM's 2012 licensing survey, collected by universities that also accepted an equity position in at least one start-up company during the 2012 fiscal year was $17,797,659.05. For those same universities, the average dollar amount of running royalties was $11,785,336.66, which was 66% of average total licensing revenue. The average dollar amount of cashed-in equity was $641,180.61, which was less than 4% of average total license ng revenue. By comparison, the average total licensing revenue collected by universities that did not accept equity in the 2012 survey year was $5,996,500.31. The "no equity" universities, produced average running royalties of $5,533,974.12, which was 92% of total licensing revenue; and their average dollar amount of cashed-in equity was $5412.11, which was 0.1% of total licensing revenue. Readers are referred to Table 2 for the descriptive statistics concerning these variables.

Prior to conducting inferential statistics to determine whether differences were present between universities that accepted equity in start-up companies and universities that did not accept equity in start-up companies in their ability to maximize total licensing revenue, checks were conducted to determine the extent to which the data were normally distributed. Of the standardized skewness coefficients and the standardized kurtosis coefficients, all were outside the range of normality, ±3 (Onwuegbuzie & Daniel, 2002). Therefore, a nonparametric (i.e., Mann–Whitney's *U*) independent samples *t*-test was conducted to answer the research question.

The nonparametric independent samples *t*-test revealed a statistically significant difference between universities that accepted equity in start-up companies universities that did not accept equity in start-up companies in their ability to maximize total licensing revenue, $U = 3805.00$, $p < .001$. The Cohen's *d* effect size associated with this difference was 0.41. Using Cohen's (1988) criteria, this result represented a small-to-moderate effect size. Universities that accepted equity in start-up companies had statistically significantly higher licensing revenue than universities that did not accept equity positions in start-up ventures.

The average dollar amount of total licensing revenue, calculated using data from the AUTM's 2013 licensing survey, collected by universities that also accepted an equity position in at least one start-up company during the 2013 fiscal year was $20,957,296.19. For those same universities, the average dollar amount of running royalties was $15,124,780.23, which was 72% of average total licensing revenue. The average dollar amount of cashed-in equity was $367,207.86, which was slightly less than 2% of average total licensing revenue. By comparison, the average total licensing revenue collected by universities that did not accept equity in survey year 2013 was $2,287,790.40. The "no equity" universities, produced average running royalties of $1,815,123.53, which was 79% of total licensing revenue; and their average dollar amount of cashed-in equity was $6711.62, which was 0.3% of total licensing revenue. Presented in Table 3 are the descriptive statistics for these variables.

Prior to conducting inferential statistics to determine whether differences were present between universities that accepted equity in start-up companies and universities that did not accept equity in start-up companies in their ability to maximize total licensing revenue, checks were conducted to determine the extent to which the data were normally distributed. Of the standardized skewness coefficients and the standardized kurtosis coefficients, all were outside the range of normality, ±3 (Onwuegbuzie & Daniel, 2002). Accordingly, a nonparametric (i.e., Mann–Whitney's *U*) independent samples *t*-test was conducted to answer the research question.

The nonparametric independent samples *t*-test revealed a statistically significant difference between universities that accepted equity in start-up companies and universities that did not accept equity in start-up companies in their ability to maximize total licensing revenue, $U = 3851.50$, $p < .001$. This difference represented a moderate effect size (Cohen's *d*) of 0.60 (Cohen, 1988). Universities that responded to the AUTM's 2013 licensing survey and accepted equity in start-up companies had statistically significantly higher licensing revenue than universities that did not accept equity positions in start-up ventures during that same year.

4. Discussion

Statistical analysis, conducted using the most resent three years of the AUTM's licensing survey data (i.e., 2011, 2012, and 2013), revealed that universities that had accepted equity in start-up companies had statistically significantly higher licensing revenue, in all three years analyzed in this investigation, than universities that did not accept equity positions in start-up ventures. In 2011, the average dollar amount of total licensing revenue earned by universities that had taken equity positions in start-up companies was $16,905,196.86. Two years later, in 2013, the average licensing revenue generated by these universities had risen to $20,957,296.19. In contrast, the 2011 average licensing revenue total by universities that had taken no equity positions in start-up

Table 2
Descriptive statistics for universities that accepted equity or not by type of licensing revenue for the 2012 licensing survey.

Accepted equity or not, license income by category	*M*	*SD*	*SUM*
Accepted equity			
Total licensing income	$17,797,659.05	$35,486,726.02	$1,477,205,701.00
Running royalties earned	$11,785,336.66	$29,176,633.46	$907,470,923.00
Cashed-in equity earned	$641,180.61	$2,383,188.73	$49,370,907.00
Did not accept equity			
Total licensing income	$5,996,500.31	$19,454,224.88	$371,783,019.00
Running royalties earned	$5,533,974.12	$19,778,040.56	$315,436,525.00
Cashed-in equity earned	$5412.11	$26,680.66	$308,490.00

Table 3
Descriptive statistics for universities that accepted equity or not by type of licensing revenue for the 2013 licensing survey.

Accepted equity or not, license income by category	*M*	*SD*	*SUM*
Accepted equity			
Total licensing income	$20,957,296.20	$44,022,064.31	$1,928,071,250.00
Running royalties earned	$15,124,780.23	$34,562,589.94	$1,300,731,100.00
Cashed-in equity earned	$367,207.86	$946,927.58	$31,579,876.00
Did not accept equity			
Total licensing income	$2,287,790.40	$4,875,568.16	$132,691,843.00
Running royalties earned	$1,815,123.53	$4,588,462.75	$105,277,165.00
Cashed-in equity earned	$6711.62	$32,355.73	$389,274.00

ventures was $6,606,741.27. By 2013, the average licensing revenue generated by these universities had dwindled to just $2,287,790.40.

In addition, the number of universities that accepted equity positions in start-up companies increased in each of the three years analyzed in this investigation. In 2011, 76 universities acquired one or more equity positions in start-up ventures. By 2013, the number of universities that had accepted equity positions had increased to 92. Conversely, the number of universities that did not accept equity positions in start-up companies during the same period decreased in each of the three years. In 2011, 64 universities had not accepted equity in any start-up companies in that year. By 2013, the number of universities that had not accepted equity positions had fallen to 58.

However, in each of the three years analyzed in this investigation, running royalty revenue, as a percentage of total licensing revenue, increased for the universities that had accepted equity positions in start-up companies. In 2011, average running royalties for the schools that had accepted equity were $10,603,286.51 or 63% of average total licensing revenue. By 2013, those same universities had earned $15,124,780.23 in running royalties, which represented 72% of their average total licensing revenue. At the same time, cashed-in equity fell, as a percentage of total licensing revenue, for the universities that had accepted equity in each of the three years analyzed in this investigation. In 2011, average cashed-in equity was $730,472.16 or 4% of average total licensing revenue and by the year 2013 average cashed-in equity had fallen to $367,207.86, which represented slightly less than 2% of average total licensing revenue for those universities.

It is counter-intuitive that the universities that had accepted increasing numbers of equity positions in each of the most recent three years of the AUTM licensing survey had also generated less in total average cashed-in equity revenue in each of the same three years. However, sound explanations exist for the unexpected results. First, licensing professionals who have demonstrated success in generating licensing revenue from all sources may have been granted, by their universities' administrators, greater latitude in decisions regarding the acceptance of equity in lieu of requiring running royalty payments from start-up ventures. An alternate explanation may be that universities were only cashing in their equity positions in companies that had shown little up-side potential. This group would include companies with products that have not performed well in the market place. Conversely, universities may hold, indefinitely, equity positions in companies that have performed well financially and that have, at least potentially, great up-side potential. This group might include companies that have earned the opportunity to offer stock to the public through initial public offerings or companies that could be sold, at great profit, to larger competitors.

4.1. Connection with existing literature

In the years immediately following passage of the Bayh-Dole Act of 1980, many institutions considered equity positions in spin-off businesses to be excessively risky and a method of last resort for accepting payment in exchange for their intellectual property (Feldman et al., 2002). However, Feldman et al. (2002) determined that attitudes and policies at research universities had evolved toward a more diversified portfolio of payment options. Feldman et al. (2002) concluded that universities were increasingly willing to accept equity, rather than the more traditional forms of licensing payment methods (i.e., licensing fees and royalty payments), in companies with the rights to market the universities' new technologies or inventions. The reasons for the change in policy, cited in Feldman et al. (2002), included more up-side income potential and the belief that universities would be viewed as entrepreneurial and ready to create joint venture opportunities by potential industry partners (Feldman et al., 2002). Results from this empirical investigation, which include evidence of an increasing number of universities accepting equity in start-up companies coupled with a 3-year upward trajectory for the average total licensing revenue earned by those institutions, support the conclusions of Feldman et al. (2002).

4.2. Implications for policy and practice

Di Gregorio and Shane (2003) analyzed universities' policies that were thought to influence university/industry spin-off activity. They discovered an inverse relationship between the royalty rates paid to academic inventors and the number of start-up companies formed to commercialize universities' intellectual property. When universities' policies espoused sharing a large portion of royalties with academic inventors, start-up activity was low. Conversely, when the inventors' share of royalty payments was paltry, a corresponding up-tick occurred in the number of spin-off companies formed. An implication of the Di Gregorio and Shane (2003) study was that universities may be able to amend their royalty payment policies and directly influence

start-up activity. An implication of this investigation is that universities that spur start-up activity could require running royalty payments from start-up companies resulting in immediate economic benefit as measured by the increase in total licensing revenue for those schools. As an alternative, universities could take equity positions in these new joint venture companies, which may create (a) a positive impact on regional economies, (b) new jobs made available for the schools' graduates and, (c) windfall profits for the universities if their technologies or inventions become commercially successful.

4.3. Suggestions for future research

Since the passage of the Bayh-Dole Act, approximately 5700 companies have been formed to commercialize universities' intellectual properties (Marion et al., 2012). Respondents to the AUTM's 2013 Licensing Survey confirmed that 818 start-up companies were formed around universities' intellectual property in that year alone. A suggestion for future research would be to conduct a qualitative or mixed method study with the purpose of identifying economic benefits, in addition to cashed-in equity, which did not appear to be an economically sufficient factor in the three years covered by this investigation, associated with university start-up activity. The investigation could include a questionnaire and licensing professionals could be asked to confirm economic benefits provided by investing in start-up companies. Potential respondents could be asked to quantify instances where newly formed companies stimulated regional economies by locating their facilities along with the corresponding job opportunities in close proximity to their partner universities. Of particular interest to universities' stakeholders would be the number of jobs filled by the schools' graduates.

5. Conclusion

The purpose of this study was to analyze the economic ramifications resulting from the acceptance by research universities of equity positions in spin-off companies as an alternative to traditional forms of licensing payments (e.g., royalties). Statistical analysis revealed that universities that had accepted equity in start-up companies had statistically significantly higher licensing revenue, in all three years analyzed in this investigation, than universities that did not accept equity positions in start-up ventures. However, higher total licensing revenue in each of the three years analyzed could be attributed to increases in running royalty revenues earned in each of those same years. In fact, revenues from cashed-in equity fell precipitously in 2011, 2012, and 2013. Universities may continue to take equity positions in start-up, joint venture companies despite decreasing revenues from cashed-in equity positions in recent years because there is the potential to create (a) a positive impact on regional economies, (b) new jobs for the schools' graduates and, (c) windfall profits for equity holders if the companies' technologies or inventions become commercially successful.

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