

Beyond Governance: The effects of knowledge and transaction-cost factors on innovation success.

Bruce A. Heiman*, San Francisco State University
Subin Im, San Francisco State University
Namwoon Kim, Hong Kong Polytechnic University

Abstract

Governance choice (type of relation) has been the “traditional” outcome variable for scholars studying both transaction cost economics (Williamson, 1985) and the knowledge-based view of the firm (e.g., Kogut, 1992). While the independent variables typically examined (knowledge tacitness, complexity, asset specificity, interaction-bandwidth and communication codes) have been shown to have substantial effects on governance choice (Heiman and Nickerson, 2002, forthcoming), the question arises, “Do these factors have effects on other important outcomes?” This speculative paper is a first attempt to apply transaction-cost and knowledge-based logics to an important non-governance outcome, notably, innovation success (or failure). We first briefly examine the traditional roles of the factors under discussion, and then extend their logic via a plausible multi-stage model of innovation performance. Our multidisciplinary problem-solving perspective (PSP) lens usefully compatibly problems, transactions and projects as representing the same unit of analysis. We try to develop our logic with an eye towards future empirical tractability. Our model asserts that knowledge impaction (tacitness and complexity) affects asset specificity, moderated by knowledge management practices (communication codes and interaction-bandwidth). Asset specificity subsequently drives knowledge-related capabilities (knowledge acquisition, application and integration), moderated by governance choice (alignment and stringency). Knowledge-related capabilities then drive innovation outcomes (our main outcome variable of interest--new product and product launch novelty/meaningfulness), which affect firm-level outcomes (e.g., financial performance), moderated by market and technological uncertainty. Our arguments focus primarily on the early parts of the proposed chain of relationships leading to innovation outcomes.

*Corresponding author information:

heiman@sfsu.edu, ph: +.1.650.575.8220, fax: +.1.415.338.5096
San Francisco State University
1600 Holloway Ave.
San Francisco, CA 94132 US

Introduction—Beyond Governance

Both the knowledge-based view of firms (KBV) and transaction cost economics (TCE) predict managers' governance choices—the decisions firms make regarding the nature and appropriateness of their formal and informal relationships. The emphasis in these views to date is (reasonably) on the determinants of the dependent variable of interest, governance (Williamson 1975, 1985). For example, the use of shared ownership (equity) to align incentives of team members to perform a project's mission reflects a governance choice. We conjecture the powerful independent variables at work in these theories manifest additional, distinct effects beyond those affecting managerial governance choices. For instance, these factors may influence success at innovation, the dependent variable proposed in this speculative paper.

Innovation is widely recognized as an important performance-related element (Kline and Rosenberg 1986; Teece 1986; Cohen and Levin 1989; Cohen and Levinthal 1990; Henderson and Clark 1990; von Hippel 1994; Mowery, Oxley et al. 1996). We see innovation as rife with opportunity to study under the lens of the nascent problem-solving perspective (Nickerson and Zenger 2004). We see innovation as the process of transferring, sharing and recombining knowledge for a purpose (frequently commercial). Innovation seems a fertile starting place for exploring the effects of knowledge-based and transaction-cost factors on non-governance outcomes. We explore the effects of knowledge-based and transaction cost factors on the character of innovation. Specifically, we ask how these factors affect (1) new product innovation and (2) product-launch innovation. These outcomes are each further categorized as each possessing degrees of two aspects, meaningfulness (relevance and fit to the existing market) and novelty (extent of uniqueness).

Our paper initially briefly describes the basics of the two perspectives under consideration in the context of the traditional dependent variable, governance. We then outline arguments for plausible relationships between transaction cost factors, knowledge-based factors and success at innovation. We briefly develop testable propositions, and finally discuss some issues with our assertions as well as future directions for research.

TCE in Brief

The theoretical basis of transaction cost economics as a semi-formal branch of new institutional economics is well-established (Williamson 1975; Williamson 1985; Williamson 1991). Asset specificity is a key (though not the sole) independent variable in TCE. We offer several brief, convenient ways to think of asset specificity: Asset specificity is the extent to which (1) a productive asset lacks redeployability (one can only make one thing, but very efficiently), or (2) unrecoverable, idiosyncratic sunk costs are associated with a project. Slightly more formally, (3) asset specificity is the magnitude of the difference in rents received for deploying an asset in its first- versus second-best use. As asset specificity increases, transactions (activities, projects) are subject to increasing threat(s) of opportunism, especially in thin markets (e.g. supplier hold-up, quality shading, price-gouging). Empirical evidence for the influence of factors such as asset specificity on opportunism hazards and hence managerial governance choice has also become more refined and persuasive in recent years (e.g. Ennew, Wong et al. 1992; Masten 1994; Oxley 1999; Leiblein and Miller 2003). Governance is typically defined as the type of (discrete) relationship between transacting parties, e.g. equity-based (integration or shared ownership)

versus non-equity-based relations (market-like relations, e.g., spot markets, thick markets for supplies). Transaction cost economics' standard formulation recognizes that, ceteris paribus, increasingly stringent governance is chosen for a transaction as asset specificity increases. In order to mitigate threats of opportunism, rational actors choose to safeguard transactions by adjusting governance with the goal of economizing transaction costs (the cost of safeguarding against opportunism).

Transactors integrate suppliers in “thin” markets for supply (where switching costs are high) as a response to moral hazard threats (Williamson 1975). Internalizing supply creates lower-powered, but aligned incentives among transactors. Conversely, in “thick” supply markets (e.g., commodity supply with low supplier-switching costs) market-relations, with high-powered incentives are comparatively more cost-efficient than incurring the (monitoring and enforcement) costs of bureaucracy associated with internalization.

TCE, innovation and problem-solving. TCE is relentless in its focus on the transaction over the firm as the appropriate unit of analysis, an attractive approach for those interested in looking at innovation outcomes. The innovation project is a good unit of analysis because the results of innovation vary with each project or activity undertaken at a firm, and innovation is executed at the project-team level. We see the project and its associated goals as the transaction under scrutiny, a TCE-compatible approach.

With very few exceptions (e.g. Ennew, Wong et al. 1992; Mollering 2002), the evidence for moral hazard and the need to craft, economizing agreements that mitigate opportunism hazards is strong. Firms exist because they represent a feasible, efficient safeguard against opportunism (Williamson 1996). Transaction-cost logic apparently strongly influences managers. Governance and associated costs are clearly critical dependent variables for a theory of the firm, as governance is the form of economic (and relational) agreement into which parties enter when transacting. The prevailing literature treats governance as the main avenue through which the debate around the influence of transaction-cost factors, such as asset specificity, flows.¹ Stepping outside the quest for a theory of the firm, however, leads to an engaging question that so far has been largely ignored: do transaction-cost factors affect outcomes besides governance choice?

The Knowledge-based View and Reconciliation with TCE

In harmony with the problem-solving perspective, we also see an innovation project not only as a transaction, but as a problem, and/or a bundle of problems. Our approach is broadly compatible with the problem-solving perspective, which recognizes issues surrounding knowledge-related (transfer and creation) problems, solution search efficacy, and problem-solving given complexity in a context that acknowledges economizing, value creation and appropriation of rents (Nickerson and Zenger 2004). The problem-solving perspective's (PSP's) emphasis on recognizing the complementary nature of multiple theories from various disciplines (rather than

¹ The two empirical studies cited as exceptions to transaction cost economics, upon closer examination, rather than contradicting TCE, merely add additional factors under the TCE core logic (which remains largely intact): economize on the total costs of the transaction, for example production costs and transaction costs incurred by safeguarding against opportunism threats. A better example of an empirical exception to the transaction cost logic might be Mowery, Oxley and Silverman (1996), which offers evidence that (in alliances) firms focus on deliverables, an approach which efficiently protects intellectual property; managers are not concerned with issues around transfer of knowledge and the expropriation threat associated therewith (Heiman and Nickerson 2002).

seeing them as antagonistic and hence mutually exclusive) provides a place within which to frame our thoughts. Prior to the recent emergence of the PSP, scholars asserted that firms are organized to optimally transfer and manage knowledge (e.g. Conner and Prahalad 1996; Grant 1996; Kogut and Zander 1996; Madhok 1997). That is, governance choice is a function of the need to mitigate knowledge sharing problems, with no regard for the possibility of opportunism. Firms are seen as efficient knowledge-sharers. Actors are all assumed well-intentioned, an assumption which has haunted this perspective (Foss 1996a; Foss 1996b). Recent theoretical and empirical work reconciling TCE with a knowledge-based view of the firm (KBV) identifies two relevant knowledge-based factors: knowledge complexity and knowledge tacitness (Heiman and Nickerson 2002; Heiman and Nickerson forthcoming). In portraying the interaction of TCE and the KBV, Heiman & Nickerson's work is additionally useful in that it places the various factors of interest into a sequential chain of relationships where, for example Heiman and Nickerson (2002) argue that governance is the outcome at the end of a plausible, proposed multi-stage chain of relationships which plausibly takes both KBV and TCE factors into account.² We use an analogous approach to develop our own proposed relationship chain with innovation as the dependent variable of primary interest.

Innovation: A new dependent variable

Given researchers' strong and persistent zeal for governance as a dependent variable, is it possible that some powerful effects of the independent variables in the TCE and KBV formulations have been overlooked? Transaction-cost and KBV factors have been shown to have such a powerful effect on governance that it seems reasonable for the question to arise, "what else might these factors affect and what is the logic behind any action?" We assert that the quality and character of innovation is likely to be substantially impacted by transaction-cost and knowledge-based factors. Similar to TCE, innovation success or failure is likely strongly influenced by managerial choices, impacted by bounded rationality, and affected by the threat of potential opportunism. In the sense of the nascent problem-solving perspective (PSP), both governance and innovation fundamentally address mitigating problems under an economizing logic. The associations proposed below recognize the TCE (and PSP) behavioral assumptions, wherein actors are assumed to be far-sighted, economizing, potentially opportunistic, and (often severely) boundedly rational.

TCE- and KBV-based Determinants of Innovation

Our proposed chain of relationships is shown in Figure 1. To aid in the discussion, each relationship is labeled with a letter. The following discussion explores the rationale for each

² Heiman & Nickerson (2002, 97) state "Several KBV scholars (Kogut, B. and U. Zander (1996). "What firms do? Coordination, identity, and learning." *Organization Science* 7(5): 502-518, Madhok, A. (1996). "The organization of economic activity: Transaction costs, firm capabilities, and the nature of governance." *Organization Science* 7(5): 577-590. have argued that governance choice need rely only on bounded rationality and not on opportunism where TCE scholars maintain that both behavioral assumptions are needed to explain governance choice. An extension of TCE is developed to encompass certain knowledge-based attributes of transactions. High-levels of two knowledge transfer attributes - knowledge tacitness or problem solving complexity - lead to the adoption of the knowledge management practices - high-bandwidth channels or idiosyncratic communication codes - to economize on the cognitive limitations of man. It is these knowledge management practices that generate contracting hazards for which TCE, and its attendant concern about opportunism, predicts equity-based collaborations are superior to non-equity-based collaborations." In common with this approach, we adopt a similarly sequential logic to Heiman & Nickerson, and also utilize both KBV- and TCE-factors as independent variables in our propositions.

proposed relationship in the chain. For example, Relationship A represents the association between knowledge impact factors (tacitness and complexity) and asset specificity.

Antecedents. Continuing with Relationship A, the key indicators of asset specificity are (as noted above) are lack of redeployability and a large comparative difference between returns to the first- versus second-best use of an asset. As (1) tacit (difficult to articulate) knowledge is increasingly shared for the purposes of solving a problem, and/or (2) existing distinct bodies of knowledge are increasingly combined in a manner that results in distinct new knowledge (indicating complexity), the uniqueness of the activity undertaken increases (Nelson and Winter 1982); (Chesbrough 1997). That is, the relevance of the resulting state of knowledge for other projects decreases—this amounts to an investment in a sunk-cost--when a particular body of knowledge is shared, or combined with another distinct body of knowledge, different potentially rewarding activities are foregone (Nickerson and Zenger 2004). Redeployability of knowledge decreases as tacitness or complexity of knowledge increase. Asset specificity increases owing to the increasing difference in returns between the first- and second-best uses of such idiosyncratic shared or new knowledge. Proposition 1 asserts this relationship:

P1a: As knowledge tacitness associated with a project increases, asset specificity increases.

P1b: As complexity associated with a project increases, asset specificity increases.

As a stylized example of tacitness (P1a), consider a project in a portable consumer electronics firm where an engineer needs to share (transfer) her knowledge of the trade-offs between functionality, weight and cost of a part, say a power supply (based on many years of experience), with a marketing manager who has little or no technical background. The marketing manager needs this knowledge to the extent that he can later make good decisions on product specifications and pricing, as lower-weight finished products command a better price. The marketing manager and the engineer meet several times to transfer the relevant detailed knowledge to the marketing manager, foregoing opportunities to work on other projects. The second best use of this knowledge (the marketing manager may never need this knowledge again) likely commands a substantially lower return than the first-best use, finishing the project. The redeployability of the knowledge is low; costs are incurred during transfer of such impacted knowledge (Heiman and Nickerson 2002); the transfer of the knowledge has increased the asset specificity of the project.

For complexity (P2a), the logic is perhaps more straightforward. Continuing the stylized example above, suppose the marketing manager and the engineer must combine particular bodies of knowledge in order to solve their problem: the marketing manager provides knowledge of user preferences and the engineer offers knowledge of weight/performance tradeoffs. This results in the creation of new knowledge (of the best choices for a power supply specification and the related tradeoffs) which is highly idiosyncratic to the project. The returns to the second-best use of this new knowledge are likely low, as the knowledge was developed for a particular project—the relevance of the knowledge to activities outside the present project is severely limited. Creating new knowledge incurs costs because an idiosyncratic sunk investment in sharing communication codes (technical elements of different bodies of knowledge) must be

undertaken to facilitate the creation process. Asset specificity increases as existing knowledge is combined to create new knowledge.

Proposition 1 recognizes the direct effects of knowledge impactedness on asset specificity. The problems raised by tacitness and complexity, however, are moderated by the effects of managerial choice of knowledge management practices (Heiman and Nickerson, 2002, forthcoming). The use of high-bandwidth interactions between parties sharing tacit knowledge increases the efficiency of knowledge transfer and decreases asset specificity by economizing on the sharing costs—for highly tacit knowledge, the co-specialized investment in high-bandwidth interactions between people (e.g., frequent in-person meetings, co-location) results in comparatively lower costs of knowledge transfer versus inefficient, low-bandwidth communications (e.g., fax, phone, infrequent or no in-person meetings). As knowledge flows more transparently under high-bandwidth interactions, the feasibility of redeploying knowledge increases: people’s skills at communicating particular knowledge increase, and more people are able to easily internalize previously “sticky” knowledge—asset specificity increases—it becomes easier (less costly) to accumulate increasingly narrow (specific) stocks of knowledge (e.g., search costs are greatly diminished). Substantial time diseconomies apply to would-be imitators seeking to develop the same knowledge (Barney 1991).

Analogously, the effects of complexity on asset specificity are moderated by sharing communication codes. Sharing or creating common communication codes refers to investing in sharing language or vocabulary, for example, one person may teach another about accepted terms and conventions in a particular branch of materials science. When parties invest time and effort (incur costs) to learn each others’ particular technical vocabulary, the impediments to combining knowledge to create new knowledge are decreased—the costs to solve complex problems is comparatively lower than without the investment in common communication codes (owing to lower search costs from increasingly narrow-scope searches), but the sunk costs incurred to develop common communication codes rise—the idiosyncrasy (asset specificity) of the project increases. The moderating effects of knowledge management practices such as common communication codes and high-bandwidth facilitate knowledge-related activities, like innovation, but the sunk costs incurred also increase. Figure 1 shows Relationship E’s moderation of knowledge attributes’ effects on asset specificity as Relationship A. Proposition 2 asserts Relationship E’s moderation of Relationship A:

P2a: Increasing use of high-bandwidth interactions to address knowledge tacitness problems increases the idiosyncratic costs incurred to solve tacit knowledge-related problems, and increases the asset specificity associated with a project.

P2b: Increasing use of common communication codes to address complexity problems increases idiosyncratic sunk costs incurred to solve complex problems, and increases the asset specificity associated with a project.

Knowledge-related Abilities.

Relationship B shows the effects of asset specificity on knowledge-related abilities: knowledge acquisition, integration and application. We define the abilities to acquire, integrate and apply knowledge as the firm’s relevant knowledge-related capabilities specific to a particular

innovation project. Relationship B asserts that increasing asset specificity leads to improved project-level knowledge-capabilities. As noted above, a narrowing of needed relevant knowledge occurs as asset specificity increases—positive reinforcement of increasingly idiosyncratic and narrowing knowledge search processes occurs, particularly for exploratory activities such as searching for solutions to specific problems (March, 1991). Relatively high asset specificity decreases the solution-search costs associated with solving innovations problems. This is a knowledge-based interpretation of the returns to specialization (Smith 1976). For example, assume that a body of highly asset specific knowledge comprises a large fraction of the knowledge involved in an activity (say, of methods to achieve acceptable tolerances for a critical part in a larger product assembly). As the firm improves how it acquires, integrates, and applies this knowledge, it becomes easier to refine the knowledge owing to actors' increased familiarity with the knowledge as it is applied repeatedly over time (say, by using specific knowledge for achieving desired tolerances in other parts in the same product assembly).³ More simply, building experience facilitates knowledge refinement, a virtuous cycle as asset specificity increases. This is analogous to the positive action of increasing physical asset specificity on productive efficiency, for an increasingly narrow range of products, identified by Williamson (1975; 1985). For knowledge-related asset specificity then, as asset specificity increases, the bounds of relevant additional knowledge search processes increasingly narrow—it becomes less costly to deepen the relevant body of knowledge (the universe of knowledge to be searched dramatically decreases in size), a comparatively efficient outcome. Proposition 3 summarizes Relationship B:

P3: As asset specificity increases, the efficacy of relevant project-specific knowledge acquisition, integration and application capabilities increases.

The effects of asset specificity on knowledge-related capabilities are moderated, however, by two TCE-related effects through which we assert that the spectre of potential opportunism threats may not be denied. Specifically, the form of project governance chosen by managers influences knowledge-related capabilities in two ways (see moderating Relationship F, Figure 1). First, if the discrete mode of governance chosen is well-aligned with a particular opportunism threat, then the knowledge-related capabilities associated with a project are expected to be unimpaired. By well-aligned, we mean that governance form is chosen so as to minimize the costs associated with safeguarding the transaction (the team-project) from mis-behavior by team members (e.g., shirking, knowledge leakage or appropriation of knowledge). In contrast, under mis-aligned asset specificity-to-governance matching, an atmosphere of suspicion, distrust and disharmony may arise and/or opportunistic behavior (e.g., hold-up, shirking on quality or contribution/participation for a project). This negatively impacts a project-team's ability to use knowledge-related capabilities. That is, unsafeguarded opportunism threats increase the likelihood of costly sub-goal pursuit (e.g., expropriation, shirking). Appropriate alignment of discrete governance to asset specificity positively affects knowledge-related capabilities.

Second, the absolute effects of increasingly hierarchy-like governance choice for within-the-firm governance of projects facilitates knowledge acquisition, integration and application, though (in the absence of an alignment requirement) possibly while incurring unwarranted high costs from

³ This argument evokes echoes of Nelson and Winter's seminal work (1982) wherein refining organizational routines is a way to build valuable experience, but also increases path-dependency.

monitoring and enforcement of behavior. *Ceteris paribus*, as comparatively more stringent governance is chosen (e.g., increased direct project monitoring by managers, penalties for non-performance, frequent product and performance reviews, and substantial rewards for successful completion—for example shared equity or bonuses), the resultant socialization effects (e.g., positive affect and identity) on persons and teams facilitates their abilities to acquire, integrate and apply knowledge relevant to a project (Kogut and Zander 1996). Incentives become increasingly aligned among people working on a project.⁴ We expect the positive effects of well-aligned project governance to be greater than those of merely choosing increasingly stringent governance when it may or may not be the most efficacious choice. Proposition 4 states the moderating effects of governance choice on knowledge-related capabilities:

P4a: As governance is increasingly well-aligned with asset specificity, for a given project, knowledge-related capabilities (acquisition, integration and application) are enhanced.

P4b: As governance becomes increasingly stringent, for a given project, knowledge-related capabilities are enhanced.

Innovation outcomes. Relationship C, Figure 1, is more straightforward, even “Tayloristic,” essentially asserting that as the tools used on a project (in this instance, people’s knowledge and team/organizational setups relevant to using knowledge) are increasingly efficiently-configured (via contract and more informal modes of social organization) project execution improves (Taylor 1911). More recently, for the field of knowledge management, Von Hippel (1994) showed empirically that co-location of team members to support improved knowledge-abilities (acquisition, integration, and application), improved the performance outcomes of activities involving “sticky” knowledge. Strong knowledge-related capabilities, for a particular activity, foster increased returns to efforts at innovation, which leads to our fifth proposition:

P5: As knowledge-related capabilities are enhanced, innovation performance increases.

Note that Figure 1 specifies four types of innovation performance: new product (NP) novelty (originality, uniqueness), and new product meaningfulness (relevance and potential impact) are affected, along with, from the marketing side, launch program (LP) novelty and launch program meaningfulness. This functional break-out of performance is intended as empirically tractable, and is relevant for managers faced with innovation problems.

Performance outcomes. Continuing in our chain of logic, Figure 1, Relationship D shows the anticipated consequences of successful innovation performance (NP and LP), at the aggregated project- business unit- and firm-levels. Given strong innovation performance, product-related performance measures such as sales, market share, and profits should increase (Snow and Hrebiniak 1980; Teece 1995). The same should hold true for more organizational-learning-related outcomes, including numbers of new product ideas, in-house innovations, and patents (Mowery, Oxley et al. 1996). Also, customer needs should be met more precisely as a result of strong innovation performance (Hamel and Prahalad 1994). Note that these effects may manifest

⁴ We admit that there are likely diminishing returns to overly stringent governance, as, for example, too much monitoring or over-concentration or rewards among a high-performing few may cause disunity. Treatment of these effects is beyond the present scope of this paper.

as a result of either launch program or new product innovation success, but we feel that success in both areas is likely a necessary condition for organizational performance measures to be affected. These observations are articulated in Proposition 6:

P6: As new product and launch program innovation outcomes increasingly improve, project-, business unit-, and firm-level performance will be positively affected.

Finally, Relationship D, Figure 1, is moderated by Relationship G, which reflects the pernicious negative effects of intervening environmental factors (market and technological uncertainty) on project-, business unit-, and firm-level performance outcomes. As disruptions originating external to the firm increase, the positive effects of successful innovation are mitigated. We consider two disruptive influences: market uncertainty which reflects demand-side disruptions, and technological uncertainty which reflects supply-side disruptions. External factors such as market and technological uncertainty have been shown to impact performance of firms and industries (Teece, Rumelt et al. 1994) to an extent similar to internal factors (e.g., firm-capabilities) and hence should not be neglected. Proposition 7 captures this assertion:

P7: As environmental uncertainty (market or technological) increases, an increasingly negative effect on project-, business unit-, and firm-level performance occurs.

Discussion

This paper takes a first look at the effects of knowledge-based and TCE factors on innovation success. Conventionally characterized by an unrelenting focus on governance choice, our proposed framework offers a plausible logic for the effects of some important TCE and KBV factors on outcomes other than governance, namely innovation success. Our focus on new product innovation success and product launch innovation success as specific outcomes increases the feasibility of subsequent empirical testing. Our approach has been to construct a multi-stage, sequential model comprised of main effects (Relationships A, B, C, and D) and intervening factors (Relationships E, F, and G). Governance retains a role in this logic, as a moderator for Relationship B, the effects of asset specificity on knowledge capabilities. Despite the sequential nature of the chain of relationships, we offer the reader an important caveat: managerial choices (notably associated with Relationships E and F) frequently occur simultaneously, not in a particular sequence—that is, managers may choose which governance mode choice is appropriate concurrently with knowledge management practice choices. We offer the sequential logic as a simplifying mechanism that is also empirically tractable, an important property. We note that despite the presence of piecemeal evidence in the literature for several stages of our model, our logic remains empirically untested (we are, however, in the process gathering and analyzing a relevant, original dataset).

Our approach, in contrast with “traditional” TCE or KBV, departs from an exclusive focus on governance as a dependent variable and redirects the focus to innovation outcomes and subsequent performance factors. Additionally, as noted earlier, this approach is compatible with the nascent, so-called Problem-solving Perspective (Nickerson and Zenger 2004)—a fundamental and typically complex problem for firms is how to achieve positive innovation outcomes. The PSP also usefully recognizes the value inherent in plausibly synthesizing theories (i.e., TCE and KBV) while focusing on the problem (as the unit of analysis) and the efficacy of problem-

mitigating measures for achieving economical, value-adding outcomes that avoid undue expropriation of rents while economizing on costs. The approach taken is multidisciplinary, and plausibly and compatibly applies TCE and KBV (which ordinarily do not predict innovation outcomes) to the important question of what factors affect innovation- (and hence firm-) performance?

References

- Chesbrough, H. W. (1997). Dynamic coordination and creative destruction: a comparative analysis of incumbent success and failure in the worldwide hard disk drive industry. Business and Public Policy. Berkeley, CA, U.C. Berkeley Haas School of Business.
- Cohen, W. M. and R. C. Levin (1989). Empirical Studies of Innovation and Market Structure. Handbook of Industrial Organization. R. Schmalensee and R. D. Willig. Amsterdam, Elsevier Science Publishers: 1060-1107.
- Cohen, W. M. and D. A. Levinthal (1990). "Absorptive Capacity: A New Perspective on Learning and Innovation." Administrative Science Quarterly 35: 569-596.
- Conner, K. R. and C. K. Prahalad (1996). "A resource-based theory of the firm: Knowledge versus opportunism." Organization Science 7(5): 477-501.
- Ennew, C., P. Wong, et al. (1992). "Organisational Structures and the Boundaries of the Firm: Acquisition and Divestment in Financial Services." The Service Industries Journal 12(4): 478.
- Foss, N. J. (1996a). "Knowledge-based approaches to the theory of the firm: Some critical comments." Organization Science 7(5): 470-476.
- Foss, N. J. (1996b). "More critical comments on knowledge-based theories of the firm." Organization Science 7(5): 519-523.
- Grant, R. M. (1996). "Toward a knowledge-based theory of the firm." Strategic Management Journal 17: 109-122.
- Hamel, G. and C. K. Prahalad (1994). Competing for the Future. Boston, MA, Harvard Business School Press.
- Heiman, B. A. and J. A. Nickerson (2002). "Towards Reconciling Transaction Cost Economics and the Knowledge-based View of the Firm: The Context of Interfirm Collaborations." International Journal of the Economics of Business 9(1): 97 - 116.
- Heiman, B. A. and J. A. Nickerson (forthcoming). "Empirical evidence regarding the tension between knowledge sharing and knowledge expropriation in collaborations." managerial and Decision Economics Special issue (1994).
- Henderson, R. M. and K. Clark (1990). "Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms." Administrative Science Quarterly 35: 9-30.
- Kline, S. J. and N. Rosenberg (1986). An Overview of Innovation. The Positive Sum Strategy: Harnessing Technology for Economic Growth. R. Landau and N. †Rosenberg. Washington, DC, National Academy Press: 275-305.
- Kogut, B. and U. Zander (1996). "What firms do? Coordination, identity, and learning." Organization Science 7(5): 502-518.
- Leiblein, M. J. and D. J. Miller (2003). "An empirical examination of transaction-and firm-level influences on the vertical boundaries of the firm." Strategic Management Journal 24(9): 839.
- Madhok, A. (1996). "The organization of economic activity: Transaction costs, firm capabilities, and the nature of governance." Organization Science 7(5): 577-590.
- Madhok, A. (1997). "Strategic Alliances as Simultaneous Failure of Markets and Hierarchies: A Knowledge-Based Perspective and Implications for the Theory of the Firm." Working Paper David Eccles School of Business.
- Masten, S. E. (1994). "Empirical Research in Transaction Cost Economics: Challenges, Progress, Directions." unpublished manuscript.
- Mollering, G. (2002). "Perceived trustworthiness and inter-firm governance:

- Empirical evidence from the UK printing industry." Cambridge Journal of Economics 26(2): 139.
- Mowery, D., J. Oxley, et al. (1996). "Strategic Alliances and Interfirm Knowledge Transfer." Strategic Management Journal 17(Winter Special Issue): 77-91.
- Nelson, R. R. and S. G. Winter (1982). An Evolutionary Theory of Economic Change. Cambridge, Belknap Press.
- Nickerson, J. A. and T. R. Zenger (2004). A knowledge-based theory of governance choice—A problem-solving approach. Working Paper, Olin School of Business, also forthcoming in Organization Science. St. Louis.
- Oxley, J. E. (1999). "Institutional environment and the mechanisms of governance: The impact of intellectual property protection on the structure of inter-firm alliances." Journal of Economic Behavior & Organization 38(3): 283-309.
- Snow, C. and L. Hrebiniak (1980). "Strategy, Distinctive Competence, and Organizational Performance." Administrative Science Quarterly 25: 317-335.
- Taylor, F., W. (1911). The Principles of Scientific Management. New York, Harper & Brothers.
- Teece, D. J. (1986). "Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy." Research Policy 15(December): 285-305.
- Teece, D. J. (1995). Managing Intellectual Assets: Invisible Assets and Firm Performance. Intellectual Capital Management Meeting.
- Teece, D. J., R. Rumelt, et al. (1994). "Understanding Corporate Coherence: Theory and Evidence." Journal of Economic Behavior & Organization 23(1): 1-30.
- von Hippel, E. (1994). "'Sticky information' and the locus of problem solving: Implications for Innovation." Management Science 40(4): 429-438.
- Williamson, O. E. (1975). Markets and Hierarchies: Analysis and Antitrust Implications. New York, The Free Press.
- Williamson, O. E. (1985). The Economic Institutions of Capitalism.
- Williamson, O. E. (1991). "Comparative economic organization: The analysis of discrete structural alternatives." Administrative Science Quarterly 36(June): 269-296.
- Williamson, O. E. (1996). The Politics and Economics of Redistribution and Inefficiency. The Mechanisms of Governance. Oxford, Oxford University Press: 195-217.

Figure 1: A Model of Innovation Performance Using Knowledge-based and Transaction-cost Factors

