Embracing an entrepreneurial ecosystem: an analysis of the governance of research joint ventures

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Audretsch, D.B., Link, A.N. Embracing an entrepreneurial ecosystem: an analysis of the governance of research joint ventures. *Small Business Economics* **52,** 429–436 (2019). https://doi.org/10.1007/s11187-017-9953-8

This version of the article has been accepted for publication, after peer review (when applicable) and is subject to Springer Nature's AM terms of use, but is not the Version of Record and does not reflect post-acceptance improvements, or any corrections. The Version of Record is available online at: http://dx.doi.org/10.1007/s11187-017-9953-8.

Abstract:

In this paper, we examine how one important type of relationship, research joint ventures (RJVs), is governed within the context of an entrepreneurial ecosystem. Based on agency theory, we investigate the relationship between the governance structure of an RJV and the likelihood that the venture will embrace elements of its research-based ecosystem, that is, the likelihood that the RJV will invite a university to become a research member of the venture. Using data from the National Research Joint Venture Database, we find that when the governance structure of the RJV affords the organizer/leader and research director (the principal) the ability to exert control over the activities of the other members of the RJV (the agents), universities are less likely to be invited to participate as a research member.

Keywords: research joint venture | R&D | technology | entrepreneurship | innovation | agency theory

Article:

Introduction

The governance of an organization typically occurs within the boundaries of legal entities, albeit of the profit or non-profit variety. It is sufficiently complex and nuanced that at least several academic fields have emerged in recent years with an explicit focus on the governance of organizations such as management, corporate governance, and non-profit management. By contrast, the governance of entrepreneurial ecosystems is certainly less straightforward because it typically spans multiple organizations, institutions, and constituents. The common denominator among these various actors is location—they are co-located at the same geographic place. Yet, there is a striking paucity in this literature of what has been termed *the strategic management of place* (Audretsch 2015), or stated differently, there is a paucity of frameworks for the governance of an entrepreneurial ecosystem, even though the complexity and ambiguity may presumably be greater or at least certainly different from that confronting a single organization (Feldman 2014). Even as research has begun to make progress in identifying precisely what constitutes an

entrepreneurial ecosystem, the nature of the governance mechanisms of an entrepreneurial ecosystem remains virtually unexplored and unknown.

The purpose of this paper is to shed light on several aspects of the governance of an entrepreneurial ecosystem. In particular, the paper examines how one important type of relationship, research joint ventures (RJVs), is governed within the context of an entrepreneurial ecosystem.[1] We suggest that an RJV can provide a conduit for activities characterized by higher risk and uncertainty than would be undertaken by the individual firms and organizations within the spatial and community contexts afforded by an entrepreneurial ecosystem, which in turn is conducive to an enhanced performance. While the extant literature on entrepreneurial ecosystems has identified how and why complementary actors, firms, and institutions combine to create this superior economic performance, the actual governance mechanisms generating greater entrepreneurship and innovative activity have generally been left unexplored. An important contribution of this paper is to explicitly identify one such governance mechanism—the research joint venture—which leverages the spatial platform and community afforded by an entrepreneurial ecosystem to enable the participating firms and organizations to engage in economic activity characterized by greater risk and uncertainty than they would otherwise.

In Sect. 2, we offer a framework, based on agency theory, for investigating the relationship between the governance structure of an RJV and the likelihood that the venture will embrace elements of its research-based ecosystem, that is to be more precise, the likelihood that the RJV will invite a university to become a research member of the venture.

In Sect. 3, we present our empirical analysis. First, we describe the dataset that we use to estimate the likelihood that a university will be invited to be a research member of the RJV. Second, we posit a structural probability model appropriate for the question at hand; third, we present descriptive statistics on the variables used to estimate the model; and fourth, we present our regression results.

We conclude the paper in Sect. 4 with a summary of our findings and a discussion of the need for future research related to the economic ecosystem of RJVs.

A framework for analysis

As we noted above, the research question that we address in this paper relates to the relationship between the governance structure of the RJV and the likelihood that the venture will embrace elements of its research-based ecosystem by inviting a university to be a research member of the venture. Before proffering an agency theory-based hypothesis between the governance structure of the RJV and whether it includes a university as a research member, we first argue that the RJV is an example of an entrepreneurial organization and that a university is part of its research-based ecosystem.

[1] Our assertion that RJVs constitute an important economic relationship is predicated on the fact that recent public policy, namely, the National Cooperative Research Act of 1984, was promulgated on the premise that RJVs are such critical elements of our nation's innovation infrastructure (i.e., our national innovation system) that incentives toward their formation were warranted to reverse the productivity slowdown that plagued the industrial sector in the late 1970s and early 1980s. See Bozeman and Link (2015).

RJVs as a governance mechanism in the context of entrepreneurial ecosystems

While only the bare contours of entrepreneurial ecosystems have been deciphered and understood at this point within extant scholarly writings, three compelling salient features have emerged in the incipient literature that does exist (Audretsch 2015). The first feature is that entrepreneurial ecosystems are spatially bounded at a single geographic location. The second feature is that the ecosystems consist of multiple enterprises, organizations, institutions, and individuals. And the third feature, which distinguishes an ecosystem from a dimension of co-location, is that the enterprises within an ecosystem, unlike those that happen to be co-located, interact in such a manner as to elevate their own economic performance as well as the economic performance of place (Audretsch 2015, p. 83):

> Not only do factors and resources, both natural and man-made, matter in shaping locational economic performance, but the organization and structure of that economic activity matters as well.

Link and Bauer (1989) and Link and Scott (2005) have identified one salient governance structure involving multiple firms, organizations, and individuals at a single location—the RJV. The RJV consists of multiple units, including for-profit firms but also non-profit research institutions and universities, bounded by a formal or informal agreement to cooperate with the goal of facilitating research and ultimately enhancing firm performance and profitability. Thus, the RJV provides one particular governance mechanism guiding the behavior of a subset of firms and organizations within an entrepreneurial ecosystem.

Based on the historical trace of intellectual thought by Hébert and Link (2006, 2009), the synthesis of the extant management literature on entrepreneurship by Audretsch et al. (2015), and the theoretical model of the entrepreneurial process by Leyden and Link (2015), an entrepreneur or an entrepreneurial organization may be viewed as a person who or entity that accepts the risk and uncertainty associated with its innovative actions. Such is an RJV. However, an RJV engaging in activities characterized by high risk and uncertainty is not the same thing as a firm engaging in activities characterized by high risk and uncertainty. The distinction is the (entrepreneurial) ecosystem context. By partnering across organizational boundaries but within the spatial and community context afforded by the entrepreneurial ecosystem, an RJV is able to incur the risk and uncertainty requisite to spur entrepreneurial activity and innovation that ultimately drives the coveted enhancements in economic performance. The entrepreneurial ecosystem provides both the spatial but also community context for cross-organizational ventures and agreements that socialize risk and uncertainty rather than having a sole firm absorb the full extent and consequences of that risk and uncertainty.

Risk and uncertainty are fundamental characteristics of the RJV. These fundamental characteristics have two important dimensions. The first dimension is the risk and uncertainty that the research project itself will be technically successful. The second dimension relates to the inherent complexity of collaborative research; there are elements of both risk and uncertainty associated with if the RJV will remain a viable entity from start-up to completion. To elaborate, the outputs of research are not predicable a priori. This is a systemic characteristic of research

per se, and it remains even if the research is informally conducted collaboratively with another firm(s) or through a more formal RJV arrangement. However, even the RJV, with its apparent contractual arrangements among members, is an incomplete arrangement because of the uncertainty of research per se and of the monitored or unmonitored behavior of the members of the RJV. Nevertheless, the RJV is an institutional improvement over informal collaborations even in light of the principal-agent issues discussed in this paper. If, however, the RJV stays intact, and if its research project is successful and leads to a new or modified technology, then based on the strength of the property rights established during the formation of the RJV, albeit that they may be limited, one or more members might bring the technology to market as an innovation.

Universities and research-based ecosystems

A university potentially represents a key component of the RJV. In particular, a university provides a complementary resource base that a firm or the RJV might utilize as it furthers its entrepreneurial pursuits (Bozeman et al. 2008). Conceptually, a university represents a reservoir of knowledge, knowledge embodied in faculty as well as in technical equipment.[2] Expanding on the insight of Rosenberg and Nelson (1994, p. 340):

> What university research most often does … is to stimulate and enhance the power of R&D done in industry [or in an RJV], as contrasted with providing a substitute for it.

Similarly, Hall et al. (2003, p. 491) note the role of a university in an RJV:

> Universities are included (invited by industry) in those [joint] research projects that involve what we have called "new" science. Industrial research participants perceive that the university could provide research insight that is anticipatory of future research problems and that it could be an ombudsman anticipating and communicating to all parties the complexity of the research being undertaken.

Agency theory

Within an organization there is a principal and agents that the principal expects to act on his/her behalf. However, as has long been discussed in the economics and management literatures, monitoring an agent's behavior is at best difficult and at worst impossible.[3] Many solutions have been offered regarding how a principal can best ensure that an agent is in fact acting on behalf of the principal. These solutions are intended to lower monitoring costs and thus alter opportunistic behaviors. But, the fact remains that even under the most well intentioned and designed structures, situations exist in which parties pursue divergent goals.

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[2] Bozeman et al. (2008) show that it is common for firms, especially small and nascent firms, to partner with a university for both the tacit knowledge embodied in faculty as well as for access to technical equipment.

[3] It is difficult to point to the origin of this literature, but arguably, Ross (1973) was among the first to offer a theoretical solution to the principal-agent problem. Although chronically outdated, the review and critique by Eisenhardt (1989) remains useful. See also Hoskisson et al. (2014) and Peng and Sauerwald (2014).

However, while agency theory and its applications have generally been oriented toward the governance of a sole organization, as explained in the sections above, an entrepreneurial ecosystem has the salient feature of consisting of multiple organizations.[4] Thus, while the governance of a single organization confronts the issues of agency and control within that organization, the governance of an entrepreneurial ecosystem also involves the issues of agency and control across multiple organizations. This adds a key feature to agency theory that has received little attention in either the academic or professional literatures.

In the case of the RJV, there is generally one individual within a firm or organization (hereafter, firm) that organizes the venture, which invites other firms or organizations to join.[5] That individual's role once the RJV is formed can vary. He/she could expand on his/her role as organizer and also assume the role of the project leader and thus direct the RJV's research agenda, or he/she could expand only on his/her role as organizer and pursue, along with other members, one of many collaborative research tasks.

It might not be unreasonable to assume that when an individual organizes the RJV and also assumes the role of project leader and director of the RJV's research agenda that he/she can be identified as the principal of the RJV, and accordingly, the other members of the RJV can be thought of as the agents that might act opportunistically. Because in-firm research is applied in its nature as opposed to basic in its nature, any knowledge that is so generated within the firm will have quasi-private good characteristics. One might expect that any one agent, if not monitored, might not act in the best interest of the venture and accordingly might attempt to appropriate some research results to afford his/her firm at least a temporary competitive advantage. However, such agent behavior, if opportunistically appropriated, will eventually be noticed because of the quasi-public good characteristics of the resulting research-based knowledge.[6]

However, university research, in contrast to in-firm research, is basic in its nature and thus the generated knowledge will have quasi-public good characteristics (Link 1996). It would then follow that because university-based knowledge is a public good, the principal of the RJV might not invite a university to become a research partner because opportunistic behavior on the part of any member, even if temporary, might not ever be noticeable. Thus, because of the governance ability of the principal, he/she will have the ability not to invite a university to be a research member of the RJV, thereby avoiding opportunistic behavior on the part of the university and any appropriating agents. There may be a cost to such behavior because, as Link and Rees (1990) have shown, research involvement with a university increases the returns to private investments in R&D.[7]

Therefore, we assert in this paper that the organizer and project leader of the RJV—the principal—who has governance control over the structure and research direction of the RJV will act in a manner to manage or monitor the members—the agents—in a way that ensures that the organizer's/leader's objectives are realized. One element of the structure of the RJV that the

[4] Relatedly, see Carbonara et al. (2016).
[5] For a review of the foundational theory on RJVs, see Hagedoorn et al. (2000).
[6] See Hall et al. (2001) and Leyden and Link (2013).
[7] For additional insight into universities as research partners, see Link (2015).

founder/leader can influence through his/her governance is whether a university is invited to join the RJV.

Empirical analysis

To test the hypothesis that a university will not be invited to join the RJV as a member when there is a governance structure in place that affords the organizer/leader and research director (i.e., the principal) of the RJV the ability to exert and monitor control over the activities of the other members of the RJV (i.e., the agents), we rely on data from what Link (2017) refers to as the National Research Joint Venture Database (NRJVD).[8]

The National Research Joint Venture Database

In 1985, the year following the passage of the National Cooperative Research Act (NCRA), the National Science Foundation (NSF) initiated an effort to document collaborations in innovation that were based on NCRA *Federal Register* filings.[9] Then, in 1993, NSF initiated the development of the COoperative REsearch (CORE) database.[10]

Through 2012, there have been 1046 *Federal Register* filings either in response to the NCRA or in response to its amendment, the National Cooperative Research and Production Act (NCRPA) of 1993. During the years that the CORE database was being constructed and maintained, efforts were made to identify and contact the lead firm in each RJV.[11] It is not uncommon for a *Federal Register* filing to list a person's name and his/her firm or organization as the point of contact for the information in the disclosure. When a person's name or the name of a firm or organization does not appear in the filing, we presumed that the party listed first among members listed in the *Federal Register* filing is the lead firm or organization. In any event, ongoing efforts were made over the past decade to establish personal contact with each RJV to learn about the scope of research being conducted in the venture as well as to delve into other economics and strategic behaviors.

In early 2014, a broad-based survey instrument was constructed and pre-tested in an effort to obtain a more in-depth understanding of RJVs. Critical to this data collection effort was our previous ability to identify specific individuals who were in the lead firm or organization and who were willing to participate in the survey. The decade-long effort to establish personal contacts and the 2-year effort to collect survey-based information was never anticipated to result

[8] This database was formally unveiled at the Conference on Entrepreneurship, Innovation, and Enterprise Dynamics, sponsored by the OECD Working Party on Industry Analysis, on December 8–9, 2014. See Link (2017). The data in the NRJVD were previously used in Bray and Link (2017).
[9] This initial effort by NSF culminated with Link and Bauer (1989).
[10] The CORE database was established and maintained at the University of North Carolina at Greensboro by Link. The CORE database represents what is ostensibly the population of US formal RJVs. For example, the National Science Board (2002, Sect. 4) drew explicitly on the CORE database in its discussion of US research alliances.
[11] It is not uncommon for an organization; such as, for example, the National Center for Manufacturing Sciences to be the lead organization is the formation of a RJV. Only RJVs with lead firms were considered in the construction of our dataset. Efforts to identify and contact the lead firm in each RJV were done outside of the sponsorship of NSF. NSF support of the CORE database ended in 2008.

in a random sample of the *Federal Register* population of 1046 RJVs. It was anticipated to result in what would be the first micro-based sample of US RJVs.

By early 2015, completed instruments were in hand from the lead firm for 117 of the 1046 RJVs noticed in the *Federal Register* in response to either the NCRA or the NCRPA. The survey dataset represents an 11.2% coverage ratio. The 117 RJVs included in the dataset culminates, to the best of our knowledge, the first systematic effort to collect information on a sample of those RJVs that were disclosed in the *Federal Register* and chronicled in the CORE database.

The average number of members per RJV in the NRJVD is coincidently comparable to the average number of members per RJV in the CORE database. The mean size of the 1046 RJVs in the CORE database is 12.93 members, and the mean size of the 117 RJVs in the NRJVD is 12.16 members. However, some of the very largest RJVs, measured in terms of membership size, in the CORE database are not in our dataset. Statistically, however, the 117 RJVs in NRJVD are representative of the 1046 RJVs in the CORE database in terms of member size.[12]

Empirical model

To test our maintained hypothesis that a university will be invited to join an RJV only in those instances where there is not a governance structure that affords the organizing firm the ability to exert and monitor control over the activities of the RJV, we estimated the probability that an RJV would include a university as a research member as a function of the governance structure of the RJV. Specifically,

$$University = I(\mathbf{X}_i + \varepsilon_i > 0) \quad (1)$$

where *University* is a dichotomous variable equaling 1 if the RJV has a university as a research member and 0 if it does not. **X** is a vector of project and firm characteristics, including *Governance*, a dichotomous variable equaling 1 if the RJV has one organizer/project leader and director of research, and all other members of the RJV have supporting roles, and 0 if all members of the RJV have equally important roles and there are no supporting roles. *I* is the indicator function, and $\varepsilon \sim N(0,1)$.

Definitions and descriptive statistics

The variables used to estimate Eq. (1) are defined in Table 1. Descriptive statistics on the variables are in Table 2, and a correlation matrix of the variables is in Table 3.

There are a few notable observations in Table 2. First, about one third of the RJVs in the sample of 117 have a university as a research partner. Second, the range of number of members in an

[12] This conclusion is based on a comparison of the probability density distribution of the number of RJV members for both the CORE database and in the NRJVD. Specifically, based on a Kolmogorov-Smirnov two-sample test, the null hypothesis that the two distributions are the same cannot be rejected even at the 0.10 level: KS = 0.088989, D = 0.177991, KSa = 1.14654, and Pr > KSa = 0.1442.

RJV is 2 to 238. The second largest RJV in the sample has 78 members.[13] Finally, third, in about one half of the RJVs, the project researched in this RJV built on previous R&D the lead firm and in about one half of the RJVs the lead firm determined the technological focus of the RJV.

Table 1. Definition of the variables

Variable	Definition
University	=1 if a university is included as a research member of the RJV; =0 otherwise
Governance	=1 if the management structure of the RJV was one in which the RJV has one project leader and other members have supporting roles; =0 if all members of the RJV have equally important roles; that is, no member has a supporting role
Members	=number of members of the RJV at the time the RJV was terminated
PreviousR&D	=1 if the project researched in this RJV built on previous R&D the firm that organized the RJV; =0 otherwise
TechnicalFocus	=1 if the technological focus of the RJV project was determined by the firm that organized the RJV; =0 otherwise

The survey instrument was completed by the lead firm that organized the RJV

Table 2. Descriptive statistics on the variables, $n = 117$

Variable	Mean	Standard deviation	Range
University	0.325	0.470	0/1
Governance	0.325	0.470	0/1
Members	12.16	25.52	2–238
PreviousR&D	0.453	0.499	0/1
TechnicalFocus	0.504	0.502	0/1

Table 3. Correlation matrix of the variables, $n = 117$

	University	***Governance***	***Members***	***PreviousR&D***	***TechnicalFocus***
University	1				
Governance	−0.188**	1			
Members	0.157*	0.307***	1		
PreviousR&D	0.197**	0.029	0.139	1	
TechnicalFocus	0.508***	−0.042	−0.076	0.421***	1

***Significant at 0.01 level, **significant at 0.05 level, *significant at 0.10 level

Table 4. Probit results, $n = 117$ (robust standard error in parentheses, calculated marginal effect in brackets)

	(1)	**(2)**
Governance	−0.841 (0.316)*** [−0.284]	−1.047 (0.355)*** [−0.269]
Members	0.019 (0.009)** [0.006]	0.024 (0.010)** [0.006]
PreviousR&D	0.194 (0.110)* [0.065]	–
TechnicalFocus	–	1.633 (0.295)*** [0.420]
Intercept	−0.996 (0.423)**	−1.273 (0.261)***
Likelihood ratio	15.44***	30.20***
Wald χ^2	11.23**	48.64***

***Significant at 0.01 level, **significant at 0.05 level, *significant at 0.10 level

[13] The regression results in Table 4 below are almost identical if the RJV with 238 members is viewed as an outlier and deleted. These results are available from the authors on request.

It is important to note in the correlation matrix in Table 3 that *Governance* is negatively correlated with *University*, as hypothesized. It is also important to note that the correlation between *PreviousR&D* and *TechnicalFocus* (see Table 1 for the definition of the variables) is positive and highly significant. Thus, each of these variables, which clearly reflect similar characteristics of the RJV project, is treated separately as independent variable in variants of Eq. (1), as shown in Table 4 below.

Probit regression results

The probit regression results from Eq. (1) are in Table 4. The specification in column 1 contains *PreviousR&D* and the specification in column 2 contains *TechnicalFocus*.

Our maintained hypothesis is confirmed in both specifications. The probit coefficient and the calculated marginal effect on *Governance* is negative and highly significant. The probability that an RJV in our sample is 28.4 (column 1) and 26.9 (column 2) percentage points less likely to have a university as a research partner when the governance structure of the RJV is one, in which the management structure has one project leader and other members have supporting roles. In other words, based on our arguments about the effect of agency theory on the inclusion of a university as a research partner, when the principal of the RJV has governance control, he/she is less likely to include a university because the output from the university will have public goods characteristics and any opportunistic behavior by the university will be hard to monitor.

The number of members in the RJV is positively related to the probability that a university is a member of the RJV. Others have found a similar finding (Link and Scott 2005). As per se membership size increases, the ability of the principal to monitor opportunistic behavior decreases and thus the cost to the venture, in terms of a university being a member decreases (Leyden and Link 1999).

Finally, an RJV is more likely to include a university in an RJV if the research project undertaken builds on previous R&D within the lead firm or if the lead firm determined the technological focus of the RJV. Our reasoning is that these research constraints bound the activities of university and thus focus its efforts toward those of the principal.

Concluding remarks

Even as the scholarly literature on small business economics and entrepreneurship unravels the role played within the particular geographical context of an entrepreneurial ecosystem, questions concerning not just what actually constitutes an entrepreneurial ecosystem but also how that entrepreneurial ecosystem is, can be, and should be governed arise as new and compelling issues. This paper has attempted to shed at least some light on one particular type of governance mechanism of an entrepreneurial ecosystem—the research joint venture.

In particular, in this paper, we apply a theory that has generally been limited within the boundaries of a single organization—agency theory—to a context involving multiple organizations and individuals within the context of a single geographic region—the entrepreneurial ecosystem. We find empirical evidence suggesting that a university will not be

invited to join the RJV as a research member when there is a governance structure capable of excluding the potential of opportunistic behavior. If that governance structure affords the organizer/leader and research director (i.e., the principal) of the RJV the ability to exert control over the activities of the other members of the RJV (i.e., the agents), universities are less likely to be invited to participate. However, while a rational decision on the part of the principal, his/her behavior will presumably influence the performance of the entrepreneurial firms comprising the entrepreneurial ecosystem as well as the overall economic performance of the particular place.

An important qualification of this paper is that the governance mechanism is analyzed for only one particular aspect of an entrepreneurial ecosystem—the RJV. Subsequent research will need to apply similar analyses for other aspects of the entrepreneurial ecosystem. Because an entrepreneurial ecosystem consists of multiple organizations and relationships, unraveling the multitude of governance mechanisms may ultimately resemble the search for the human genome. One might consider expanding our initial effort in terms of public sector research partners. While the arguments we present herein, and while our data are so limited, it is reasonable to think that asymmetric incentives will also exist when there are public sector research partners in the RJV, such as national laboratories. Clearly, private sector research partners as well as public sector research partners might have divergent goals from that of the principal, but they also might have divergent goals from each other due to, among other things, differing emphases between outputs from the research and social outcomes from the research. While the bulk of work and research remains to be done, this paper has made a first step in this process.

References

Audretsch, D. B. (2015). *Everything in its place: entrepreneurship and the strategic management of cities, states and regions*. New York: Oxford University Press.

Audretsch, D. B., Kuratko, D. F., & Link, A. N. (2015). Making sense of the elusive paradigm of entrepreneurship. *Small Business Economics, 45*, 703–712.

Bozeman, B., & Link, A. N. (2015). Toward an assessment of impacts from U.S. technology and innovation policies. *Science and Public Policy, 43*, 369–376.

Bozeman, B., Hardin, J., & Link, A. N. (2008). Barriers to the diffusion of nanotechnology. *Economics of Innovation and New Technology, 17*, 751–763.

Bray, J. W., & Link, A. N. (2017). Dynamic entrepreneurship: on the performance of U.S. research joint ventures. *Small Business Economics*. https://doi.org/10.1007/s11187-017-9862-x.

Carbonara, E., Santarelli, E., & Tran, H. T. (2016). *De Jure* determinants of new firm formation: how the pillars of constitutions influence entrepreneurship. *Small Business Economics, 47*, 139–162.

Eisenhardt, K. M. (1989). Agency theory: an assessment and review. *The Academy of Management Review, 14*, 57–74.

Feldman, M. P. (2014). The character of innovative places: entrepreneurial strategy, economic development, and prosperity. *Small Business Economics, 43*, 9–40.

Hagedoorn, J., Link, A. N., & Vonortas, N. S. (2000). Research partnerships. *Research Policy, 29*, 567–586.

Hall, B. H., Link, A. N., & Scott, J. T. (2001). Barriers inhibiting industry from partnering with universities: evidence from the advanced technology program. *Journal of Technology Transfer, 26*, 87–98.

Hall, B. H., Link, A. N., & Scott, J. T. (2003). Universities as research partners. *Review of Economics and Statistics, 85*, 485–491.

Hébert, R. F., & Link, A. N. (2006). The entrepreneur as innovator. *Journal of Technology Transfer, 31*, 589–597.

Hébert, R. F., & Link, A. N. (2009). *A history of entrepreneurship*. London: Routledge.

Hoskisson, R. E., Arthurs, J. D., White, R. E., & Wyatt, C. (2014). Multiple agency theory: an emerging perspective. In M. Wright, D. Siegel, K. Keasey, & I. Filatotchev (Eds.), *The Oxford handbook of corporate governance* (pp. 673–702). New York: Oxford University Press.

Leyden, D. P., & Link, A. N. (1999). Federal laboratories as research partners. *International Journal of Industrial Organization, 17*, 557–574.

Leyden, D. P., & Link, A. N. (2013). Knowledge spillovers, collective entrepreneurship, and economic growth: the role of universities. *Small Business Economics, 41*, 797–817.

Leyden, D. P., & Link, A. N. (2015). Toward a theory of the entrepreneurial process. *Small Business Economics, 44*, 475–484.

Link, A. N. (1996). On the classification of industrial R&D. *Research Policy, 25*, 397–401.

Link, A. N. (2015). Capturing knowledge: private gains and public gains from university research partnerships. *Foundations and Trends in Entrepreneurship, 11*, 139–206.

Link, A. N. (2017). Ideation, entrepreneurship, and innovation. *Small Business Economics, 48*, 279–285.

Link, A. N., & Bauer, L. L. (1989). *Cooperative research in U.S. manufacturing*. Lexington: Lexington Books.

Link, A. N., & Rees, J. (1990). Firm size, university based research, and the return to R&D. *Small Business Economics, 2*, 25–31.

Link, A. N., & Scott, J. T. (2005). Universities as partners in research joint ventures. *Research Policy, 34*, 385–393.

National Science Board. (2002). *Science and engineering indicators*. Arlington: National Science Board.

Peng, M. W. & Sauerwald, S. (2014). Corporate governance and principal-principal conflicts. In M. Wright, D. Siegel, K. Keasey, & I. Filatotchev (Eds.), *The Oxford handbook of corporate governance* (pp. 658–672).

Rosenberg, N., & Nelson, R. R. (1994). American universities and technical advance in industry. *Research Policy, 23*, 323–348.

Ross, S. A. (1973). The economic theory of agency: the principal's problem. *American Economic Review, Papers and Proceedings, 63*, 134–139.