



FACTOR PAYMENTS, RESOURCE-BASED BARGAINING, AND THE CREATION OF FIRM WEALTH IN TECHNOLOGY-BASED VENTURES

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A central tenet of resource-based logic is that undervalued resources utilized by firms organized to exploit them will produce superior economic performance over the long run. Yet when young technology-based ventures pursuing new opportunities do not possess full property over these resources, input providers retain the right to bid up factor prices to match each resource's marginal productivity. In response to these limitations in extant resource-based logic, we apply and extend Lippman and Rumelt's full payments and bargaining perspectives and propose an alternative method by which entrepreneurs can generate firm wealth through the unique bundling of cospecialized resources. Both theoretical implications and directions for future research are discussed as well. Copyright © 2009 Strategic Management Society.

INTRODUCTION

The specific actions entrepreneurs take to form and exploit opportunities in order to create wealth is centrally important to the literature on strategic entrepreneurship (Hitt *et al.*, 2001). According to resource-based theory, firm wealth is created and preserved over the long run through the utilization of resources valued at point lower than their marginal productivity (i.e., undervalued resources, Barney, 1986) provided these resources are also fixed (or quasi-fixed) in supply (i.e., the Ricardian foundation of resource-based theory, Peteraf, 1993).

Keywords: technology-based ventures; resource-based theory; factor payments; stakeholder bargaining; opportunity formation and exploitation

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Two unique features of the start-up process among technology-based ventures, however, raise important challenges to established resource-based logic. First, the ubiquity of environmental uncertainty surrounding technology-based ventures makes it increasingly difficult for entrepreneurs (even with superior knowledge) to accurately estimate future revenues and costs to determine if a resource is indeed undervalued. Second, most technology-based ventures share property rights to inputs with key suppliers (e.g., the technology is licensed, investment capital is provided in exchange for equity ownership, etc.). The existence of partial property rights coupled with systemic uncertainty implies that to the extent environmental uncertainty makes it difficult for each stakeholder to estimate *a priori* the rent generating capacity of their input, these suppliers often retain the right to correct any valuation errors over time to ensure full payment is received in exchange for use of the resource. Entrepreneurs contracting for key resources that seek to exploit new

opportunities are, therefore, unable to lock in any advantages the venture may have enjoyed from utilizing a resource initially undervalued.

Based on these issues, this article argues for an alternative framework for investigating the creation of firm wealth in technology-based ventures. Building from Lippman and Rumelt's (2003a; 2003b) recent work outlining the full payments and bargaining models, we argue that entrepreneurs can generate superior firm wealth over the long run through the unique bundling of complementary resources. We demonstrate here that under such a model, firm wealth can be created and preserved over the long run even, when key input providers fully appropriate the individual marginal product created through the use of their inputs (e.g., Makowski and Ostroy, 1995; 2001; Lippmann and Rumelt, 2003a; 2003b). By implication, the unit of analysis in this article shifts from an exclusive focus on the Ricardian properties of individual resources (e.g., Peteraf, 1993; Peteraf and Barney, 2003) to an analysis of the synergistic interaction among complementary firm resources as the mechanism for wealth creation through the development of new opportunities.

In a regime characterized by high uncertainty and partial property rights, the alternative perspective we construct here provides several unique advantages for resource-based logic over the traditional undervalued resource perspective. Strategic factor market theory builds on the premise that temporary factor market imperfections create the opportunity for firm resources to be purchased at a price point below their individual rent-generating potential (Barney, 1986; 2001). Over time, increasing pricing efficiency will determine whether the entrepreneur correctly forecasted the true economic value of a particular resource (Peteraf and Barney, 2003). The assumption is that the long-term economic benefit locked in by the entrepreneur is derived directly from the exploitation of an earlier valuation error made by another input provider. But where suppliers retain partial property rights over their inputs, they reserve the ability to correct these valuation errors through various bargaining tactics with the end objective of at least securing a payment stream in equilibrium with their input's marginal product (Makowski and Ostroy, 2001; Lippman and Rumelt, 2003b). Conversely, when the exploitation of new opportunities occurs through the super additive combination of two or more resources, it implies that even if key input providers work to secure these factor payments, surplus revenues not directly attributed to a

specific strategic factor remain as a pot of wealth to be divided among those who possess residual rights of firm ownership. This perspective has major implications for how we think about and examine the development of new opportunities by technology-based ventures.

Our emphasis here on resource complementarities offers a more grounded view of what actually occurs in the resource acquisition process of technology-based ventures. For example, industry insiders often recommend that entrepreneurs, in order to create superior wealth over the long run, should look for venture capitalists who can provide value (i.e., managerial expertise, legitimacy, etc.—besides just capital), rather than just taking the deal which takes the least amount of equity in exchange for capital. Conversely, venture capitalists often note that one of the primary indicators they use in making their investment decisions is whether they think they can work well with the venture's management team (Bygrave, 2003). Therefore, potential complementarities between the management team and investors (such as venture capitalists) appear to play a significant role as investors decide whether to fund a new opportunity. At the firm level of analysis, we expect that when such complementarities emerge among individual resources, they account for the variable amount of wealth generated by individual firms pursuing new opportunities (Foss and Ishikawa, 2007).

As a basis for this discussion, we have organized the article in the following manner. First, we note the current state of the resource-based literature with a specific focus on the contribution of the undervalued resources perspective as a key component of the resource heterogeneity approach. Next, we outline some of the criticisms of the resource heterogeneity approach culminating in Lippmann and Rumelt's recent work on the factor payments and resource bargaining models (2003a; 2003b). Based on this discussion, we then formulate a series of propositions applying Lippmann and Rumelt's models to predict the generation of wealth in technology-based ventures. Lastly, we highlight several implications of these propositions for resource-based theory and offer several suggestions for future research.

THEORETICAL BACKGROUND

Over the past 20 years, resource-based logic has emerged as a central paradigm in strategic

management theory (Lippman and Rumelt, 2003a; Barney and Arian, 2001; Barney, 1991). Resource-based theories of organizational performance continue to shape how management scholars think about and explore the causes of firm performance (cf. Peteraf and Barney, 2003). Within this tradition, recent work by Lippman and Rumelt (2003a; 2003b), capitalizing on fundamental paradigmatic developments in economic theory, constructs two complementary perspectives (i.e., the factor payments and bargaining perspectives) for exploring the link between resources and performance differentials among firms. We now highlight key developments in RBT and discuss the substance of specific criticisms that have emerged in the literature to provide a basis for an analysis of how the emerging perspectives fundamentally reshape resource-based logic.

Resource heterogeneity and undervalued strategic factors

At its conceptual core, RBT relies upon the premise that individual firms possess partially heterogeneous stocks of resources (Penrose, 1959; Wernerfelt, 1984; Barney, 1986; Barney, 1991; Peteraf and Barney, 2003). Superior firm performance (i.e., conceptualized as economic rents) derives from the implementation of unique strategies leveraging resource base differentials. In RBT, these rents are Ricardian, since rent payments are made in exchange for the use of inputs that are fixed (or quasi fixed) in supply (Peteraf, 1993). This implies that when demand for these factors increases as it becomes apparent they can be used to exploit an opportunity, the relative inelasticity of supply will increase the value of these resources. Firms, then, that acquire resources at a lower price point than current market prices are able to earn economic rents (e.g., net cash flows in excess of breakeven) and outperform competitors who are forced to acquire critical resources at the higher, current market prices.

While Ricardian economics offers an explanation as to why performance differentials persist over time, the Ricardian framework is less helpful for explaining how resources become valuable in the first place. Furthermore, although a considerable amount of prior research largely confirms that *valuable resources* are positively associated with increased firm performance, few have explored how these resources are initially accumulated/acquired by firms or the specific factors that determine the intrinsic value of a resource (Armstrong and

Shimizu, 2007; Newbert, 2007). These questions have immense theoretical and practical significance among new technology-based ventures, given that most firms organize around a set of resources whose value is often not known *a priori* (cf. Makadok and Barney, 2001)

Factor markets and resource valuation. A central assumption of resource-based logic is that resources are *valuable* to the extent they allow firms to exploit external opportunities and/or threats (or increase revenues or decrease costs) (Barney, 1991). Priem and Butler (2001a), however, argue that such reasoning is tautological given that competitive advantages created by the use of valuable resources are defined in the same terms as the metrics used to *value* a resource (e.g., the resource increases firm effectiveness/efficiency). Barney, while disputing the claims that resource-based logic is tautological does acknowledge that ‘. . . the determination of the value of a firm’s resources is exogenous to the resource-based theory presented in the 1991 article’ (2001: 42). He goes on to suggest that consistent with more recent work in RBT, market conditions determine when (or if) resources are valuable.

The *market conditions* perspective originally emerged when Barney (1986) argued that managers/entrepreneurs must utilize resources that are *undervalued* by strategic factor markets to produce superior economic performance. Resources are undervalued when the price of the particular resource does not fully reflect the value to be created by the use of the resource (or when the marginal revenue generated exceeds the marginal cost of utilizing the resource). This can occur when the entrepreneur procures a resource at a pricing threshold below that of its revenue potential.

To identify these undervalued resources, Barney (1986) proposes that managers/entrepreneurs either utilize superior information or simply capitalize on luck in discovering the resource/market opportunity. Eventually, however, the increasing pricing efficiency of strategic factor markets would eliminate the possibility of generating positive economic profits because the market will eventually be able to fully reflect the value of the entrepreneur’s strategy. By implication, then, the relative pricing efficiency of the strategic factor market discourages imitation by competitors because the increased demand for the strategic resource will increase its acquisition cost (or, concomitantly, its value to the entrepreneurial firm). At the base of this argument, however, is the notion that strategic factor markets are not fully

informationally efficient (Barney, 1986; Foss and Ishikawa, 2007).

Dierickx and Cool (1989) argue that some critical resources affecting a firm's relative performance simply are not openly traded on factor markets, but accumulate over time, through various ways, in firms. To the extent firms can bundle and deploy these resources to exploit emerging opportunities, performance differentials can persist given the difficulty in transferring these resources between firms (Dierickx and Cool, 1989). Building on this argument, because certain resources are not openly traded, strategic factor markets provide limited pricing information managers/entrepreneurs can use to determine the value of a resource (Denrell, Fang, and Winter, 2003). Furthermore, even when a corresponding factor market exists for key resources, the emergence of super-additive returns increases the difficulty of accurately valuing resources (Denrell *et al.*, 2003). The implication is that the price system provides only limited information for determining the value of certain types of and combinations of resources.

Stakeholder bargaining and resource valuation. Without the aid of an efficient pricing system, suppliers providing critical inputs to new technology-based ventures have limited information upon which to value their resources. Consider a university licensing a breakthrough technology to a start-up firm. Given that a complete external market does not exist for the technology, the university has little information to use to accurately estimate its value. Furthermore, a new venture rarely possesses a sufficient asset base to ensure that the university can garner complete royalty payments for the life of the licensing agreement. Although the university will use whatever available information it can find to estimate future cash flows, etc., to accurately value the technology, the inherent uncertainty of this process greatly increases the chance the technology will either be over- or undervalued; The university will extract either too many or too little rents in exchange for the use of the technology.

In RBT, the ability of the entrepreneur to acquire the technology at a lower price point than its ultimate value, to date, is generally viewed as a positive for the venture, given that it allows the firm (read—the entrepreneur) to collect the excess cash flows generated by using the undervalued technology. The *gain* of the entrepreneur, therefore, comes at the expense of the university. The problem with this approach, however, is that only one stakeholder in

the process—the entrepreneur—benefits from the *undervalued* resource. The issue is not that input providers should not appropriate *any* rents, given that profit generation is a central goal of any corporation. Rather, suppliers appropriating rents in excess of those required as payments for the use of specific strategic factors they provide diminishes the rents payable to other key suppliers, thereby minimizing the effect of valuable resources on firm-level performance (Coff, 1997; 1999).

Given the need to acquire key inputs from external providers to even initiate operations, these challenges can be exacerbated among new technology-based ventures. In addition to licensing intellectual property from universities, many technology ventures must also procure investment capital from external providers and source other key inputs from external organizations to construct the resource base of the firm (cf. Shane and Stuart, 2002; Shane, 2000). The embedded challenges of resource valuation and stakeholder appropriation can, in some situations, lead to inefficient outcomes where the input provider is not able to fully appropriate the rents generated by the use of their specific resources (cf. Makowski and Ostroy, 2001).

Appropriation concerns raise the issue of how bargaining positions initially emerge and subsequently evolve among key suppliers (Barney and Arian, 2001). Furthermore, to the degree bargaining positions emerge early on in the resource acquisition process, Barney and Arian (2001) question whether the relative strength of a stakeholder's bargaining position would be reflected in the value assigned to the resource. Under this line of the reasoning, the value of a resource, then, could at least partially be a function of the ability of the supplier to command rents in exchange for use of the resource. Overall, though, the implication of this line of research is that performance differentials between firms are only part of the RBT story. Eventually, the accumulated rents must be distributed to key suppliers and RBT needs further development to explain how this process should unfold.

Factor payments and bargaining models

In response to these issues, Lippman and Rumelt (2003a; 2003b), in two companion articles capitalizing on recent developments in economic theory (e.g., Makowski and Ostroy, 2001; 1995), offer several revisions to resource-based logic. First, Lippman and Rumelt (2003a) argue that all firm

revenues are payments for the use of specific resources. Thus, the value of a resource is indicated by the amount of the firm's revenue that can be attributed to the resource.¹ Second, instead of viewing suppliers as price takers (e.g., assuming markets and prices are a given, Makowski and Ostroy, 2001), managers/entrepreneurs should be viewed as creators of *new value* or even *new markets* through innovative action (Lippman and Rumelt, 2003b). The value—as indicated by its *price*—of the resource *emerges* through a complex bargaining process whereby suppliers seek to extract rents from a venture based on the relative strength of their bargaining position and their relative contribution to the marginal product of the venture. In this process, markets need not play a central role in determining the *a priori* value of resources. Third, complementarities between resources create surplus revenues that are not directly attributable to specific resources and, therefore, allow firms to generate wealth in excess of the marginal contribution of each resource (Lippman and Rumelt, 2003a; 2003b). Under these conditions, therefore, firms can generate wealth even when individual suppliers seek to achieve some equality between the marginal product they provide and the rents they are able to extract from a venture.

Based on these points, Lippman and Rumelt (2003a) argue that the goal of any firm is to maximize the surplus revenues (e.g., wealth) created through the unique bundling of resources (2003a). While this process does create a bargaining challenge whereby these surplus revenues must be allocated among the key suppliers, the broader implication is that the total wealth created by the firm potentially *increases* as unique resource complementarities emerge from combining individual resources. These resources, however, do not necessarily have to be scarce—or even undervalued—to produce a sustainable strategic advantage, but rather the unique bundling of resources (even commodities) can produce superior firm wealth (Lippman and Rumelt, 2003a). Based on this foundation, we now develop how the factor payments and bargaining models enable technology-based ventures to produce firm wealth, even when the firm does not possess full property rights to its inputs.

FACTOR PAYMENTS AND RESOURCE-BASED BARGAINING

As noted above, the combination of systemic uncertainty and the bargaining power of suppliers derived from possession of partial property rights increases the difficulty of locking in superior economic returns over the long run through the use of undervalued resources. Following Lippman and Rumelt (2003a; 2003b), we argue that entrepreneurs can still generate superior wealth through the construction of specific resource complementarities within the firm. We now contextualize the factor payments and bargaining models within technology-based entrepreneurship and outline a series of theoretical propositions.

Factor payments and resource valuation

As we mentioned above, given the primary objective of predicting the sustainability of competitive advantages between firms, early RBT work generally equated the value of a resource to its ability to enable the firm to exploit opportunities or defend against emerging threats (Barney, 1991). Eventually this perspective was modified to include the ability of resource to increase firm revenues and/or decrease costs. For example, Peteraf noted that '... firms with superior resources have lower average costs than other firms' (1993: 180), reflecting—at least implicitly—the logic of strategic factor market theory (Barney, 1986).

However, Lippman and Rumelt (2003a) point out that there exists substantial disagreement in neoclassical theory regarding the substance of economic costs, and that this issue has migrated into RBT through the coupling of superior economic performance with the notion of economic rents (e.g., Peteraf, 1993). The central issue derives from the application of opportunity cost logic to the process of valuing resources, particularly when unique complementarities exist between specific resources (Lippman and Rumelt, 2003a). Specifically, when a firm can leverage complementarities between resources, two conditions emerge. First, these combinations are unpriced by external factor markets since the value that is created is unique to the firm. Second, given that the firm is uniquely positioned to capture the value created by the complementary resources, the logic of opportunity costs is no longer relevant for determining the *true* economic costs of utilizing specific resources; there simply are no

¹Lippman and Rumelt (2003b) offer rent sensitivity analysis as a tool for measuring the variance in revenue each resource is responsible for.

alternative uses between firms for complementary resources (Lippman and Rumelt, 2003a). Therefore, firm profits as the simple difference between a firm's revenues and factor costs are best conceptualized as *simple rents* versus the more standard concept of *economic rents* generally embedded in RBT logic (Lippman and Rumelt, 2003a).

Valuable resources and firm valuation. Even with this extensive discussion regarding the nature of economic rents and costs briefly outlined above, resource-based theorists are still left with the issue of how to value resources given the absence of an external market mechanism. Though subtle, Lippman and Rumelt (2003a) work to resolve this issue by making several fundamental contributions to RBT through the factor payments perspective. First, whereas the current dialogue in RBT focuses on the role of external markets in valuing resources based on the relative tradeability and/or completeness of factor markets (Denrell, *et al.*, 2003), Lippman and Rumelt suggest that value emerges *endogenously* as the firm generates wealth (e.g., '... net revenues are the sum of payments to all resources,' 2003a: 921).² Specifically, the value of a resource is a function of the portion of the firm-level revenues generated by the use of the resource minus the payments made to the factor owner in exchange for the use of the resource. As such, external markets for resources are not necessary for determining the value of resources. This condition becomes especially critical when complementarities exist between individual resources.

Among young technology-based ventures, this approach, while helpful, still does not fully resolve the challenge of resource valuation, since most young firms do not immediately generate revenue (cf. Varian, Farrell, and Shapiro, 2004). However, entrepreneurs and other key suppliers are still making critical investments in resources and decisions regarding the configuration of these resources in the firm during the prerevenue stage. Under these conditions, in the absence of revenue, do alternative methods exist for valuing resources?

²This argument closely resembles recent work by Kohn (2004) who argues that a fundamental paradigm shift—from a value paradigm to an exchange paradigm—is underway in economic theory. In the exchange paradigm, Kohn (2004) argues, economic agents can strategically set prices for their inputs based on expected value and, therefore, value emerges as a consequence of their overall bargaining process, rather than as an input into the bargaining process.

Regarding the lack of a role for markets in the pricing of specific assets, Lippman and Rumelt (2003a) argue that the aggregated value of strategic factors can also be expressed in the total market capitalization of public firms (i.e., again, the value of a resource is a function of discounted future cash flows). While prerevenue technology-based ventures are almost never publicly traded, they do engage in the process of resource accumulation and/or development. Furthermore, critical resources are often acquired in exchange for at least partial property rights over the residual cash flows of the venture (i.e., investment capital exchanged for partial equity ownership; technology licensed in exchange for partial equity ownership, etc.). When the ownership over the residual cash flows of the venture is set based on the exchange of key inputs for equity ownership, firm value is also determined, since these input providers are basing their equity demands at least partially on future expected cash flows from the venture. Therefore, the value of even privately held firms still reflects the aggregated value of the firm's strategic resources. By implication, then, the value of individual resources can be determined by the marginal contribution of each to the total valuation of the firm.

Proposition 1: There is a positive relationship between the expected value of key strategic resources and the total valuation of technology-based ventures.

The standard empirical strategy in resource-based studies focuses on the relationship between the valuable, rare, and imitability properties of individual resources and firm performance (e.g., Crook *et al.*, 2008). Lippman and Rumelt (2003a) expand this discussion to focus on the properties of the interaction among firm resources. Specifically, Lippman and Rumelt (2003a) suggest that firms are *coalitions* of multiple resources, including commodities and scarce resources. Since commodity inputs are priced on factor markets and prices for these inputs are generally somewhat elastic, Lippman and Rumelt (2003a) suggest that commodity resources and scarce resources play the central role in determining the net revenues in a venture. The task of the business strategist is to create various combinations of these resources in order to maximize the extra cash flows (Lippman and Rumelt, 2003a).

To create these valuable combinations of resources, entrepreneurs should focus on developing and

exploiting complementarities among key resources (Lippman and Rumelt, 2003a). Complementarities exist between resources when the total value created from the combined use of these resources exceeds the value created from the individual contribution of each resource (Teece, 1986; Lippman and Rumelt, 2003a). As noted above, resource complementarities are especially important to the creation of firm wealth, since various combinations are not priced on factor markets—especially as combinations of resources grow more complex (Lippman and Rumelt, 2003b) and the value created can generally only be captured by the coalition of factor providers with residual rights of ownership within the firm. The initial process of organizing a young technology-based venture should yield some complementarities among strategic factors within the firm (i.e., the combined experience and skill of the management team in working specific technologies, relationships with specific funding agents, etc.). Furthermore, to the extent that complementarities do not emerge, potential signals are provided to other possible suppliers that fundamental flaws exist with the venture's core value proposition (Lippman and Rumelt, 2003b). If it becomes apparent that sufficient complementarities do not exist, a lack of fit is evident among key strategic factors within a young venture, and key suppliers would likely conclude that the venture will not be able to generate sufficient future cash flows (i.e., wealth). This would diminish the value they place on the firm as a whole. By implication, the degree to which a firm can develop complementarities among key strategic resources will increase the total valuation of the firm above the valuation of a comparable firm with the same set of resources but with weaker development of complementarities among these resources.³

Proposition 2: There is a positive relationship between the expected value of complementarities that emerge among key strategic resources and the total valuation of technology-based ventures.

Bargaining and resource valuation

Whereas the expected marginal contribution of specific resources and resource combinations to the

³ As we argue in propositions 5–7, resource cospecialization does not inevitably emerge among a set of resources based on the properties of these resources. Rather, it is the central task of the entrepreneur to develop cospecialization among these resources.

future cash flows of technology-based ventures can be used for determining the value of strategic resources, these propositions also create a conundrum for resource-based theorists. If key suppliers believe their specific inputs are essential for the creation of wealth by the venture, they will likely command higher factor payments in exchange for the use of these resources (Lippman and Rumelt, 2003b). This line of reasoning is based on recent developments in economic theory shifting the definition of perfect competition away from price taking to full appropriation (e.g., Makowski and Ostroy, 1995; 2001). When markets are perfectly competitive, input providers are able to fully appropriate their marginal contribution to wealth creation in the economy (Makowski and Ostroy, 2001).

Recall our earlier example regarding the university licensing an undervalued technology to an entrepreneurial venture. By implication of the above, we would expect university officials to engage in tactics to bid up their factor payments as the value of technology becomes more apparent over time. These increased factor payments, in turn, either increase the operational costs of the venture (i.e., increased royalty payments) or reduce the amount of equity available to other key suppliers (i.e., demand for more equity) depending upon the specific details of each contractual arrangement. This erases any temporary advantages stemming from the use of an undervalued strategic resources.⁴ Furthermore, in both cases, the relative bargaining position of key suppliers potentially diminishes the amount of wealth (i.e., net cash flows) created by the venture that can be distributed among the venture's residual owners.

Resource specialization and wealth creation. To fully understand the relationship between factor payments, bargaining positions, and the creation of firm wealth, we must consider the impact of specialized resources. This involves most of the earlier work on RBT (see Barney and Arikan, 2001, for a review). According to Teece (1986), resource specialization refers to a situation where value creation derived

⁴ Among technology-based ventures, key stakeholders extract factor payments in the form of either direct compensation or equity positions within the company. For example, whereas investors typically will not take any direct compensation in favor of large equity stakes, hired employees often take direct compensation coupled with small equity stakes in the company. The exact mix of these different types of compensation is an interesting extension of this study, but one we will not address here in much detail.

from the bundling of complementary resources is unilaterally dependent on a specific resource. For example, suppose the technology licensed by the university to the venture was developed by a scientist who is the only person in the world that can successfully engineer, adapt, and advance the technology. Without access to complementary resources within the firm, the scientist does not possess the tools he/she needs to successfully develop the technology, but perhaps the scientist could gain access to these resources in several different firms. By implication, although the only way value can be created in this situation is through the interaction of the scientist's knowledge and the venture's complementary resources, the scarce resource is still the scientist's knowledge.

Based on these conditions and following the reasoning of Makowski and Ostroy (1995; 2001), we could assume that the scientist—through the university—would command higher factor payments (i.e., greater royalty payments and/or equity stakes in the venture) in exchange for the use of his/her specialized input. In this case, the improved bargaining position of the scientist leads to higher factor payments made by the venture. Furthermore, higher factor payments reduce the venture's overall wealth that can be distributed to the entire pool of suppliers.

Proposition 3: There is a positive relationship between the degree of specialization embedded in strategic resources and the corresponding factor payment (i.e., increased operating costs or equity requirements) necessary to employ these resources within technology-based ventures.

Resource cospecialization and wealth creation. In light of the negative impact of resource specialization on wealth creation within technology-based ventures, it is not surprising Lippman and Rumelt (2003a; 2003b) focus their attention on the role of cospecialized resources in the creation of firm wealth. According to Teece (1986), resource cospecialization emerges when a bilateral dependence emerges between two or more resources embedded within a firm. For example, suppose over time an entrepreneurial team learns how to successfully market the technology developed by the scientist. Although they may not understand how to develop the technology on their own and, therefore, still need to employ the services of the scientist, the actual successful commercialization of the technology is

now jointly dependent upon both the scientist's knowledge and the managerial team's marketing capabilities. If we were to remove either of these components, the venture would likely create far less wealth. Value creation in this situation, then, is derived from the cospecialized mix of several resources within the firm.

Resource cospecialization produces several interesting effects on the bargaining position of individual suppliers within a venture. First, in light of the fact that the net cash flows created by the venture are a function of the interaction between two resources, the marginal test for determining the value of strategic resources (suggested by Lippman and Rumelt, 2003a) would indicate that both resources are equally important for generating wealth (e.g., remove one from the equation and the net revenue stream falls precipitously). Furthermore, supposing Makowski and Ostroy's (1995) model of perfect competition as full appropriation holds, factor payments in equilibrium with each resource's marginal product would likely be far less than they would be if either resource was simply specialized (versus cospecialized). By implication, holding the individual value of a resource constant, the bilateral dependence of cospecialized resources implies that the cost basis of the firm would be lower, thereby increasing the amount of wealth generated. Even if each stakeholder fully appropriates the marginal product of his/her specific input, a large reservoir of surplus revenues (i.e., firm wealth) exists which can then be distributed among the residual claimants.

Proposition 4: There is an inverse relationship between the degree of cospecialization among strategic resources and the corresponding factor payment (i.e., increased operating costs or equity requirements) necessary to employ each resource within technology-based ventures.

The emergence of cospecialized resources

So far our discussion has principally focused on wealth creation being a function of the interaction among strategic resources. The wealth-creating potential of strategic resources is contingent upon how these resources interact with other resources, not simply a static artifact of each individual resource. As implied with our technology licensing example above, we suggest that the cospecialization of resources can emerge over time—even from resources that were initially *specialized* (Siggelkow,

2002). Building on Lippman and Rumelt (2003b), we now argue that the central wealth-creating task of the entrepreneur is to develop cospecialization among a firm's core set of resources. (Siggelkow, 2002; Porter, 1996; Milgrom and Roberts, 1995).

Strategic fit and resource cospecialization. In much of the earlier research on resource complementarities, the central managerial task was to utilize these unique resource combinations to achieve strategic fit among a firm's strategy, structure, and processes (Milgrom and Roberts, 1990, 1995; Porter, 1996). A central contribution of this literature is that rather than seeing fit as a static equilibrium derived from some blueprint configuration of an organization's resources, developing fit from complementary resources involves a complex process of exploring where evolving interactions produce multiple equilibria (Rivkin and Siggelkow, 2007). This will no doubt involve leveraging trade-offs among various resource combinations (Porter, 1996). While it may not be possible to initially fully maximize firm value from specialized and cospecialized resource pairings, it is possible to create new value propositions from novel combinations of resources (cf. Lippman and Rumelt, 2003b).

While similarities exist in building cospecialized resources across young and mature firms alike, several fundamental differences do exist with young technology-based ventures. First, among many young ventures, the strategic focus of the firm is often not well defined, but potentially is derived from the specific resources the firm has already accumulated (cf. Sarasvathy, 2001). Second, while the venture often possesses a set of key resources, the structure of the organization is generally not yet established, but emerges as the venture organizes around key elements of the value proposition (i.e., resource complementarities, Siggelkow, 2002). Consistent with these differences, the evolution of strategic fit develops through the bundling of complementary resources. Porter (1996) sees the bundling of resources involving three progressive stages: simple consistency, reinforcing other key elements, and optimization of effort. In the final three propositions developed below, we extend these arguments to show how resource complements can be built into cospecialized resources—a crucial component of firm-level strategic fit.

Resource cospecialization stage one: reducing bargaining costs. The first stage in achieving strategic fit through the bundling of resources is simple consistency between the resource and the overall

strategy of the firm (Porter, 1996). Simple consistency refers to the ability of certain strategic factors to deliver common elements of a venture's value proposition. While simple consistency is the weakest form of cospecialization, it nevertheless lays a foundation upon which increasing levels of cospecialization can be built by reducing stakeholder opportunism—and, by implication, reducing corresponding factor payments—through developing cooperative arrangements among a set of resources.

As a largely defensive maneuver, the accumulation of strategic substitutes (i.e., inputs can be substituted for each other in the venture's production processes)⁵ enables the venture to reduce the corresponding factor payments made to each stakeholder. The corresponding reduction in bargaining costs occurs because each resource is being used as a hedge against price increases (i.e., factor payments) by the other strategic input provider. Stated differently, if one factor provider attempts to charge a higher price for its input, the venture can substitute the other input in order to maintain the current costs of production. Therefore, the ability to utilize strategic substitutes creates a hedge against opportunistic behavior by input providers since the venture can simply utilize substitute inputs if one provider attempts to extract payments in excess of its marginal contribution (cf. Milgrom and Roberts, 1990). Among young ventures, entrepreneurs have a broader set of potential strategic substitutes since the focal outcomes are not well defined.

The issue, however, with the ability of ventures to reduce bargaining costs through the possession of strategic substitutes is whether such redundancy is a wise investment for a young venture with low amounts of financial slack (cf. George, 2005). The answer, of course, is dependent upon the extent to which key strategic factors provided to the venture are specialized. For example, given the specific type of commercialization model adopted by many technology-based ventures characterized by high fixed costs and nonexistent revenues during the start-up phase (cf. Varian *et al.*, 2004), many are forced to acquire external capital to fund early operations. Initially, investment capital can be considered as a specialized resource since the venture is unilaterally

⁵In this article we refer to *substitutes* in the most general definition of the word. Namely, the firm can utilize either input to accomplish the same general objective of the firm's production activities.

dependent upon the investor to cover significant operational losses. Furthermore, to the extent the future fortunes of the venture are contingent upon the receipt of early capital investments, investors can bid up their factor payments (i.e., equity stakes) to levels that potentially exceed the actual marginal contribution of the investment capital to the actual long-term performance of the organization.

To hedge against this possibility, some entrepreneurs will attempt to accumulate capital from a variety of sources to reduce the overall bargaining power of the capital provider (cf. Denis, 2004). In some cases, this may involve the acquisition of different types of capital (i.e., debt versus equity financing) or sourcing capital from a broader set of providers (i.e., strategic and equity investors, cf. Denis, 2004). But a far more frequent response since capital raising is a difficult and time-consuming process is the implementation of bootstrapping financing strategies to at least partially offset certain early expenses borne by the venture (Winborg and Landström, 2001; Van Auken, 2005). In this regard, the financial management capabilities of the entrepreneur can serve as at least a partial strategic substitute for outside capital, thereby reducing the unilateral dependence of the venture on the investor (e.g., Van Auken, 2005).⁶ As a defensive maneuver, therefore, the accumulation of strategic factor substitutes can reduce the potential of factor providers of engaging in opportunistic behavior by bidding up the required factor payments. In turn, as a crucial first step, this reduction in the ability of factor providers to engage in opportunistic behavior opens the door for cooperative arrangements to be developed between resource providers, since no one input is irreplaceable in the venture's production processes. In no way do we suggest that these strategic factors are perfect substitutes for each other, but at this early stage, the extent to which each type of input can produce the key organizational outcome allows the venture to utilize these different resources as strategic substitutes.

Proposition 5: The accumulation of substitute strategic factors reduces the factor payments required to obtain the services of key individual resources within technology-based ventures.

⁶This specific situation reminds us of a common adage in entrepreneurial finance circles: the ventures that do not need external capital have the easiest time raising it.

Resource cospecialization stage two: increasing net revenues. The next stage of bundling resources involves the venture attempting to develop complementarities among these resources. As described above, resource complementarities emerge when 'doing more of one thing increases the returns to doing more of another' (Milgrom and Roberts, 1995: 181). A by-product, then, of complementarities among key resources is super additive returns to the interaction of two or more variable factors. For example, among technology-based ventures, a key early step many ventures must take is the simultaneous investment in product development and the development of a team with diverse capabilities that can move a technology towards commercialization. In this case, the interaction of resources (technology and team complementarities) has the potential to increase the effect of each resource on value creation within the venture. If team capabilities are too different or have diverse perspectives on where the commercialization opportunities are, then complementarities are unlikely to develop, crippling the economic potential of the venture.

By implication, suppose a technology venture that has licensed a set of IP from a university is seeking to hire a qualified CEO to manage the early development and growth of the company. If key insiders were to utilize an undervalued resource perspective as the filter through which they evaluate potential candidates, they would probably develop some rank order of candidates based on the combination of the *value* of these candidates' managerial skills and abilities with each person's salary demands. To the extent the firm can obtain the services of a skilled candidate for a below market wage (i.e., lower factor payments), extant strategic factor market theory predicts the firm should generate superior economic performance over the long run.

The challenge, however, with this approach—as we have noted throughout this article—is that when resource providers maintain at least partial property rights over their inputs, they retain some bargaining power they can utilize to bid up their corresponding factor payments over time into equilibrium with the value they provide to the firm. By implication, the firm cannot lock in long-term economic returns derived from paying these individuals below market wages over the long run. In a discussion regarding the impact of resource complementarities on strategic fit, Milgrom and Roberts (1995) highlight the impact of human resource incentive policies at Lincoln Electric, a top-performing company in its

industry. The basic gist of this policy is that the company tries to precisely measure and compensate accordingly the marginal contribution of each employee. As a result, through a system of bonuses, the encouragement of employee ownership, a policy of no layoffs, and other such complementary HR policies, superior performers can often significantly increase their salaries (i.e., factor payment) to match their specific contributions to the company while still enabling the firm to outperform its rivals. As such, Milgrom and Roberts argue that the complementary pay systems and HR programs at Lincoln Electric ‘... create strong incentives for high and growing productivity and the means to achieve it’ (1995: 203).⁷ Furthermore, since the bonus system operates within a system of complementary factors, each of these factors reinforces the effects of the other factors, thereby decreasing the singular importance of any isolated factor for producing superior performance.

By implication, this example suggests that the technology venture’s stakeholders should focus their search on a CEO whose skills, background, and abilities can reinforce key elements of the value proposition the venture is attempting to create. Furthermore, given that it is likely the CEO candidate will eventually bid up his/her factor payments to achieve some equilibrium with the value he/she provides to the company, the individuals responsible for selecting a CEO should be less concerned with trying to acquire the services of a CEO for a below market wage. To be clear, we are not suggesting that ventures frivolously spend capital by overpaying for the services of a particular CEO. Instead, our central observation is that firms should (or they eventually will) pay for services of key resources (human or other) in equilibrium to the value they provide to the company. For a company with low cash reserves, this implies that they could develop a compensation package that utilizes more equity ownership in lieu of direct salary. As we noted above, both forms of compensation serve as a factor payment to the employee. The mutual reinforcement between the abilities of the CEO candidate and the key elements of the value proposition the venture seeks to develop lead to the increasing development of the

cospecialization of key organizational resources. Over time, as the highly relevant skills and abilities of the CEO interact with the particular technology in development, the joint effect of these combined resources should increase the marginal product of each strategic factor. By implication, the venture should be able to produce higher net revenues given the reduced bargaining costs coupled with the increasing cospecialization between resources.

Proposition 6: The development of strategic factor complementarities increases the marginal product of bundled strategic factors without a corresponding increase in factor payments within technology-based ventures.

Resource cospecialization: optimizing the value proposition. The third stage in bundling resources is the *optimization of effort* derived from the interaction of core elements within the organization (Porter, 1996). However, the complex nature of the organizing process often prevents full optimization. The optimization process we describe here allows ventures to minimize bargaining costs while increasing the marginal product derived from use of cospecialized resource bundles to achieve local optimization (e.g., Rivkin and Siggelkow, 2007). Over time, as the value of these bundles becomes apparent, the venture can work to link these key elements to achieve more global optimization at the firm level. However, through this development process, the accumulation of strategic factor substitutes and the experimentation with various resource bundles creates the possibility that the venture will develop stockpiles of redundant and/or unnecessary inputs. Over time these stockpiles may increase the inefficiency of the venture (cf. George, 2005). As a crucial final stage in this process, optimization allows ventures to cast off unnecessary inputs while working to integrate key cospecialized resource bundles.

Regarding the optimization of effort, Porter (1996) describes how the inventory control systems at the clothing store Gap enable the firm to keep store shelves stocked without having to maintain large in-store inventories (thus keeping costs low). Gap is able maintain such a system, because ‘coordination and information exchange ... (allows the firm) to eliminate redundancy and minimize wasted effort ...’ (Porter, 1996: 73). Among technology-based ventures, once the relative value of key cospecialized resource bundles becomes apparent, the task of the entrepreneur is to link these elements through the process of vertical integration.

⁷Milgrom and Roberts (1995) suggest that Lincoln Electric was so good at simultaneously lowering prices while delivering superior service as a result of their complementary HR systems that the company was able to force GE and other large companies to exit the industry.

In the vertical integration/transaction cost literature, firm scope decisions (i.e., the decision whether to bring a particular resource exchange into the firm or to let the market manage the exchange process) are often contingent upon the trade-off between the level of specialization of the resource and the probability the transaction partner will engage in opportunistic behavior (i.e., increase required factor payments) (Mahoney, 1992; Leiblein and Miller, 2003). Barney and Hesterly (2008) draw a similar conclusion when applying resource-based logic to vertical integration decisions, and suggest that the focus of the manager and/or entrepreneur should be to reduce the threat of opportunism.⁸ By establishing property rights over a particular resource by vertically integrating it within a firm, the assumption is that the firm will be able to reduce the costs of ownership by controlling the opportunism of input providers.

However, as noted above, full property rights for some resources simply cannot be fully transferred even when these resources are embedded within the firm (Grossman and Hart, 1986; Milgrom and Roberts, 1990). In these cases, the input provider retains bargaining power and can continue to engage in tactics to bid up its factor payment even while its input is actively employed in the production processes within the firm. For example, a scientist who develops the technology licensed by a venture, even if this individual is hired into the firm, retains the right to command higher factor payments in exchange for his/her contribution of the technology. Furthermore, to the extent the factor payment received by the scientist is not in equilibrium with his/her marginal contribution to the venture, we predict that the scientist would engage in tactics to achieve such an equilibrium. By implication, vertical integration cannot reduce the costs of ownership over a particular strategic factor when the firm cannot establish full property rights over the resource.

We argue that entrepreneurs make vertical integration decisions with a broader goal in mind than simply mitigating the threat of opportunism. Specifically, the decision to bring a particular exchange relationship within a firm is made because potential complementarities among the resources allow

resource providers to generate greater amounts of wealth than if these resources were not combined together. Stated differently, vertically integrating cospecialized resource combinations allow the venture to create super additive returns while simultaneously reducing bargaining costs. Therefore, the logic for vertical integration decisions is whether bringing a particular resource within the firm will enable the venture to achieve super additive returns by leveraging the complementarities among the set of resources. Furthermore, once the entrepreneur is able to assess the relative value of particular resource combinations, he/she can work to optimize these combinations through the process of vertical integration.

Proposition 7: The process of organizing around cospecialized resource combinations enables ventures to achieve greater levels of optimization in vertical integration decisions thereby increasing the amount of wealth created by technology-based ventures.

DISCUSSION

Research implications

Empirical tests of RBT. When Dierickx and Cool (1989) first raised the issue regarding the link between the unique bundling of resources and superior economic performance, Barney (1989) suggested that unique resource bundles were an example of the social complexity of firms; which, in turn, was a factor that made a firm's resource base costly to imitate. Numerous authors, however, have criticized this approach, arguing that by linking both the properties of individual resources and the bundling of resources with firm performance, RBT confounds two distinct levels of analysis (Foss and Knudsen, 2003). To this point, Peteraf and Barney (2003) argue that RBT should be cast at both the enterprise and resource levels of analysis; where resource heterogeneity produces differential value, which aggregates into performance differences between firms/enterprises. At the basis of their argument, however, they clarify the central importance of resource heterogeneity in explaining performance differentials between firms.

This article argues for explaining performance differentials between technology-based ventures by considering the interaction of bundled, cospecialized

⁸This argument reflects the central tenet of extant resource-based logic: resources are valuable to the extent they allow the firm to pursue emerging opportunities or defend against threats.

resources on firm performance and not just the properties of individual resources. This is consistent with the full payments and bargaining perspectives outlined by Lippman and Rumelt (2003a; 2003b). By implication, empirical tests of this model must consider the effects of resources embedded in a system of resources to explain firm performance, thereby shifting the level of analysis to bundles of resources within the firm. Furthermore, whereas RBT does not recommend the use of a specific type of dependent variable (Foss and Knudsen, 2003), we suggest that the primary outcome of interest is the creation of firm wealth.

Adjusting study designs for testing resource-based logic to explain wealth creation among technology-based ventures helps resolve several emerging issues. In a recent review, Newbert (2007) concludes that support is mixed for the resource heterogeneity approach across the RBT empirical literature (e.g., only 37 percent of studies were significant). Instead, empirical support for an *organizing* approach to RBT appears much more robust. Furthermore, Newbert (2007) notes that the number of empirical studies employing the resource heterogeneity approach is actually decreasing while, comparatively, the number of *organizing* studies is increasing. This change is occurring in response to some of the conceptual shifts in the way scholars understand the relationship between the organization of firm resources and firm performance (Newbert, 2007). In contrast, Crook *et al.* (2008) report in their meta-analytic study that the valuable, rare, and imitability properties of resources are positively associated with firm performance. However, this link does not always seem to hold when key input stakeholders are appropriating the value before it gets to the firm level. Our view is that consistent with Lippman and Rumelt's (2003a; 2003b) complementary factor payments and bargaining perspectives, the mechanism by which resources impact firm performance is contingent upon how the resource interacts with other resources in the firm. This approach differs fundamentally from the more common approach of examining the direct effect of individual resources on firm performance moderated by organizational attributes. Instead, we propose that the joint effect among two or more resources will be more strongly associated with the creation of firm wealth, since both the super additive effect as well (as the relative bargaining power of the input provider) can be better accounted for.

Implications for RBT: costs versus revenues. There is some debate among resource-based

scholars about the relative importance of costs versus revenues. Throughout much of the prior work on RBT, costs appeared to play a central role in the development of resource-based logic. For example, Peteraf and Barney (2003) suggest that RBT, as an efficiency paradigm, offers a model to explain firm performance differentials based on maximizing end customer benefits at an even (lower) cost basis than competitors. Furthermore, Barney's (1986) arguments regarding the role of undervalued strategic factors builds upon the idea that firms able to source inputs at lower price points will outperform their rivals, even if the customer benefits provided are the same. To this end, Makadok and Coff (2002: 10–11) explain that '... the value of a resource in strategic factor markets ... necessarily means the value that a firm captures by acquiring a resource—not the value created for the end consumers.' Conversely, Priem (2007) argues that the value a firm can appropriate is directly a function of the revenues it generates (top-line growth comes before bottom-line growth) and that strategy scholars are neglecting a critical component of firm performance.

An important issue in this discussion is the key factors managers/entrepreneurs must focus on to generate superior economic performance. On the one hand, Barney (1986) argues that if you can acquire undervalued resources, you can lock in economic rents over the long run. Priem (2007), on the other hand, appears to suggest that if you can maximize the net benefits created for consumers, your firm can generate higher levels of economic performance. We believe both perspectives, in isolation, ignore critical aspects of the wealth creation process in technology-based ventures, and since net cash flows are the primary manner through which residual claimants are compensated, both costs and revenues must be simultaneously considered.

Implications for transaction cost theory and RBT. One of the recent developments in the resource-based literature is the development of a link between RBT and transaction costs economics (TCE) (e.g., Madhok, 2002; Foss and Foss, 2005; Mayer and Salomon, 2006). This dialogue between transaction cost and resource-based theorists is relatively new given perceived differences in several key dimensions (i.e., unit of analysis, theoretical question, etc.). While Madhok (2002) offers several compelling reasons why we should more closely consider the overlap between the two theories, Foss and Foss (2005) argue that the minimization of transaction costs is a primary route for value creation in firms.

Conversely, Mayer and Salomon (2006) testing both transaction cost and resource-based logics, find support for the notion that the relative quality of the firm's technological capabilities affect the type of governance arrangements implemented by the firm even in the face of *contractual hazards*. The implication is that researchers must more carefully consider the impact of resource heterogeneity on firm governance decisions (which typically is the domain of transaction costs economics).

While we concur that resource-based logic has much to gain from a more explicit link between RBT and TCE, we suggest that this link is most relevant for particular types of resources (i.e., specialized resources). On the issue of cospecialized resource combinations, however, both frameworks need additional development to better model the value creation process. By applying and extending the factor payments and resource bargaining models developed by Lippman and Rumelt (2003a; 2003b), along with other core developments in RBT, we provide an alternative framework for thinking about the complementary issues of rent appropriation and wealth creation and how the development of cospecialized resources bundles can simultaneously control bargaining costs while generating surplus revenues.

Implications for real options theory in RBT. Regarding the issue of resource valuation, the use of real options theory has recently gained traction as a framework for modeling resource investment decisions under uncertainty (McGrath, 1997; Folta and Miller, 2002). According to McGrath (1997), real options approaches are a preferred mode of investing in resource development when the process is highly uncertain but the commitment required from input providers is substantial. In this type of setting, the strength of an options-based decision process, McGrath (1997) suggests, is that input providers can assess the value of the investment at different stages to determine whether subsequent investment is warranted. By implication, sequential investment decisions where capital is allocated over time based on the variance of the option value allows input providers to reassess the merits of particular resource development projects without having to invest the capital all at once. Thereby they do not run the risk of losing the entire investment if the development process encounters insurmountable obstacles.

In similar fashion, Magill and Quinzii (2002) propose that when incomplete markets provide unreliable pricing signals regarding the value of an

investment in a particular asset, the combination of bounded rationality and opportunism in exchange processes tends to limit the temporal scope of contractual arrangement between organizational stakeholders. Stated differently, when input providers cannot reliably predict the future, they do not attempt to, but rather develop shorter-term contracts that account for things they can predict. The challenge, however, with this approach among young technology-based ventures is that equity stakes are often granted early in the lifecycle of the venture. So, although recent articles utilize a real-options reasoning to explain the staging of capital infusions (Li, 2008), the equity stake in most cases has already been predetermined. (For example, a VC firm providing a \$2 million investment for a 40 percent equity stake paid out in five installments as the venture reaches key milestones). By implication, further codevelopment of real options logic with the factor payments/bargaining perspectives we outline here might reveal a stronger contractual arrangement between a venture and input providers where equity stakes are granted over time as the marginal productivity of key resources becomes more apparent. In all likelihood, the reason equity stakes are granted the way they typically are is because input providers are supplying specialized resources and are, therefore, able to extract higher factor payments based on their unilateral bargaining position.

Practical implications

The emphasis on *ex post* bargaining does raise several interesting issues regarding the current state of practice in stakeholder bargaining in entrepreneurial ventures. First, whereas Lippman and Rumelt (2003b) focus on the need for stakeholders to engage in *ex post* bargaining over the fair allocation of the surplus revenues, we draw attention back to the need for stakeholders to bargain over factor payments to ensure that each resource receives full payment to match its marginal product. Then, once full factor payments are made, theory suggests the *ex post* bargaining process should determine how to allocate the surplus revenues. By implication, the allocation of revenues should proceed in two stages: first, allocate the portion of revenues linked to individual factor payments, and second, divide up surplus revenues.

The challenge is that many key stakeholders often forgo initial factor payments to minimize the cash outflows from early-stage ventures for an increased

share of the surplus revenues. For example, recent work by Wasserman (2006) reports that among IPO-stage firms, founder entrepreneurs typically earn, on average, \$25,000 less than nonfounder managers. This suggests founders are commanding lower up-front factor payments in exchange for higher residual returns over the long run. Furthermore, underwriters and venture capitalists appear to band together to increase IPO underpricing, thereby extracting excessive rents from the firm (Arthurs *et al.*, 2008). In this situation, the standard agency model is flipped, because corporate insiders (i.e., the entrepreneur) actually must work to protect the firm from excessive rent appropriation by external capital providers.

More broadly, this situation reflects our earlier observation that when key stakeholders extract rents payable for the use of undervalued resources (here, underpricing of the firm), they do so at the expense of other key stakeholders. In the situation described above, the entrepreneurs managing IPO-stage firms are extracting lower factor payments than would be warranted by their marginal contribution to revenues, in exchange for a greater share of the venture's future net cash flows. However, the VCs and underwriters are banding together to extract excessive rents that far exceed their marginal products. These issues suggest that both academics and practitioners must work to redesign the standard contract in early stage technology-based ventures to ensure these markets are more efficient at distributing both the equitable factor payments and surplus revenues.

Limitations

An important limitation of this article stems from our exclusive focus on technology-based ventures, especially where these ventures do not hold full property rights to key resources. While this scenario reflects the current state of practice in technology-based entrepreneurship, among large, established firms with full property rights over their resources, the logic of undervalued resource perspective likely would be more relevant. We do think that the central task of the entrepreneur to create cospecialized resource bundles is similar to the task of managers in large firms, but given the impact of path dependencies in established firms, the process of developing cospecialized resource combinations is also likely to differ in important ways. The bottom line is that while our propositions are broadly relevant to many types of organizations, our propositions

are the most relevant where property rights are incomplete.

Lastly, one of the key assumptions we make in the article—consistent with Makowski and Ostroy's (1995; 2001) reformulation of perfect competition in neoclassical theory—is that input providers will inevitably seek to bid up factor payments to achieve an equilibrium with the marginal productivity of each resource. We do not assume, however, that this process is predictably linear or that the input provider can always perfectly assess the *true* marginal productivity of their supplied input. In fact, an important extension of this study would be a more in-depth analysis of this bargaining process to confirm the tendency of input providers to seek such a factor payment equilibrium. Toward this end, Blyler and Coff (2003) argue that because of the self-serving biases common in decision making, market actors may, in fact, overvalue their contributions, thereby attempting to extract higher factor payments. An alternative perspective—consistent with prospect theory—would be that when resources are cospecialized, factor providers would be reticent to attempt to bid up factor payments because they would not want to endanger the super additive gains derived from the development of cospecialized resource bundles. As such, until future research confirms the relevance of such a process, it should be noted that this assumption is a baseline condition of the propositions we develop in this study.

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