Examining and Integrating Transaction Cost Economics and Resource-Based View Explanations of the Firm's Boundary Choices

DISSERTATION

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Abstract

The three essays of this dissertation complement extant research by explicitly revealing the boundary conditions of the central predictions of transaction cost economics and by offering traceable novel insights from the integration of this approach and resource-based explanations of the firm's boundary choices.

Chapter two employs a semi-formal modeling approach to examine the central predictions of transaction cost economics regarding asset specificity and governance forms. The analysis assumes away capability differences across firms. The approach factors several issues that are often acknowledged but rarely examined in the extant research, such as diminishing returns to transaction specific investment, endogeneity in asset specificity and governance form choices, lack of focus on both the parties in a transaction, and ex-ante alternative uses of resources. Incorporating these factors into the analysis provides a more precise articulation of the boundary conditions surrounding the central prediction of transaction cost economics.

Chapter three extends the semi-formal model presented in the chapter two by considering differences in productive capabilities across potential exchange partners to integrate transaction cost and resource-based perspectives on the firm's boundary choices. In particular, the analysis focuses on whether and how differences in the levels of asset specificities across transaction stages and differences in the productive capabilities across potential partners affect governance mode choices. The analysis identifies the specific conditions where the application of the resource-based logic may alter standard transaction cost economics predictions.

Chapter four further extends the model by considering firm specific governance capabilities. It examines the relationship between governance capabilities and governance forms by integrating asset specificity, productive capability, and governance capability perspectives on the firm's boundary choices. The analysis examines whether and how differences in productive capabilities across potential partners and the partner firm's governance capabilities may affect the relationship between the focal firm's governance capabilities and governance forms. This chapter suggests that only in specific conditions a firm's governance capabilities related to a specific governance form favor that governance form.

The dissertation offers several opportunities for future research and presents an approach that can be exploited to examine these opportunities.

Dedicated to the dynamics of innate and unrelenting human spirit of inquiry, reasoning and learning, and the limits of human intellect— Neelansh and Priyansh, my sons, who, for me, symbolize this dynamics the best.

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Chapter 1: Introduction

The major theoretical perspectives used by strategic management scholars to examine the choice of the boundaries of firms are Transaction Cost Economics (TCE) and the Resource-Based View (RBV) of the firm (Santos & Eisenhardt, 2005; Silverman, 2002).

Transaction cost theory culminates in fundamental propositions that discriminately align transaction characteristics— asset specificity, uncertainty, and frequency— with cost economizing governance forms (Riordan & Williamson, 1985; Williamson, 1991a). Williamson (1985: 56) asserts that "asset specificity is a locomotive to which TCE owes much of its predictive power." TCE's central predication contends that absent asset specificity market governance is more efficient than hierarchy. This difference in efficiency is hypothesized to decline and eventually reverse as asset specificity rises (Riordan & Williamson, 1985; Williamson 1979, 1985, 1991a).

Despite the strong evidence supporting TCE's central predictions (e.g. Macher & Richman, 2008), even the most ardent supporters of TCE have suggested that there may be limits to the impact transaction specific investment (TSI)—investments that have higher value in a transaction than outside it, ex-post— may have on governance choices (Coase, 1988, 2000, 2006; Williamson, 1999). To the extent the TSI impact is limited, it represents often underappreciated boundary conditions for this theory. And while other

scholars have identified some of the other determinants of governance choices (Barney, 1999; Madhok, 1997; Zajac & Olsen, 1993; Riordan & Williamson, 1985) to date, the precise boundary conditions for traditional TSI explanations has yet to be explored.

Chapter 2 of this thesis begins to explore the boundary conditions for traditional transaction specific investment explanations of governance choices. Using a semi-formal modeling approach (Williamson, 1991a: 270) and applying assumptions that are widely accepted in transaction cost theory (Riordan & Williamson, 1985; Williamson, 1991a), it shows that TCE specified high or low levels of asset specificity may not be necessary or sufficient for hierarchical or market forms of governance respectively. Assumptions regarding the homogeneity of productive capabilities, the level of competitive imperfection in adjacent stages of production, diminishing returns to asset specificity, and the symmetric emphasis on profit maximizing concerns of both potential exchange partners critically inform these conclusions. Empirically, these results suggest that research that causally links transaction specific investment and firm boundary choices, but that fails to control for other factors that can influence governance choices, is likely to generate misleading conclusions.

Further, while TCE emphasizes opportunistic hazard in the presence of asset specificity (Williamson, 1985), it downplays the role of firm specific productive capabilities (Madhok 1997), and it does not account for the possibility that firms may develop governance capabilities — capabilities to manage organizing costs (Williamson, 1999).

Proponents of the resource-based view posit that firm specific capabilities and resources influence a firm's boundary choices (Barney, 1999; Conner & Prahalad, 1996; Madhok, 1997, 2002). Though several arguments are often grouped together under competence based arguments (Williamson, 1999), firm specific productive and governance capabilities and their influence on firm's boundary choices have been particularly advanced.

The basic idea in the work related to firm specific productive capability (e.g., Barney, 1999; Demsetz, 1988; Jacobides & Winter 2005) is that if productive resources are heterogeneously distributed across firms and barriers to imitation exist then a firm should internally govern exchanges where its resources provide a comparative advantage and outsource those exchanges where it is at a comparative disadvantage and there is a significant cost to accessing a capability through internal development or acquisition.

Critics of the RBV primarily argue that productive capability based arguments naively ignore opportunism concerns and transactions costs (e.g. Foss, 2003:149), and the comparative capability test identifies the desired provider of a function but it does not determine the desired form of governance (Argyres & Zenger, 2008).

Further, given their explanatory inadequacies and complementary focus on asset specificity and heterogeneous productive resources across firms, many scholars have suggested potential benefits from integrating both TCE and RBV perspectives on the firm's boundary choices (Langlois & Foss, 1999; Leiblein, 2003; Mahoney 2001; Madhok, 1997; Williamson, 1999). Integrating these perspectives has been challenging. Prominent scholars have noted the difficulties in capturing the theoretical richness of these perspectives (Gibbons, 2005; Jacobides & Winter, 2005; Makadok, 2006). The primary conceptual challenges of synthesizing the TCE and RBV logic lie in bridging the theories' different units of analysis (transaction vs. resource) and in developing a parsimonious framework that incorporates all relevant transaction and resource characteristics.

Though recent efforts have begun to link theories of exchange hazards and comparative capability on the determinants of firm boundaries, at least two issues have particularly hindered progress in this area. First, extant research rarely considers the resources and objectives of all potential exchange partners in a transaction. Second, existing research ignores the potential for the (endogenous) selection of asset specificity to influence associations between asset specificity and organizational form when capability differences across partners exist. In part, these limitations reflect an enduring disconnect between transaction cost and heterogeneous capability theories of organization. Not surprisingly, calls for better integration of existing theories of the firm are routinely made (Mahoney & McGahan, 2007).

Chapter 3 of this thesis builds on the approach laid out in the Chapter 2 to explicitly integrate RBV and TCE perspectives on the firm's boundary choices. In particular, the model from Chapter 2 is extended to allow for productive differences across firms to exist. Using assumptions that are widely accepted in TCE (Riordan & Williamson, 1985; Williamson, 1991a) and the RBV (Barney, 1991; Peteraf, 1993), the chapter examines whether and how differences in the level of asset specificity across transaction stages and differences in productive capabilities across potential partners affect governance mode choices. The results of this analysis provide three primary findings. First, the model indicates that standard TCE and RBV assumptions imply the existence of sixteen distinct transaction types. Second, the model suggests that five of these sixteen transaction types involve heterogeneously distributed capabilities across potential partners and significant levels of asset specificity in at least one of the activity stages. Third, the model suggests that a joint transaction cost and resource-based perspective is relevant in three of these five transaction types. Importantly, the model identifies specific situations— such as unilateral transaction specific investments by original equipment manufacturers (OEM)— where it is economically rational to select market governance despite the existence of high levels of asset specific investment.

In addition, recent work, drawing on the RBV, has begun to acknowledge that firms may also differ in managing the organizing costs emphasized within the TCE literature; and it argues that firm-boundary choices may also be influenced by such governance capabilities (Argyres & Mayer, 2007; Dyer & Singh, 1998; Mayer & Salomon, 2006). Governance capabilities are usually hypothesized to favor the governance form (i.e., market or hierarchy) in which a firm has higher comparative efficiency (Mayer & Salomon, 2006).

Although research on firm specific governance capabilities has begun to offer valuable insights, many aspects remain to be examined. Contrary to the extant arguments, situations may exist where firm specific contracting capability reduces the likelihood of market exchange. For instance, if potential partners are aware of a firm's superior contracting capability, their interest in collaborating may be adversely affected. Specifically, a partner firm's interest is likely to be more important when it has required productive capabilities and has also developed capabilities to manage the organizing costs in a hierarchy. Though it is plausible that governance capabilities— via influences on the organizing costs specific to a governance form— may affect a potential partner's interest adversely, and that differences in productive capabilities across potential partners may moderate the relationship between governance capability and governance form, we are unaware of efforts that aim to explicitly integrate all the three perspectives on governance choices.

Chapter 4 explicitly examines the effects of governance capabilities on governance form choices by integrating asset specificity, productive capability, and governance capability perspectives on the firm's boundary choices. The paper specifically focuses on: (i) hierarchical management capability (HMC)— a irm's capabilities in managing bureaucratic distortions and incentive degradations in hierarchy, and (ii) market contracting capability (MCC)— a firm's capabilities in managing opportunistic losses in market exchange. Building on the semi-formal approach laid out in previous chapters, and additionally allowing firms to differ in their governance capabilities favor a governance form in which a firm has higher comparative efficiency. Based on the levels of asset specificity and differences in productive capabilities across potential partners, a firm's governance form that maximizes its profit. Further, differences in productive capabilities across potential exchange partners and a potential

partner's governance capabilities asymmetrically affect the relationships of hierarchy and market management capabilities with the governance forms. Chapter 5 offers discussion and conclusions and presents the future research opportunities.

Chapter 2: Examining the Relationship between Asset Specificity and a Choice of Governance Form

Transactions cost economics (TCE) has emerged as the dominant explanation of the boundary choices of firms over the last several decades. Building on Coase's (1937) original insight that hierarchical forms of governance will only emerge when the use of market forms of governance is too costly, most transaction costs economists have focused on a single important determinant of the relative cost of using market forms of governance— the level of transaction specific investment (Klein, Crawford & Alchian, 1978; Riordan & Williamson, 1985). According to this theory, high transaction specific investment (TSI) leads to a high threat of opportunism, and this threat can be most efficiently managed through the adoption of hierarchical form of governance. In the absence of high levels of asset specificity, the theory asserts that the market is the most efficient form of governance. Empirical research tends to support this general assertion (Boerner & Macher, 2003; Macher & Richman, 2008).

However, even the most ardent supporters of TCE have suggested that there may be limits to the impact TSI may have on governance choices (Coase, 1988, 2000, 2006; Williamson, 1999). To the extent the TSI impact is limited, it represents often underappreciated boundary conditions for this theory. And while other scholars have identified some of the other determinants of governance choices (Barney, 1999; Madhok, 1997; Riordan & Williamson, 1985; Zajac & Olsen, 1993), to date the precise boundary conditions for traditional TSI explanations have yet to be explored.

The purpose of this chapter is to explore the boundary conditions for traditional transaction specific investment explanations of governance choices. Using a semi-formal modeling approach (Williamson, 1991a: 270) and applying assumptions that are widely accepted in transaction cost theory (Riordan & Williamson, 1985; Williamson, 1991a), it is shown that (1) high transaction specific investment is neither necessary nor sufficient for hierarchical governance, and (2) by itself, low specific investment is neither necessary nor sufficient for market forms of governance. Assumptions regarding the homogeneity of productive capabilities, the level of competitive imperfection in adjacent stages of production, diminishing returns to asset specificity, and the symmetric emphasis on profit maximizing concerns of both potential exchange partners critically inform these conclusions. Empirically, these results suggest that research that causally links transaction specific investment and firm boundary choices, but which fails to control for other factors that can influence governance choices, is likely to generate misleading conclusions.

This chapter proceeds as follows. Section 2.1 provides a brief overview of TCE predictions on the relationship between asset specificity and governance forms. Section 2.2 describes the model, transaction, and profit expressions under various governance forms for the potential exchange partners. The necessary and sufficient conditions to choose a particular governance form are mentioned in section 2.3 and discussed in Appendix A. Building on sections 2.2 and 2.3, section 2.4 examines the TCE predicted relationships between asset specificity and governance forms. Section 2.5 discusses the

insights and limitations and concludes.

2.1 Literature Review

Williamson (1979, 1985, 1991a) offers detailed discussions on fundamental propositions that match transaction characteristics— asset specificity, uncertainty and frequency— with cost economizing governance forms. For the purposes of this chapter, the brief review presented below focuses on TCE's central propositions regarding the relationship between asset specificity and governance forms. We specifically follow Riordan & Williamson (1985) and Williamson (1991a) in reviewing assumptions underlying TCE's central propositions.

Williamson (1985: 56) asserts, "asset specificity is a locomotive to which TCE owes much of its predictive content". Asset specificity exists when asset specialization such as co-location or customization to a transaction results in quasi rents. Quasi rents exist when the value of the specialized assets in a transaction is higher (higher revenue, lower cost, or both) than the maximum value possible from their redeployment in an alternative transaction, *ex-post* (Riordan & Williamson, 1985; Williamson, 1991a: 282).

TCE posits that the costs of organizing a transaction in a market or a hierarchy are functions of asset specificity. In market exchange, quasi rents resulting from the presence of asset specificity can be appropriated by an opportunistic exchange partner. Firms incur costs in writing, monitoring, and enforcing contracts to protect against opportunism in market exchange. Due to complexity, uncertainty, or both, contracting essentially remains incomplete, and the losses due to opportunistic appropriation of a quasi rent cannot be eliminated. Thus, market transaction costs include both contracting costs and expected losses due to opportunism. In contrast, the cost of hierarchy is attributed to bureaucratic distortions and incentive degradations, and at low levels of asset specificity an additional cost penalty due to loss of demand aggregation (scale diseconomies) may be present. As hierarchy is at cost disadvantage to the market at low asset specificity, TCE predicts a market transaction (Riordan & Williamson, 1985: 368, 369; Williamson, 1985, 1991a). Further, TCE posits that both market transaction costs and hierarchical governance costs increase in asset specificity. However, market transaction costs are thought to rise faster than the cost of hierarchy (Williamson, 1991a: 283). Riordan & Williamson (1985: 368) contend that the cost disadvantage of hierarchy "decreases and is eventually reversed as asset specificity deepens". Figure 1 from Williamson (1991a: 284) captures the above arguments.



Figure 1: Governance Cost as a Function of Asset Specificity

Williamson (1991b: 83) also contends that hierarchy is the organization form of the last resort. He claims that TCE reverses the usual neoclassical preference for hierarchical organization and 'absent pre-existing monopoly power, TCE reserves hierarchy for transactions with high asset specificity'. Moreover, Williamson (1983) argues that the bilateral high asset specificity, condition known as exchange of hostages, will nullify the risk of opportunism, and consequently, will lead to market exchange. In essence, Williamson's operationalization of TCE suggests that, except in the situations involving exchange of hostages, high asset specificity is both a necessary and a sufficient condition for a hierarchical governance form to occur.

Figure 1 and the accompanying arguments have become dominant in the extant TCE literature. Two important limitations are implicit in Figure 1, however. First, Williamson (1991a: 282) recognizes that the analysis summarized in Figure 1 "focuses entirely on transaction costs; neither the revenue consequences nor the production costs savings that result from asset specialization are included". He further suggests, "such added asset specificity is warranted only if these added governance costs are more than offset by production cost savings and/or increased revenues". Since the returns to asset specificity are often concave—returns decline after an optimum level of asset specificity world (Riordan & Williamson, 1985) —, market organization may not always be at cost disadvantage at an optimum level of asset specificity. Second, Williamson (1991b: 82) warns against the oversimplification implicit in the Figure 1 that compares alternative governance at the same level of asset specificity. He suggests,

"asset specificity is a design variable rather than a given, whence the value of specificity and the type of governance are determined simultaneously rather than sequentially (Masten, 1982; Riordan & Williamson, 1985)".

2.2 The Model

The model introduced in this chapter examines decisions facing firms seeking to organize a transaction. For simplicity, the model considers two firms— A and B— and a transaction that can be divided into two stages— upstream stage two and downstream stage one. A transaction is said to be organized in a hierarchy when a firm undertakes both the stages, and to be organized via the market when a firm contracts for one of the stages with the other firm.

The model follows the standard transaction cost assumptions laid out in Riordan & Williamson (1985) and Williamson (1991a: 284) and reviewed above. First, at low asset specificity, the cost of hierarchy is assumed to be greater than the transaction cost in the market. Second, the market transaction costs and the cost of hierarchy are assumed to be increasing functions of asset specificity, with transaction costs in the market rising faster than the cost of hierarchy. Third, consistent with standard transaction costs reasoning, beyond a level of asset specificity, returns to asset specificity are assumed to decline. Specifically, it is assumed that while the cost of specialization increases at a constant rate, revenue increases at a decreasing rate with the level of asset specificity in a particular stage.

Importantly, in this model both the potential partners are assumed to be

homogeneous with respect to their ability to undertake activities in either stage of production. This homogeneity assumption implies that partners face the same costs and revenues when undertaking either stage of the transaction. The homogeneity across players could result from imitation via direct duplication or strategic substitution (Barney, 2002). Though homogenous with respect to each other, both firms may be heterogeneous (Barney, 1991; Peteraf, 1993) with respect to a marginal player in either stage of the transaction. For example, arguably Coke and Pepsi may be homogenous with respect to their ability to undertake either concentrate manufacturing or bottling, but are significantly different from a marginal player in either stage.

In the model, a firm undertaking a downstream stage one generates revenue $R_1(k_1)+R_2(k_2)$, where parameters k_1 and k_2 indicate the levels of asset specificity in stages one and two, respectively, and agrees to pay $R_2(k_2)$ to the firm undertaking the upstream stage two. The resources, $\mathbf{r_1}$, that are required to enable the activities in stage one cost C_1 . It costs amount, $\gamma_1 k_1$, to specialize the resources in stage one to the transaction. As assumed above, revenue from a stage increases with the level of asset specificity in that stage. Formally, for $k_1 > 0$, $R_1(k_1) > R_1(0)$ where $R_1(0)$ represents the maximum revenue that can be derived from deploying stage one resources to an alternative transaction, *expost*. When asset specificity is present, higher revenue could be opportunistically appropriated by the exchange partner, and a firm faces exchange hazards. To mitigate exchange hazards, the firm incurs, $T_c(k_1)$, in contracting costs towards writing, negotiating, monitoring and enforcing the contract with its potential partner. Due to complexity, uncertainty, or both, contracting essentially remains incomplete. Thus, $t_1(k_1)$

represents the fraction of the revenue that can be captured by an opportunistic potential partner despite contracting; and $t_1(k_1)^*R_1(k_1)$ captures the expected loss due to opportunism. The fraction $t_1(k_1)$ ranges between 0 and 1. It is 0 (low asset specificity) when stage one revenue in the transaction is just equal to the maximum revenue from potential redeployment of stage one resources in an alternative transaction, *ex-post*. It could be 1 (high asset specificity) when maximum revenue from potential redeployment of stage one resources in an alternative transaction, *ex-post*, is negligible compared to the stage one revenue in the transaction. The total transaction cost in managing the exchange relations for the firm undertaking stage one is given by $M^1(k_1) = T_c(k_1) + t_1(k_1)*R_1(k_1)$. The cost of hierarchy a firm incurs in managing the level of asset specificity k_1 and resources r_1 in stage one is given by $H(k_1, r_1)$ (Williamson, 1991: 282). Finally, based on the level of asset specificity in stage two, k_2 , the firm undertaking stage one may gain $t_2(k_2)*R_2(k_2)$ opportunistically. Without loss of generality, if firm A were to conduct stage one in a market exchange, it could capture profit $\Pi_a^m(k_1, k_2)$. Formally,

$$\Pi_a^{\ m}(k_1, k_2) = R_1(k_1) - C_1 - \gamma_1 k_1 - M^1(k_1) - H(k_1, r_1) + t_2(k_2) R_2(k_2),$$
(1)

Alternatively, if firm A were to internalize both stages, it would capture revenue $R_1(k_1) + R_2(k_2)$. The resources, r_1 and r_2 , that are required to undertake activities in stage one and two cost C_1 and C_2 , respectively. It costs amount $\gamma_1 k_1$ and $\gamma_2 k_2$ to specialize the resources in stage one and stage two to the transaction. The cost of hierarchy for managing the two stages in a transaction is represented by $H(k_1+k_2, r_1+r_2)$. Furthermore, consistent with Riordan & Williamson (1985), the model allows for a cost penalty $C(x, k_2)$ due to the loss of demand aggregation (scale diseconomies) that occurs when firm A

elects to organize transaction hierarchically and has upstream stage two output only for the firm's downstream needs in stage one. In this instance, x represents the scale of the transaction and C(x, k_2) declines with increases in both x and k_2 . Thus, $\Pi_a^{h}(k_1, k_2)$ represents the profit that the firm A could capture if it were to organize the transaction in hierarchy. Formally,

$$\Pi_a^{n}(k_1, k_2) = R_1(k_1) + R_2(k_2) - C_1 - C_2 - \gamma_1 k_1 - \gamma_2 k_2 - H(k_1 + k_2, r_1 + r_2) - C(x, k_2),$$
(2)

In the model, the cost of hierarchy is explicitly conceptualized as a function of asset specificity as well as the scale and scope of resources being managed. However, Riordan & Williamson (1985) and Williamson (1991a) treat the cost of hierarchy as primarily a function of asset specificity. For the purposes of this chapter, it is possible to simplify the notation by replacing $H(k_1+k_2, r_1+r_2)$ with $H^{12}(k_1+k_2)$, and $H(k_1, r_1)$ with $H^1(k_1)$ in the profit equations. Further, consistent with TCE, at low levels of asset specificity the cost of organizing in hierarchy is greater than the cost of organizing in the market, while beyond some level of asset specificity, k in the Figure 1, hierarchy has a lower cost than a market transaction. Formally, for $k_1 \approx 0$, $M^1(0) + H^1(0) < H^{12}(0+0)$; and for $k_1 > k_{1*} > 0$, $M^1(k_1) + H^1(k_1) > H^{12}(k_1+0)$.

Analogously, with k_1 and k_2 levels of asset specificity in stages one and two, respectively, $\Pi_b^{m}(k_1, k_2)$ represents the profit that could be captured by firm B if it were to undertake stage two in a transaction organized via a market exchange; and $\Pi_b^{h}(k_1, k_2)$ represents the profit that firm B could capture if the firm B were to organize the transaction in a hierarchy. Formally,

$$\Pi_{b}^{m} = R_{2}(k_{2}) - C_{2} - \gamma_{2}k_{2} - M^{2}(k_{2}) - H^{2}(k_{2}) + t_{1}(k_{1})*R_{1}(k_{1}),$$
(3)

$$\Pi_{b}^{\ h} = R_{2}(k_{2}) + R_{1}(k_{1}) - C_{2} - C_{1} - \gamma_{2}k_{2} - \gamma_{1}k_{1} - H^{12}(k_{1}+k_{2}) - C(x, k_{1}),$$
(4)

A firm also faces a decision as to whether deploy the resources to an alternative transaction, *ex-ante*— before deploying the resources to the transaction under consideration. In the model, Π^1 and Π^2 respectively indicate the maximum profits that could be earned by deploying resources, $\mathbf{r_1}$ and $\mathbf{r_2}$, required for stage one and two to alternative transactions, *ex-ante*. Further, for ease of demonstration we assume that: $\Pi^1 \ge 0$; and $\Pi^2 \ge 0$. In the extant literature these conditions are implicitly assumed to have been met.

2.3 Necessary and Sufficient Conditions for Governance Forms

We assume that a firm chooses the governance form that maximizes its expected profit across all alternatives. This assumption informs the necessary and sufficient conditions for a firm to choose a particular governance form— hierarchy or market. A firm chooses hierarchy (i.e., undertakes both stages one and two) when the expected profit in hierarchy for that firm is higher than the expected profits from either participating in a market exchange (i.e., internally undertaking only one of the stages) or deploying the resources in an alternative transaction, *ex-ante*. However, for market exchange than through organizing the transaction in hierarchy or deploying the resources in an alternative transaction, *ex-ante*. This is because, to use a market form of exchange, a firm must have an exchange partner that is also willing to use market governance to manage the exchange. It is noteworthy that

while extant TCE arguments focus on a single party in a transaction (Zajac & Olsen, 1993), this chapter explicitly recognizes that the necessary and sufficient conditions for market exchange require that both exchange partners find this choice to be profit maximizing.

Appendix A provides algebraically simplified expressions indicating when a particular governance form would be the profit maximizing alternative. The next section focuses on examining the relationship between asset specificity and the choice of governance forms across homogenous exchange partners building on the expressions derived in Appendix A.

2.4 Asset Specificity and the Choice of Governance Forms

The analysis in this section focuses on two questions. First, it examines if high asset specificity is a necessary and sufficient condition for hierarchy. Second, it examines how likely a market exchange is for transactions involving low levels of asset specificity. Boundary conditions for TCE predictions of market exchange for transactions involving bilateral high asset specificity (exchange of hostages) are also discussed. Further, the focus on homogenous exchange partners sheds light on the limitations of TCE predictions in the absence of heterogeneity across potential exchange partners.

To address these questions, this section analyses transactions with the combinations of extreme (high/low) levels of asset specificity across the two stages, as indicated in Figure 2. The analysis draws on the necessary and sufficient conditions for a governance form mentioned in section 2.3 and presented in Appendix A.



Figure 2: Potential Transactions across Homogenous Exchange Partners

2.4.1 Asset Specificity and Hierarchy

Inequality (5)— expressed as inequality (v) in Appendix A.1— specifies a necessary condition for firm A to choose hierarchy to organize a transaction with asset specificity $k_1 > 0$ in stage one and insignificant level of asset specificity ($k_2 \approx 0$) in stage two.

$$R_2(0) - C_2 - C(x, 0) > -\Delta G(k_1, 0),$$
(5)

Here $\Delta G(k_1, k_2) = [M^1(k_1) + H^1(k_1) - H^{12}(k_1+k_2)]$ represents the difference between organizing costs in the market and a hierarchy. TCE posits that as asset specificity deepens market transaction costs increase faster than hierarchical costs. In other words, $\Delta G(k_1, 0)$ increases with asset specificity, k_1 ; thus, beyond some level of asset specificity, say k_{1*} , (i.e., for $k_1 \ge k_{1*}$), inequality (5) holds, resulting in the choices of hierarchical governance. At lower levels of k_1 (i.e., for $k_1 < k_{1*}$) hierarchy is at a cost disadvantage, consequently inequality (5) does not hold, leading to the choice of market governance. In circumstances where operations are undertaken sufficiently close to the efficient scale, the cost penalty, C(x, 0), is negligible. Therefore, inequality (5) is more likely to hold; i.e., the transaction is more likely to be organized within hierarchy. Thus, as reviewed earlier and shown here, TCE implies that asymmetric high asset specificity is both a necessary and a sufficient condition to organize the transaction within hierarchy.

Is high asset specificity a necessary condition for hierarchy? To examine if asymmetric high specificity is a necessary condition for hierarchy, below we explore if hierarchy can occur despite low asset specificity in both stages. Inequality (6)— expressed as inequality (vi) in Appendix A.1 — mathematically states a necessary condition for firm A to choose hierarchy for a transaction involving low levels of asset specificity in both stages.

$$R_2(0) - C_2 - C(x, 0) - [H^{12}(0+0) - H^1(0)] > 0,$$
(6)

TCE reasons that, at low levels of asset specificity, inequality (6) will not hold, as the cost penalty due to scale diseconomies [C(x, 0)] and the organizing cost in hierarchy $[H^{12}(0+0)]$ are sufficiently high to make hierarchy less attractive than a market exchange. However, inequality (6)underscores that, in addition to these factors, it is critical to consider the value in the adjacent stage $[R_2(0) - C_2]$, since this value may more than compensate for the cost of hierarchy $[H^{12}(0+0)]$ and the cost penalty due to scale diseconomies [C(x, 0)]. In such cases, inequality (6) may hold, and asymmetric high asset specificity may not be a necessary condition for hierarchy.

There are three reasons why inequality (6) may hold despite low levels of asset specificity. First, as envisaged in the model, if the value derived from the adjacent stage $[R_2(k_2) - C_2]$ is independent of the degree of asset specificity in stage one (k_1) then hierarchical organization may dominate market organization even at low levels of k₁. For instance, this value may be a function of competitive imperfections in stage two associated with scarce productive resources or structural conditions. Second, at low levels of asset specificity, the costs of a market transaction are negligible. Thus, even a small incremental cost of hierarchy $[H^{12}(0+0) - H^{1}(0)]$, perhaps due to differential administrative requirements, suffices to meet the TCE assumption of the costs of hierarchy being higher than the costs in the market. Third, the extent of the cost penalty due to scale diseconomies $[C(x, k_2)]$ is also independent of the level of asset specificity in stage one (k_1) . Importantly, TCE does not provide any guidance on the extent of value in the adjacent stage relative to the cost of hierarchy and cost penalty due to scale diseconomies. Thus, it is plausible that in some situations inequality (6) may hold and firm A may opt for hierarchy, despite a low level of asset specificity.

Formally, at $(k_1 \approx 0, k_2 \approx 0)$, for $(R_2(0) - C_2) >$ some value > 0, it may be the case that: $R_2(0) - C_2 - C(x, 0) - [H^{12}(0+0) - H^1(0)] > 0$. In other words, while market governance may be cost economizing, given imperfect competitive conditions and homogeneity, hierarchical governance may be profit maximizing for a firm even at low levels of asset specificity.

While the arguments above demonstrate that asset specificity may not be a necessary condition for hierarchy, they ignore reverse causality (endogeneity) in

governance form choices and the level of asset specificity. It may be the case that while a high level of asset specificity is not a necessary condition for hierarchy, hierarchy may endogenously and positively influence the level of asset specificity. Formally, while $\Pi_a^{h}(0, 0) > \Pi_a^{m}(0, 0)$; for $k^*_1 > 0$ and $k_2 \approx 0$, $\Pi_a^{h}(k^*_1, 0) > \Pi_a^{h}(0, 0)$ and $\Pi_a^{h}(k^*_1, 0) > \Pi_a^{m}(k^*_1, 0)$ where k^*_1 , represents the profit maximizing level of asset specificities for stage one under hierarchy. The possibility that a high level of asset specificity is not necessary for hierarchy but endogenously determined with hierarchy suggests that empirical evidence linking high asset specificity with hierarchy may in fact be representing a strong association and not causation, as usually interpreted.

In summary, asset specificity is not a necessary condition for hierarchy to occur when a firm can capture sufficient rents from engaging in an imperfectly competitive adjacent stage. Further, while high asset specificity is not a necessary condition for hierarchy, hierarchy may endogenously result in a high level of asset specificity. Moreover hierarchy is more likely, the closer the scale of the internalized transaction to the efficient scale for the upstream stage.

Is high asset specificity a sufficient condition for hierarchy? To examine if asymmetric high asset specificity is a sufficient condition for hierarchy, we analyze inequality (5)— $R_2(0) - C_2 - C(x, 0) > -\Delta G(k_1, 0)$ — which represents a necessary condition for firm A to choose hierarchy for a transaction involving k_1 level of asset specificity in stage one and insignificant levels of asset specificities in stage two. TCE contends that at high levels of asset specificity in stage one, k_1 , the cost disadvantage in the market, $\Delta G(k_1, 0)$, will be high enough for inequality (5) to hold, and hierarchy will result.

However, there are three reasons why inequality (5) may not hold despite high levels of asset specificity. First, the cost disadvantage in the market, $\Delta G(k_1, 0)$, may be bounded from above. As reviewed earlier, returns to a specific investment may be concave— beyond certain level of asset specificity, marginal revenue will be less than the marginal cost of specialization (Riordan & Williamson, 1985). Thus, specific investment will be undertaken only up to an optimum level, k^{**}_1 (Williamson, 1991: 282). As the market transaction costs increase with the level of asset specificity, maximum market transaction costs, $M^1(k^{**}_1)$, occur at the optimum level of asset specificity. Rationally, the total transaction costs in the market cannot be more than the value it seeks to protect. In the model, it follows that: $M^1(k^{**}_1) \leq R_1(k^{**}_1)$. Thus, the upper bound on the costs of a transaction in the market would be $R_1(k^{**}_1)$. Conservatively assuming that as asset specificity deepens, $k_1=k^{**}_1$, the cost of hierarchy is negligible in comparison to the organizing costs in the market, implies that the difference in the organizing costs, $\Delta G(k^{**}_1, 0)$, will be bounded from above by $R_1(k^{**}_1)$.

Second, the cost penalty in hierarchy due to scale diseconomies $[C(x, k_2)]$ is not a function of the level of asset specificity in stage one (k_1) . Consistent with TCE, the cost penalty is expected to be high at $k_2\approx 0$. The extant arguments focus on the high asset specificity in the stage undertaken by the focal firm. These arguments are not always explicit about the extent and existence of a cost penalty due to scale diseconomies that the focal firm may incur in organizing an adjacent stage with low asset specificity under hierarchy.
Finally, as stated earlier, the value in the adjacent stage, $[R_2(k_2) - C_2]$ is independent of k_1 , and it is likely to depend on the level of competitive imperfection in stage two.

Thus, it is plausible that despite operating at the optimum level of asset specificity, k^{**}_{1} , inequality (5) may not hold. Formally, it is plausible that: for $k_1 = k^{**}_{1}$, $R_2(0) - C_2 - C(x, 0) < -\Delta G(k^{**}_{1}, 0)$. The upshot is that the degree of asset specificity in stage one is not a sufficient condition to determine if firm A should choose to organize through hierarchy. It is noteworthy that market exchange will occur only if necessary and sufficient conditions for market exchange (discussed later) hold.

The arguments above ignore the effect of endogeneity in the relationship between asset specificity and hierarchy. As argued above, the optimum level of asset specificity in a single stage and the consequent risk of opportunism may not be sufficient for hierarchy to occur. However, high asset specificity in both the stages of the transaction may suffice. Formally, it is plausible that: while for $k_1=k^{**}_{1} > 0$, $\Pi_a^{m}(k^{**}_{1}, 0) > \Pi_a^{h}(k^{**}_{1}, 0)$; for $k_1=k^{*}_{1} > 0$ and for $k_2=k^{*}_{2} > 0$, $\Pi_a^{h}(k^{*}_{1}, k^{*}_{2}) > \Pi_a^{m}(k^{**}_{1}, 0)$ where k^{**}_{1} is an optimum level of asset specificity for stage one in the market exchange, and k^{*}_{1} , k^{*}_{2} are the optimum level of asset specificities for stage one and stage two in hierarchy. While the implication of the model that high asset specificity in both stages leads a firm to choose hierarchy strengthens the association between asset specificity and hierarchy, it also indicates boundary conditions for the TCE predicted market exchange under the condition of bilateral high asset specificity (Williamson, 1983).

2.4.2 Asset Specificity and Market Exchange

Below we examine if low asset specificity is a necessary and sufficient condition for market exchange. Boundary conditions for the prediction of TCE for market exchange for a transaction involving bilateral high asset specificity (exchange of hostages) are also discussed.

Low asset specificity and market exchange. The analysis presented in the previous section shows that: (i) optimum asset specificity is not a sufficient condition for hierarchy, and (ii) hierarchy may exist even at low levels of asset specificity. These arguments also imply that low asset specificity is neither a necessary nor a sufficient condition for a firm's preference for market exchange. However, for market exchange to exist it must be the case that both the exchange partners find it to be a profit maximizing form. Therefore, below we examine TCE predicted market exchange at low levels of asset specificity to further our understanding of the boundary conditions that may exist. Inequalities (7) - (10)— represented as xv-xviii in Appendix A.2 — provide the necessary and sufficient conditions for market exchange to occur.

$$0 > R_2(0) - C_2 - [H^{12}(0+0) - H^1(0)] - C(x, 0),$$
(7)

$$\mathbf{R}_{1}(0) - \mathbf{C}_{1} - \mathbf{H}^{1}(0) > \Pi^{1} \ge 0, \tag{8}$$

$$0 > R_1(0) - C_1 - [H^{12}(0+0) - H^2(0)] - C(x, 0),$$
(9)

$$\mathbf{R}_2(0) - \mathbf{C}_2 - \mathbf{H}^2(0) > \Pi^2 \ge 0, \tag{10}$$

The extant TCE literature emphasizes inequality (7) which compares profit captured by firm A in a market transaction with the potential profit firm A could capture by organizing the same transaction in hierarchy. TCE posits that at low asset specificity the cost of hierarchy, $H^{12}(0+0)$, and cost penalty due to diseconomies of scale, C(x, 0), are high. Therefore, inequality (7), representing a necessary condition for market exchange, holds. The extant TCE analysis limits or ignores the implications of all other inequalities. Together, these inequalities explicitly incorporate bilateral concerns that recognize the existence of and preference for profit maximizing alternatives for both the partners. As revealed below, these inequalities imply stringent conditions for market exchange to occur.

First, as argued earlier, if stage two is less competitive, firm A (or any firm that is homogenous with respect to B) may choose to organize via hierarchy to take profit from these competitive imperfections in the adjacent stage. Analogous reasoning applies for firm B (inequality 9). In other words, given homogeneity and an imperfectly competitive adjacent stage, vertical integration— backwards or forward, as the case may be— poses a credible threat to market exchange.

Second, competitive conditions in either stage may have conflicting effects on the likelihood of market exchange. For example, while near perfect competitive conditions, i.e., $[R_1(0) - C_1] \approx 0 \approx [R_2(0) - C_2]$, may increase preference for market exchange over hierarchy (i.e., they make inequalities (7) and (9) more likely to hold), they will decrease the preference for market exchange over deployment of resources in alternative transactions, *ex-ante* (i.e., they weaken inequalities (8) and (10)). Conversely, while significantly imperfect competitive conditions in both stages will strengthen inequalities (8) and (10), they will weaken inequalities (7) and (9). In general, market exchange is more likely to occur with moderate competitive conditions in either stage where profit

potential is high enough for either partner to cross the "*ex-ante* hurdle", and low enough for either partner to not find adjacent stage attractive for hierarchical governance.

The conflict mentioned above will not occur if resources for both stages have very low profit potential, *ex-ante*. In that case, near competitive conditions in both stages will increase the likelihood of market exchange. In other words, homogenous firms are more likely to opt for market exchange when the resources required to enable the activities in either stage do not have attractive profit potential in the alternative transactions, *ex-ante*, as well as in the transaction.

Third, as indicated in the left-hand sides of inequalities (8) and (10), potential profits captured by the firm undertaking stage one and two may not be equal. However, given homogeneity in their ability to undertake either stage, each partner would prefer the stage that is more profitable, and market exchange may not occur. However, regardless of the stage they undertake, if firms share the potential total profit equally among them, market exchange can occur. Given low asset specificity, such sharing of profit is feasible through side payments or explicit contracts. Additionally, for either firm, the resultant profit in market exchange adjusted for side payment must be the maximum profit possible across all alternatives. In other words, the necessary and sufficient conditions for market exchange— represented through inequalities (vii) – (x) in Appendix A.2 — will be replaced by the following:

$$[\Pi_a^{\ m}(0,0) + \Pi_b^{\ m}(0,0)]/2 > \Pi_a^{\ h}(0,0) = \Pi_b^{\ h}(0,0)^1$$
(11)

$$[\Pi_a^{\ m}(0,0) + \Pi_b^{\ m}(0,0)]/2 > \Pi^1; \text{ and } [\Pi_a^{\ m}(0,0) + \Pi_b^{\ m}(0,0)]/2 > \Pi^2,$$
(12)

¹ As firms are homogenous, in the absence of preexisting commitments (Williamson, 1999) they would earn equal profit from organizing the transaction in hierarchy.

Fourth, the arguments presented so far ignore the effect of the endogenous nature of the choice of asset specificity and hierarchy. While at low asset specificity either firm may prefer market exchange, at the optimum level of asset specificities a firm may capture a higher profit in hierarchy than it can capture in the market at low asset specificity. Formally, while inequalities 11 and 12 may hold, it may be the case that $\Pi_a^{h}(k^*_{1,k}k^*_{2}) > [\Pi_a^{m}(0,0) + \Pi_b^{m}(0,0)]/2$; where k^*_{1} and k^*_{2} indicate the profit maximizing levels of asset specificities for stage one and stage two (organized in hierarchy). Analogous arguments for firm B also apply. Thus, the endogenous nature of the choice of asset specificity and hierarchy for either firm may weaken the likelihood of market organization at low asset specificity.

The upshot is that the prediction of market exchange holds only for a limited set of transactions involving low asset specificity across homogenous exchange partners. The scope of prediction is limited as: (i) both firms must find market exchange to be the profit maximizing governance form at low asset specificity, (ii) in the absence of preexisting commitments (Williamson, 1999), homogeneity across partners necessitates equal profits for exchange partners; and (iii) the profit captured in market exchange for either partner must be more than the profit it could capture in hierarchy with optimum levels of asset specificities in both stages.

As an aside, it is noteworthy that, if firms were not homogenous, market exchange may occur for a much larger set of "low asset specificity" transactions. For instance, market exchange may be preferable for heterogeneous firms since (i) exchange partners may not be able to undertake adjacent stages profitably despite a competitive imperfection in both stages; i.e., inequalities (7) through (10) may hold simultaneously; (ii) profit differences among exchange partners in a market transaction will be more agreeable; i.e., constraining inequalities (11) and (12) may not apply; (iii) hierarchy may not be attractive despite an endogenous choice of asset specificity due to the inability to undertake adjacent stage profitably. Indeed, in the extant TCE literature, is it assumed that the focal firm maximizes profit in market exchange and that it suffices if the exchange partner just breaks even (Riordan & Williamson, 1985; Williamson, 1983, 1991a). In order for this assumption to hold, it must be the case that the partner that just breaks even cannot undertake the stage of the transaction that provides higher profit to the focal firm. In the extant literature, while common knowledge technology in the stage where a partner firm just breaks even is explicitly acknowledged, the heterogeneity across the exchange partners in their ability to undertake the stage the focal firm undertakes remains implicit. It follows that, absent heterogeneity across exchange partners the domain of TCE prediction for market exchange is limited. Inferences suggested here concur with Madhok (2002: 535), who claims that resource-based theory plays a potentially much more critical role in economic theory and in explaining the institutional structure of production than even many resource-based scholars recognize. Next, we turn to analyzing market exchange for a bilaterally high asset specific transaction.

Symmetrical high asset specificity and market exchange. TCE also prescribes market exchange for the transaction involving symmetrical levels of high asset specificity in both stages. A transaction is characterized as symmetric when the appropriable losses

due to opportunism are equal across both the stages. In the model $t_2(k_2)*R_2(k_2) \approx t_1(k_1)*R_1(k_1)$ when $k_1 > 0$ and $k_2 > 0$ satisfies the definition for a symmetric high asset specific (SHS) transaction². The model underscores that SHS transaction requires symmetrical appropriable losses and not the identical levels of specificities across the stages per se. Further, given symmetrical appropriable losses, firms may also be able to avoid contracting costs, and negligible market transaction costs will be incurred for a market exchange involving SHS transaction.

SHS transactions with negligible market transaction costs are similar to the transactions involving low asset specificities in both stages analyzed earlier. However, as SHS transactions may involve high asset specificity in either stage, they differ from low asset specific transactions in two important ways. First, as the cost penalty due to scale diseconomies declines in asset specificity, SHS transactions may not suffer from a cost penalty when organized in hierarchy. Second, since high asset specificity is possible in either stage of a SHS transaction, these exchanges create higher value than the symmetric low asset specificity case. On one hand, higher value with negligible market transaction costs makes market governance more likely than resource deployment in the alternative transaction *ex-ante*. On the other hand, higher value in either stage makes exchange partners more interested in hierarchy than in the case for a transaction with low asset specificities in either stage. Thus, all else being the same, SHS is more likely to be organized in hierarchy than the low asset specific transactions discussed earlier. Other

² It is noteworthy that in the model appropriable loss is a function of revenue from the stage, and the fraction— $t_1(k_1)$ and $t_2(k_2)$ — that is at opportunistic risk. Revenue from a stage is directly affected by both the level of asset specificity and the competitive imperfection in the stage. The fraction of revenue that can be appropriated— $t_1(k_1)$ and $t_2(k_2)$ — is affected by the level of asset specificity.

concerns discussed with organizing low asset specific transactions across homogenous exchange partners in the market apply to SHS transactions as well. It follows that only a subset of SHS transactions across homogenous partners will be organized in the market. As indicated earlier, productive heterogeneity across partners is more likely to increase the variety of SHS transactions that would be organized in the market.

2.5 Discussion and Conclusions

The chapter takes a novel first step in explicitly examining the boundaries of the TCE's central predictions on asset specificity and governance forms. Importantly, the chapter is consistent with the central assumptions made by the extant TCE literature. The transaction is treated as the fundamental unit of analysis, and asset specific investments are assumed to be value enhancing. Standard reasoning applies regarding the effects of asset specificity, cost of hierarchy, cost of a transaction in the market, and cost penalty due to scale diseconomies in hierarchy. Furthermore, the analysis explicitly focuses on the interaction between homogenous exchange partners, it recognizes profits from the potential deployment of resources in an alternative transaction (*ex-ante*), it underscores the interaction between asset specificity and competitive conditions prevailing within each of the separable stages of a transaction, and it recognizes the existence of and preference for profit maximizing alternatives for both the exchange partners. The analysis differs from the extant literature in modeling these conditions, more precisely.

The extant TCE arguments contend that the level of asset specificity determines the choice of governance form through the tradeoff between market transaction costs and cost of hierarchy. In essence, Williamson's operationalization of TCE is usually said to suggest that asset specificity is both a necessary and a sufficient condition for hierarchical governance form to occur. However, as discussed below, this is not necessarily the case.

Indeed, the analysis here reveals two primary boundary conditions to the standard transaction cost logic relating asset specificity to governance form. First, it turns out that high asset specificity, by itself, is neither a necessary nor a sufficient condition for hierarchy. The chapter concludes that, while a market transaction may be cost economizing at low levels of asset specificity, hierarchy may be more profitable for a homogenous firm if imperfect competitive conditions prevail in an adjacent stage. A greater extent of vertical integration in a less competitive environment, despite low asset specificity, may support the conclusion. Moreover, although asset specificity and the consequent risk of opportunism in the focal stage may not be necessary for hierarchy, hierarchy may itself lead to high levels of asset specificity (Masten, 1982; Riordan & Williamson, 1985). Thus, while the conclusion is valid, it may not be easily observable. The analysis supports the claim that empirical evidence linking asset specificity with hierarchy only supports association, and not causation as popularly presented (Macher & Richman 2008). Further, it is shown that the cost disadvantage in the market is bounded from above when returns to asset specificity are concave (Riordan & Williamson, 1985). The bounded cost in the market may be less than the potential cost penalty from bringing into hierarchy adjacent stages with low asset specificity. Thus, despite the optimum level of asset specificity in the focal stage a firm may find a market transaction attractive.

Second, the chapter shows that, by itself, low asset specificity is neither a

necessary nor a sufficient condition for a market exchange across homogenous exchange partners. A greater extent of vertical integration, despite low asset specificity, serves as a potential example. Market exchange across homogenous partners is likely only for a small subset of transactions with low asset specificity, for the following three reasons: (i) both firms must simultaneously find the market exchange profit maximizing; (ii) in the absence of preexisting commitment, homogeneity across partners requires that interacting firms capture equal profits in the market exchange; (iii) endogeneity in asset specificity and hierarchy requires that either firm captures more profit in a market exchange at low asset specificity than it could by organizing the transaction within a hierarchy at optimum levels of asset specificity in both stages. The inferences are consistent with Riordan & Williamson (1985: 367), who arguably did not see low asset specificity as a driver of governance form when stating, "neoclassical analysis is well suited for transactions involving non-specific investments."

Further, arguments favoring a market transaction due to a cost penalty from scale diseconomies in hierarchy (Riordan & Williamson, 1985) may be misleading. These arguments suggest that, for exchange involving low asset specificity, a small scale downstream firm is more likely to favor market governance to benefit from scale economies realized by a potential upstream partner. This argument takes a naïve view of the influence of purchasing scale on bargaining. It is unlikely that an upstream firm will pass on its cost savings to a downstream firm with low purchasing scale, more so when the upstream stage is less than perfectly competitive. In other words, firms with low purchasing scale will find a market exchange more costly (therefore, less preferable) than

implied in the extant TCE arguments, and in this chapter. A small firm's preference for market exchange will worsen if it is strategically as capable as upstream partner in undertaking an imperfectly competitive upstream stage.

The model also underscores that many factors— such as endogeneity and homogeneity— have asymmetric effects on hierarchy and market exchange. For example, reverse causality between high asset specificity and hierarchy is reinforcing— asset specificity beyond some level leads to hierarchical governance, which may, in turn, lead to further increases in asset specificity. However, decisions by one exchange partner on lowering asset specificity within its stage of a transaction may have non-trivial adverse effects on the other partner's interest in market exchange. In general, while homogeneity across exchange partners favors hierarchy, it weakens the potential partners' interest in a market exchange.

The analysis presented in this chapter remains limited in at least one important way. It allows for imitation, via direct duplication and substitution, and the likelihood of simultaneous use of hierarchy by the exchange partners. It ignores the explicit treatment of the likely competitive consequence of simultaneous use of hierarchy by potential partners in the market. It is noteworthy that, with its focus on a focal firm in the exchange, the extant TCE analysis does not examine the possibility of simultaneous use of a hierarchical governance form by its potential exchange partner.

That both firms may simultaneously use a hierarchical governance form appears consistent with the real life examples where firms that could have undertaken only one stage in the transaction and worked with each other in the market choose hierarchy and compete in product markets. Further, it is likely that in situations involving potential simultaneous use of hierarchy, competitive behavior such as Cournot competition and entry sequencing may play an important role in the choice of governance form. For example, when one firm chooses hierarchy to enter the product-market first, the other firm, despite having the homogenous productive capability, based on the demand conditions may stay out of the market entirely. While a fully formal analysis is ideally desirable, it appears that in many situations the insights provided by the analysis may not differ qualitatively.

The insights in the chapter have important implications for empirical work. First, the analysis offers testable implications. The chapter suggests that homogenous partners are likely to organize transactions involving low asset specificity in the market only where both stages have low potential for rents due to near competitive conditions. Conversely, market exchange with a profitable stage will involve heterogeneous exchange partners. Further, the firm managing a less profitable stage in a market exchange will have inferior capabilities in managing a higher profitable stage. A few studies have emphasized the productive capabilities of the focal partner (Hoetker, 2005; Leiblein & Miller, 2003; Leiblein, Reuer & Dalsace, 2002; Poppo & Zenger, 1998; Silverman, 1999), but few have made attempts to capture the difference in productive capability between a firm and its existing and potential exchange partners (Geyskens, Steenkamp, & Kumar, 2006). We are unaware if the importance of assessing the capability differences across potential partners for either stage has been recognized, at all.

Second, the analysis underscores the importance of assessing the extent of the

cost penalty due to scale diseconomies and the intensity of a competitive imperfection in either stage of the transaction. In the extant empirical work, low competitive intensity (thin markets) in the adjacent stage is frequently used as a proxy for a high level of asset specificity (Parmigiani, 2007; Walker & Weber, 1984). Competitive intensity in the adjacent stage may not always be a true proxy for asset specificity, however. For example, a firm that finds sugar a strategically equivalent substitute for artificial sweetener may not face asset specificity in dealing with an artificial sweetener supplier even if the artificial sweetener industry is imperfectly competitive. Third, the analysis underscores the importance of recognizing endogeneity between asset specificity and hierarchy. Finally, while the analysis provides insights into boundary conditions for TCE predictions, how frequently these boundary conditions are observed in the real life poses an interesting empirical question.

Insights from this chapter and the tractable approach deployed in examining the TCE's boundary conditions suggest numerous opportunities for future research. First, while the model constrains the effects of specialization of assets in a stage to revenue in that stage, future work may focus on cross stage effects of asset specificity on revenue as well as cost. Second, the chapter focuses on assets that can be deployed in mutually exclusive ways across transactions. Thus, examining relationships between asset specificity and governance form for assets, such as brands, with simultaneous usage across transaction offers a promising avenue for research. Third, Williamson (1999) conjectures that "alignment calculus will be tilted in favor of the form that possesses pre-existing investments of a (largely) nonredeployable kind." Assuming that firms have pre-

existing specialized investments for either one or both stages, the analysis in this chapter can be adapted to shed light on the influence of pre-existing specialized resources on governance form. Finally, the chapter suggests that integrating the effects of asset specificity and heterogeneity offers a promising opportunity.

This chapter takes a step forward in providing precise understating of the boundaries of the TCE's central predictions on asset specificity and governance form, and it builds the basis for interesting future research. The analysis reveals that the effect of asset specificity on governance form is less deterministic than the Williamson's TCE is popularly argued to suggest; by implication, the Coasian theory still awaits full operationalization. The analysis in this chapter explicitly emphasizes the need for multiple perspectives in studying the choice of governance form.

Chapter 3: Integrating TCE and RBV Explanations of Firms' Boundary Choices: Where Does It Matter?

Transaction Cost Economics (TCE) and the Resource-Based View (RBV) have emerged as the major theoretical perspectives on the firms' boundary choices. Each of these perspectives identifies a variety of factors influencing these choices (Williamson, 1999). While TCE emphasizes opportunistic hazard due to the presence of asset specificity (Williamson, 1985) and downplays the role of firm-specific productive capabilities (Madhok 1997), the RBV underscores heterogeneous capabilities across firms (Barney, 1991; Peteraf 1993), but underestimates the influence of opportunistic hazards (Foss, 2003:149). Given their differential focus on asset specificity and capability differences, many scholars have suggested potential benefits from jointly considering both TCE and RBV perspectives in explaining the firms' boundary choices (Langlois & Foss, 1999; Leiblein, 2003; Mahoney, 2001; Madhok, 1997; Williamson, 1999). The existing empirical evidence seems to support a joint perspective (Argyres, 1996; Hoetker, 2005; Leiblein & Miller, 2003; Silverman, 1999).

Though recent efforts have begun to link theories of exchange hazards and comparative capability about the determinants of firm boundaries, at least two issues have hindered progress in this area. First, the extant research rarely considers the resources and objectives of all potential exchange partners in a transaction. Second, existing research ignores the potential for the (endogenous) selection of asset specificity to influence associations between asset specificity and organizational form when capability difference across partners exists. In part, these limitations reflect an enduring disconnect between transaction cost and heterogeneous capability theories of organization. Not surprisingly, calls for better integration of existing theories of the firm are routinely made (Mahoney & McGahan, 2007).

The purpose of this chapter is to integrate RBV and TCE perspectives on the firms' boundary choices by focusing on asset specificity and productive capability differences across potential exchange partners. Using a semi-formal modeling approach (Williamson, 1991a: 270), we apply assumptions that are widely accepted in TCE (Riordan & Williamson, 1985; Williamson, 1991a) and the RBV (Barney, 1991; Peteraf, 1993) regarding the cost of organizing various types of economic activity and the influence of exogenous differences in comparative capability on the firm's boundaries, respectively. The model provides one means to examine whether and how differences in the levels of asset specificity across technologically separable stages in a transaction and differences in productive capabilities across potential partners affect governance mode choices.

The analysis provides three primary findings. First, the model indicates that when neither exchange partner has a comparative advantage in both stages in a transaction, standard TCE and RBV assumptions imply the existence of sixteen distinct transaction types. Second, the model suggests that five of these sixteen transaction types involve heterogeneously distributed capabilities across potential partners and significant levels of asset specificity in at least one of the activity stages. Third, the analysis reveals that integrated transaction cost and resource-based perspective matters in three of these five transaction types. Importantly, the model identifies specific situations— such as unilateral transaction specific investments by OEM manufacturers— where it is economically rational to select market governance despite the existence of high levels of asset specific investment.

This chapter proceeds as follows: Section 3.1 provides a brief literature review. Section 3.2 presents the model setup. Section 3.3 provides the necessary and sufficient conditions for governance mode choices. Section 3.4 analyzes the transactions that offer unique context to integrated TCE and RBV perspectives. Section 3.5 offers discussion and conclusions.

3.1 Literature Review

In order to develop a model integrating the influence of transaction cost and resource-based logic on firm boundaries it is helpful to precisely define the primary assumptions and insights provided by each of these theories. As several papers provide detailed reviews of the logic underlying TCE (e.g. Macher & Richman, 2008), the RBV e.g. Barney & Arikan, 2001), or both regarding the firms' boundary choices (e.g. Leiblein, 2003), we restrict our comments to a brief review of the arguments that are central to this chapter.

Williamson (1979, 1985, 1991a) offers a theory of economic governance that explains how the potential for opportunism influences economic organization. This theory argues that markets and firms (hierarchy) represent alternative organizing structures. Market governance offers high-powered incentives but it is subject to value destroying haggling and holdup concerns. Firm governance mitigates these exchange costs but requires investment in costly bureaucratic mechanisms and risks the abuse of authority.

The theory developed by Williamson (1979, 1985, 1991a) culminates in fundamental propositions that discriminately align transaction characteristics— asset specificity, uncertainty, and frequency- with cost economizing governance forms including market, hybrid, and hierarchy. The main arguments are that transaction characteristics, notably asset specificity, influence the level of expected exchange hazards and that firms internalize those transactions that are vulnerable to opportunism in the market. As stated in Williamson (1985: 56), "asset specificity is a locomotive to which TCE owes much of its predictive power." Recognizing that market forms of organization may benefit from scale-induced productive cost advantages (Riordan & Williamson, 1985), TCE contends that, absent asset specificity, market governance is more efficient than hierarchy. This difference in efficiency is hypothesized to decline and eventually reverse as asset specificity rises (Riordan & Williamson 1985; Williamson 1979, 1985, 1991a). Although Williamson (1991b: 82) asserts that asset specificity is a choice variable, the implications of this treatment have not always been incorporated into governance analysis (Macher & Richman, 2008).

While resource-based work emphasizes explanations for relative and persistent differences in firm performance, its logic has also been applied to explain firm boundaries (e.g. Barney, 1999; Demsetz, 1988; Jacobides & Winter 2005). The basic

idea in this work is that, if productive resources are heterogeneously distributed across firms and barriers to imitation exist, then a firm should internally govern exchanges where its resources provide a comparative advantage. The corresponding proposition may also be stated as follows—if productive resources are heterogeneously distributed and there is a significant cost to internally developing or acquiring a capability, then a firm should outsource those exchanges where it is at a comparative disadvantage. In either case, this logic assumes that initial differences in the distribution of resources are due to exogenous factors such as luck (Barney, 1986), the presence of an initial endowment of non-tradable resources (Dierickx & Cool 1989; Peteraf 1993), or entrepreneurial serendipity (Denrell, Fang & Winter, 2003).

A number of concerns have been expressed regarding the current state of economic governance research applying the transaction cost or resource based logic. Critics of Williamsonian TCE, among other issues, argue that it: i) only emphasizes "exchange" and excludes "production" activities (Madhok, 1997; Winter, 1991); ii) does not explain firm heterogeneity (Connor, 1991; Oxley, 1999: p.23), and iii) focuses on a single party in a transaction (Zajac & Olsen, 1993). These omissions suggest that TCE assumes the existence of the requisite capabilities for managing an internalized transaction and equates production functions across firms (Conner, 1991; Demsetz, 1988; Teece, 1985). Further, as discussed below, due to data limitations and the reduced form design of existing empirical tests, it is possible to interpret existing empirical evidence supporting TCE arguments as consistent with those of RBV (Carter & Hodgson, 2006; Monteverde, 1995).

A similar degree of criticism has been leveled at resource-based approaches to economic governance. Critics of the RBV primarily argue that: (i) the RBV naively ignores opportunism concerns and transactions costs (e.g., Foss, 2003), and (ii) the comparative capability test identifies the desired provider of a function but does not determine the desired form of governance (Argyres & Zenger, 2008). These arguments suggests that resource or capability-based perspectives on economic organization assume that the focal firm appropriates all created value (Makowski & Ostroy, 2001) when, in practice, sharing value is a complicated bargaining game played out among all participant stakeholders (Bowman & Ambrosini, 2000; Boddewyn, 2001; Coff, 1999).

The explanatory inadequacies and complementary strengths of these perspectives have led many scholars, including Williamson (1999), to call for an integration of the resource-based and transaction cost perspectives (Langlois & Foss, 1999; Leiblein, 2003; Madhok, 1997; Silverman, 2002). The existence of similar assumptions (e.g., boundedly rational decision makers) and shared emphases on the role of the firm in resolving conflicts of interest, coordinating resource development, and applying distinctive resources suggests that integration is likely to be quite fruitful. As proffered by Santos and Eisenhardt (2005), "many intriguing insights are likely to come from studies that explore the relationships among [RBV and TCE] boundary conceptions, rather than from forcing them into competition."

While widespread interest seems to exist in the development of an integrated theory of economic organization based on the TCE and RBV logic, progress has been impeded by a number of significant challenges. In particular, prominent scholars have noted the difficulties in capturing the theoretical richness of these perspectives (Gibbons, 2005; Jacobides & Winter, 2005; Makadok, 2006). The primary conceptual challenges of synthesizing the TCE and RBV logic lie in bridging the theories' different units of analysis (transaction vs. resource) and in developing a parsimonious framework that incorporates all relevant transaction and resource characteristics. The primary empirical challenges involve measuring these differences—a barrier that is quite salient given that prior studies have rarely focused on measuring differences in the capabilities across the focal firm and its potential exchange partners (Geyskens, Steenkamp and Kumar, 2006). Perhaps consequently, empirical work has largely failed to go beyond identifying direct independent effects of these theories on governance form.

To address these shortcomings, we proceed by developing arguments that more clearly identify the roles that comparative capability and transaction costs play in defining boundaries of the firm.

3.2 The Model

The model introduced in this chapter examines decisions facing firms seeking to organize a transaction. The model considers two firms, labeled A and B, and a transaction that can be divided into two stages, upstream stage two and downstream stage one. A transaction is said to be organized in hierarchy when a single firm undertakes both stages internally and to be organized via the market when a firm contracts for one of the stages with another firm.

The model follows the standard TCE and RBV assumptions reviewed below. In particular, the model incorporates four assumptions consistent with standard TCE reasoning (Riordan & Williamson, 1985; Williamson, 1991a: 284). First, the cost of organizing through hierarchical governance is assumed to be greater than the cost of transacting in the market at low levels of asset specificity. Second, the cost of hierarchy and the cost of transacting through the market are assumed to be increasing functions of asset specificity, with the cost of transacting in the market rising faster than the cost of hierarchy. Third, exchanges organized within a firm are assumed to suffer a production cost penalty relative to exchanges organized in the market, due to scale diseconomies. Fourth, productive returns to asset specificity are assumed to be concave. More specifically, consistent with the statements in Williamson (1991a) indicating that specific investments will be undertaken only to the extent that such investments are profitable, the model assumes that revenue attributed to a particular stage increases at a decreasing rate with the level of specific investment in that stage and that the cost of specialization increases linearly with increases in the level of a specific investment.

The model is also consistent with standard RBV logic. The model assumes that firms differ in their ability to access resources and these differences may persist, possibly due to various factors such as luck, endowment, or *ex ante* and/or *ex post* barriers to competition (Barney, 1986, 1991; Peteraf, 1993). Consequently, in comparison to a potential exchange partner, a firm may face irreducible cost disadvantages in undertaking a particular stage of a transaction (Barney, 1999). By explicitly accounting for heterogeneous production costs across potential exchange partners, it is possible to examine whether and how the existence of heterogeneous resources affects organization. Moreover, the model explicitly considers bilateral concerns in the sense that the selection of market organization requires this governance mode to be profit maximizing for both parties in a transaction.

The model incorporates assumptions mentioned above via following five points. First, the downstream stage one generates revenue $R_1(k_1)+R_2(k_2)$ where parameters k_1 and k_2 indicate the levels of asset specificity in stage one and two respectively. When a firm undertakes both the stages, it captures the entire revenue. When it undertakes only downstream stage one and chooses to contract with another firm to conduct upstream stage two, the partner firm receives revenue $R_2(k_2)$. The revenue attributable to a stage increases in the level of asset specificity associated with that stage; formally, for $k_1 > 0$, $R_1(k_1) > R_1(0)$. Here, $R_1(0)$ represents the maximum revenue that can be derived from deploying generic resources ($k_1 \approx 0$) in stage one to an alternative transaction, expost. While increasing the level of asset specificity, k_1 , increases the overall revenue credited to activities in a stage, it also raises the possibility that this additional revenue may be opportunistically appropriated by the exchange partner. It costs amount, $\gamma_1 k_1$, to specialize the resources in stage one to the transaction.

Second, the resources, r_1 , that are required to enable the activities in stage one may cost differently, for firm A this is, C_{1A} , and for firm B, C_{1B} . Further, without any loss of generality, when a transaction involves exchange partners with heterogeneous resources, the model assumes that firm A incurs lower cost than firm B in accessing the resources required for stage one, and firm B has a cost advantage over firm A with respect to acquiring the resources required for stage two. However, firms, due to imitation or strategic substitution (Barney, 2002) may also be homogenous in their ability to access resources required to enable the stages; formally, $C_{1A} \leq C_{1B}$, and $C_{2B} \leq C_{2A}$.

Third, to mitigate exchange hazards, the focal firm incurs contracting costs $T_c(k_1)$ towards writing, negotiating, monitoring and enforcing the contract with the potential partner. Due to complexity, uncertainty, or both, nevertheless contracting essentially remains incomplete and exposes a firm to risk of opportunism. Here, $t_1(k_1)$ represents the fraction of the revenue that can be captured by an opportunistic potential partner despite contracting, while $t_1(k_1)*R_1(k_1)$ captures the expected monetary loss due to opportunism. Thus, $t_1(k_1)$ is bounded between 0 and 1— it is 0 when there is no specific investment, and revenue attributable to stage one in the transaction is just equal to the maximum revenue from potential redeployment of stage one resources in an alternative transaction, ex-post. It is 1 when there is a high degree of asset specificity and the maximum revenue from a potential redeployment of downstream stage one resources in an alternative transaction. In sum, the total transaction cost in managing a market exchange for the firm undertaking stage one is given by $M^1(k_1) = T_c(k_1)+t_1(k_1)*R_1(k_1)$.

Fourth, the term $H(k_1, r_1)$ represents the cost of hierarchy that the firm incurs in managing the level of asset specificity k_1 and resources r_1 in stage one (Williamson, 1991: 282).

Finally, based on the level of asset specificity in upstream stage two, k_2 , the firm undertaking stage one may gain $t_2(k_2)^*R_2(k_2)$ by behaving opportunistically. If firm A were to undertake stage one via a market exchange, it could capture profit $\Pi_a^{m}(k_1, k_2)$ where k_1 and k_2 represent the level of asset specificities in stage one and stage two, respectively. Formally,

$$\Pi_a^{\ m}(k_1, k_2) = R_1(k_1) - C_{1A} - \gamma_1 k_1 - M^1(k_1) - H(k_1, r_1) + t_2(k_2) * R_2(k_2),$$
(1)

Alternatively, if firm A were to internalize both stages, it captures revenue $R_1(k_1) + R_2(k_2)$. Resources, r_1 and r_2 , that are required to undertake activities in stages one and two, cost the firm A, C_{1A} and C_{2A} , respectively. The amounts $\gamma_1 k_1$ and $\gamma_2 k_2$ capture the investments required to specialize the resources in stage one and stage two to the transaction. $H(k_1+k_2, r_1+r_2)$ represents the cost of managing the two stages with hierarchical governance. Furthermore, as discussed earlier, the model allows for a cost penalty $C(x, k_2)$ due to loss of demand aggregation (scale diseconomies) under the assumption that a firm which internalizes this activity produces only for the firm's downstream needs in stage one. Here, x represents the scale of the transaction such that $C(x, k_2)$ declines with increases in both x and k_2 (Riordan and Williamson, 1985). Finally, $\Pi_a^h(k_1, k_2)$ represents the profit that firm A could capture if it were to organize the transaction in hierarchy. Formally,

$$\Pi_{a}^{h}(k_{1}, k_{2}) = R_{1}(k_{1}) + R_{2}(k_{2}) - C_{1A} - C_{2A} - \gamma_{1}k_{1} - \gamma_{2}k_{2} - H(k_{1} + k_{2}, r_{1+}r_{2}) - C(x, k_{2}),$$
(2)

The cost of hierarchy represented as $H(k_1+k_2,r_{1+}r_2)$ implies it to be a function of asset specificity as well as the scale and scope of resources being managed. Riordan & Williamson (1985) and Williamson (1991a) assume the cost of hierarchy to primarily be a function of asset specificity. It is possible to simplify the notation by replacing $H(k_{1+}k_2, r_{1+}r_2)$ with $H^{12}(k_{1+}k_2)$, and $H(k_1, r_1)$ with $H^1(k_1)$ in the profit equations. Further,

consistent with TCE, at low levels of asset specificity the cost of organizing in hierarchy is greater than the organizing cost in the market; while beyond some level of asset specificity, say k_{1*} , hierarchy has a lower cost than a market transaction. Formally, for $k_1 \approx 0$, $M^1(0) + H^1(0) < H^{12}(0+0)$; and for $k_1 > k_{1*} > 0$, $M^1(k_1) + H^1(k_1) > H^{12}(k_1+0)$.

Analogously, $\Pi_b^{\ m}(k_1, k_2)$ represents the profit that could be captured by firm B when it participates in the market exchange undertaking upstream stage two; and $\Pi_b^{\ h}(k_1, k_2)$ represents the profit that firm B could capture if it were to undertake both the stages via hierarchy. Formally,

$$\Pi_{b}^{m}(k_{1}, k_{2}) = R_{2}(k_{2}) - C_{2B} - \gamma_{2}k_{2} - M^{2}(k_{2}) - H^{2}(k_{2}) + t_{1}(k_{1})*R_{1}(k_{1}),$$
(3)

$$\Pi_{b}^{h}(k_{1}, k_{2}) = R_{2}(k_{2}) + R_{1}(k_{1}) - C_{2B} - C_{1B} - \gamma_{2}k_{2} - \gamma_{1}k_{1} - H^{12}(k_{1}+k_{2}) - C(x, k_{1}),$$
(4)

Our model also accounts for the possibility that a firm may deploy the resources to an alternative transaction, ex-ante. If the presence of heterogeneous resource stocks implies that firms differ in the cost of accessing these resources, then firms may differ in the expected profits from deployment of resources in alternative transactions, ex-ante. In the model, Π^{1A} and Π^{2A} , respectively, indicate the maximum profits that could be earned by firm A deploying resources, $\mathbf{r_1}$ and $\mathbf{r_2}$, to an alternative transaction. Further, for the ease of demonstration we assume that: $\Pi^{1A} \ge 0$; and $\Pi^{2A} \ge 0$. Analogous assumptions for firm B apply. In the extant literature these conditions are implicitly assumed to have been met.

3.3 Necessary and Sufficient Conditions for Governance Forms

We assume that a firm chooses the governance form that maximizes its expected profit. A firm chooses hierarchy (i.e., it owns resources to undertake both stages one and two) when its expected profit in hierarchy is higher than the expected profits from either participating in a market transaction (i.e., undertaking only one of the stages) or deploying the resources in an alternative transaction, ex-ante. However, in order for market governance to arise, a second condition must be met. Namely, both the focal firm and a partner firm must expect to capture a higher expected profit through exchange than either one can capture by organizing the transaction within hierarchy or deploying their resources in an alternative transactions, ex-ante. It is noteworthy that while extant TCE arguments and heuristic models focus on a single party in a transaction (Zajac & Olsen, 1993), the model presented in this chapter recognizes that market exchange requires that it be a profit maximizing alternative for both exchange partners.

Appendices B.1 and B.2, respectively, discuss the necessary and sufficient conditions for a firm to choose a particular governance form— hierarchy or market, and they provide algebraically simplified expressions that incorporate profit expressions (1), (2), (3) and (4) into these conditions. Next, we examine the choice of governance form for transactions involving both asset specificity and heterogeneous productive capabilities across potential exchange partners.

3.4 Integrating the Asset Specificity and Costly to Copy Resource Perspectives on Governance Form Choices



Figure 3: Transactions Involving Asset Specificity and Resource Heterogeneity

This section analyzes the integrated effects of asset specificity and heterogeneity on the exchange partners' governance form choices. Figure 3 above depicts potential transactions considered by our model. The left- and right-panels of the figure portray upstream stage two and downstream stage one activities from the perspective of firms B and A, respectively. The rows indicate whether the resource is or is not highly specific. A resource is deemed specific to a transaction when it has higher value (the model considers higher revenue effects of asset specificity) in the transaction than the maximum value in an alternative transaction, ex-post. The columns indicate whether or not the focal firm enjoys a comparative advantage in utilizing this resource. A resource is considered to be heterogeneously distributed across partners when a potential partner faces a cost disadvantage in accessing this resource or its strategic equivalent. In sum, based on the levels of asset specificity and capability differences across partners, we consider four potential archetypical resources in each stage.

Figure 3 suggests that a transaction can be classified by the combination of resources from upstream and downstream stages. As each of these stages may have one of the four archetypical resources, the figure reflects sixteen distinct transaction types. As discussed in Appendix B.4, five of these sixteen transaction types provide distinct economic contexts within which to examine the integrated effects of asset specificity and heterogeneity. These five transactions are as follows: (i) unilateral homogenous and specific (it involves homogenous and specific resource r_{11} in stage one and heterogeneous and non-specific resource r_{24} in stage two), (ii) bilateral heterogeneous and unilateral non-specific (it involves heterogeneous and non-specific asset r_{14} in stage one and r_{23} in stage two), (iii) unilateral homogenous and non-specific (it involves homogenous and non-specific resources r_{12} in stage one, and r_{23} in stage two), (iv) unilateral homogenous and bilateral high asset specific (it involves high specific and homogenous resource r_{11} in stage one, and r₂₃ in stage two), and (v) bilateral heterogeneous and bilateral high asset specific (it involves heterogeneous and high specific resource r_{13} in stage one, and r_{23} in stage two).

The predictions from TCE and RBV regarding the selection of governance for the first two of the five unique transactions are in conflict. For instance, in exchange type one, a firm A must determine how to organize a transaction involving downstream stage

one activities with a highly asset specific resource that does not provide a competitive advantage (r_{11}) and a non-specific but costly to copy resource (r_{24}) in upstream stage two. In this setting, from the perspective of firm A, TCE predicts the use of hierarchical governance while the RBV predicts market exchange. The predictions from TCE and the RBV are consistent for the third type of transaction, where firm B deploys a heterogeneous and specific resource, r₂₃, in upstream stage two and faces homogenous and non-specific resources, r_{12} , in downstream stage one. This transaction is usually analyzed from the firm B's perspective in the TCE literature. Here, for firm B the prediction of hierarchy is consistent with both TCE and resource-based perspectives. The remaining two types of transactions are characterized by bilateral high asset specificity. TCE predicts market forms of governance in these settings, reasoning that the exchange of hostages neutralizes the risk of opportunism (Williamson, 1983). While the RBV perspective emphasizing heterogeneous resources in both stages supports the TCE prediction of market form for the fifth transaction, it does not offer the same prediction for the fourth transaction, where firm B does not face any disadvantages in accessing the required resources.

Below we analyze the first of the five unique transactions in detail, and then we extend the analysis to examine the others. The analyses draw on the mathematical inequalities reflecting the necessary and sufficient conditions to identify a particular governance form as efficient (see Appendix B.3). These inequalities incorporate TCE and RBV implications for the transaction characteristics and heterogeneity across the partners

under consideration. Finally, logical inferences and implications for further theory development are drawn.

3.4.1 Unilateral homogenous and specific transaction

The transaction of interest involves a homogenous and specific resource (r_{11}) in stage one and a heterogeneous and non-specific resource (r_{24}) in stage two. Thus, only firm A has resources that are homogenous and specific. Inequality (5)— represented as inequality (xiii) in Appendix B.3— specifies a necessary condition for firm A to rationally choose hierarchy over market to organize this transaction.

$$R_2(0) - C_{2A} - C_1(x, 0) > -\Delta G(k_1, 0),$$
(5)

In this inequality, k_1 and 0 represent the levels of specificity in stage one and two, respectively. The equation $\Delta G(k_1, 0) = [M^1(k_1) + H^1(k_1) - H^{12}(k_1+0)]$ represents the difference in governance costs that firm A would experience between organizing through market and hierarchy. TCE posits that the cost disadvantage of using market governance, $\Delta G(k_1, 0)$, increases in the level of asset specificity, k_1 , and, therefore beyond some level of asset specificity (i.e., for $k_1 >$ some value, say, k_{1*}), the inequality (5) holds. Further, at production levels sufficiently close to efficient scale in stage two, the cost penalty associated with internalizing stage two, $C_1(x, 0)$, becomes negligible. Thus, at quantity levels close to the efficient scale, a firm is more likely to organize within hierarchy.

Inequality (5) captures two reasons why focal firm A may find hierarchical organization less profitable than market organization despite high levels of asset specificity in stage one. First, standard transaction cost logic indicates that the cost disadvantage associated with market transaction costs, $\Delta G(k_1, 0)$, may be bounded from

above when returns to asset specificity are concave— beyond a certain level of asset specificity, marginal increases in revenue will be less than the marginal cost of increased investment in specialization (Riordan & Williamson, 1985). Therefore, specific investment will be undertaken only up to an optimum level, say k^{**}_1 (Williamson, 1991a: 282). This implies that the maximum cost disadvantage associated with using the market, $\Delta G(k_1, 0)$ will occur at $k_1 = k^{**}_1$. Second, since the resource based view assumes that the cost disadvantage firm A faces in accessing costly to copy resources for stage two is theoretically unbounded (Barney, 1991, 1999), the costs of internalizing a transaction may dwarf the costs of opportunism associated with market organization.

The preceding paragraph explicitly recognizes the tradeoffs between bounded market transaction costs due to specific investment, and theoretically unbounded cost disadvantages to imitate heterogeneous resources. When the potential cost disadvantage in accessing strategically equivalent resources for stage two outweighs the loss expected in the market due to high levels of asset specificity, it is efficient for firm A to choose market over hierarchy. Formally, while $[R_2(0) - C_{2B} > 0]$; given $(C_{2B} < C_{2A})$, $[R_2(0) - C_{2A} < \text{some value}]$, such that: $[R_2(0) - C_{2A} - C_1(x, 0) < -\Delta G(k^{**}_1, 0)]$. Indeed, this inequality indicates that firm A's cost disadvantage in accessing resources could be high enough that despite investing in the optimum level of asset specificity in stage one, it may capture higher profit via market exchange than in hierarchy. Formally, Π_a^m $(k^{**}_1) > \Pi_a^h(k^*_1, k^*_2)$ where k^*_1, k^*_2 represent the optimum level of asset specificity for stage one and 2 in hierarchy.

The arguments above result in a non-trivial implication—despite the existence of high levels of asset specificity, when facing costly to copy resources, firm A may prefer market exchange over hierarchy. However, it remains to be answered why a firm facing costly to copy resources will opt for high specific resources when it can deploy non-specific resources in the market exchange? Indeed, as $\Delta G(k_1, 0)$ increases in the level of asset specificity k_1 , it is plausible that there exists $k^{***}_{1} < k^{**}_{1}$, such that: $\Pi_a^m (k^{***}_{1}) > \Pi_a^m (k^{***}_{1})$. This implies that if less-specific resources exist, firms facing costly to copy resources may endogeneously choose to employ resources with low-levels of specificity and organize via market transactions, and render the non-trivial implication inconsequential.

The preceding counter arguments focus on firm A's preferences. Market exchange will only be a feasible option, when all parties (here firm B and A both) prefer market exchange over all other alternatives. To examine the implications of firm B's preference for market exchange, below we present inequalities (6) and (7)— represented as inequalities (xvi) and (xvii) in Appendix B.3. These inequalities mathematically state the necessary and sufficient conditions for a potential partner firm (here, firm B) to rationally choose to undertake stage two in a market exchange involving homogenous and specific resource r_{11} in stage one and heterogeneous and non-specific resource r_{24} in stage two. Inequalities (6) and (7) respectively suggest that firm B must capture a higher profit in a market exchange than it can potentially capture by either organizing the transaction in hierarchy or deploying the resources required for stage two in an alternative transaction, ex-ante.

$$t_1(k_1) * R_1(k_1) - H^2(0) > R_1(k_1) - C_{1B} - \gamma_1 k_1 - H^{12}(k_{1+0}) - C_2(x, k_1),$$
(6)

$$\mathbf{R}_{2}(0) - \mathbf{C}_{2B} - \mathbf{H}^{2}(0) + \mathbf{t}_{1}(\mathbf{k}_{1}) * \mathbf{R}_{1}(\mathbf{k}_{1}) > \Pi^{2B} \ge 0,$$
(7)

As argued below, incorporating firm B's self-interest suggests that it is possible to reverse the TCE prediction regarding asset specificity and organization when a firm faces heterogeneous resources. Indeed, there are at least two reasons to believe that it will be rational for firm A to increase asset specificity in stage one to enable market exchange when facing costly to copy resources in an adjacent stage. First, if optimum asset specificity occurs at k_{1}^{**} as argued earlier, then despite high levels of asset specificity, it will be more efficient for focal firm A to choose market exchange over hierarchy. Second, since partner firm B's potential benefit from opportunistic behavior against firm A, $t_1(k_1) * R_1(k_1)$, increases with the level of asset specificity (k_1) , partner firm B is more likely to opt for market exchange (i.e., inequalities 6 and 7 above are more likely to hold) the higher the level of asset specificity in the stage one. More importantly, as firm B does not face a cost disadvantage in accessing strategically equivalent resources for stage one, below some level of asset specificity in stage one, say, $k_{1}^{c_{1}} > 0$, inequality 6 may not hold. In other words, while firm A may prefer market exchange at lower levels of asset specificity than k_{1}^{c*} , firm B will not. For $k_{1}^{c*} < k_{1} < k_{1}^{**}$, market organization of the transaction is more likely the higher is the asset specificity k_1 . The preceding identifies conditions under which it may be efficient for firm A to select levels of specificity and choose forms of organization that create vulnerability to opportunism. Specifically, increasing asset specificity to attract a potential exchange partner that does not face cost disadvantage in accessing resources for either stage to market exchange is a rational

choice for a firm that faces cost disadvantage in accessing resources required for adjacent stage.

3.4.2 Bilateral heterogeneous and unilateral non-specific transaction.

The second transaction of interest involves a heterogeneous and non-specific asset (r_{14}) in stage one and a heterogeneous and specific resource (r_{23}) in stage two. For ease of argument we will focus on an economically analogous transaction- involving heterogeneous and specific resource (r₁₃) in stage one, and heterogeneous and nonspecific resource (r₂₄) in stage two. The analogous transaction differs from the one analyzed in section 3.4.1 in one way— partner firm B now also faces a cost disadvantage in accessing the resources required for stage one. Formally, while the analysis presented in section 3.4.1 assumed that $C_{1B} \approx C_{1A}$; we assume here that $C_{1B} > > C_{1A}$. This change lowers the value of the right hand side of inequality 6, reducing the minimum level of asset specificity (k^{c^*}) required in stage one for firm B to find market exchange attractive. Lowering k^{c*}₁ makes market exchange more likely by increasing the range of asset specificity $(k_{1}^{**} - k_{1}^{**})$ in stage one for which both partners find market exchange attractive. Additionally, due to cost disadvantages in adjacent stage, either firm may not find hierarchy with endogenously determined higher levels of asset specificities more attractive than the market exchange. In other words, as the disadvantage associated with accessing resources in the adjacent stage increases for both firms, market exchange is more likely. Moreover, as firm A may lower the asset specificity needed to attract firm B to market exchange due to cost disadvantage firm B faces, the resulting market exchange involving low asset specificity will be consistent with the TCE perspective.

3.4.3 Unilateral homogenous and non-specific transaction.

The third transaction of interest involves a homogenous and non-specific asset (r_{12}) in downstream stage one and a heterogeneous and specific resource (r_{23}) in upstream stage two. This transaction represents the classic transaction analyzed in the mainstream TCE literature, albeit with firm B as the focal firm. Here, TCE posits that as the level of asset specificity (k_2) in stage two deepens firm B, due to rising exchange hazards, will face higher organizing costs in the market than in hierarchy. Thus, TCE predicts hierarchical governance for firm B. As firm B does not face relative cost disadvantages in accessing the resources required for stage one, RBV implications are consistent with the standard TCE prediction for firm B. It is noteworthy that since firm B can access resources through imitation, its preference for hierarchy is independent of firm A's preferences.

3.4.4 Unilateral homogenous and bilateral high asset specific transaction.

The fourth transaction of interest involves a homogenous and specific resource (r_{11}) in stage one and a heterogeneous and specific resource (r_{23}) in stage two. The bilateral high asset specificity condition can be of two types— symmetrical and asymmetrical degrees of high asset specificity. The symmetrical high asset specificity (SHS) condition implies that both partners face the same appropriable losses. TCE predicts market governance as the equivalently appropriable losses neutralize the risk of opportunism. RBV predicts market exchange for firm A that faces costly to copy resources in stage two. However, market governance for a SHS transaction is not always likely. The absence of a cost disadvantage for firm B suggests that it is less likely to
prefer market exchange when its use of market may allow firm A to capture potential high levels of profits in stage one. Further, high specificity in both the stages indicates that either firm will not suffer from high cost penalty due to scale diseconomies when internalizing the adjacent stage.

The asymmetrical high asset specificity condition may result in either of the firms facing expropriation losses in the market. When firm A faces higher appropriable losses than firm B, the transaction will be economically similar to the transaction analyzed in section 3.4.1 which involved unilateral homogenous and specific resources. When firm B faces higher appropriable losses than firm A, the transaction will be economically similar to the one analyzed in section 3.4.3 which involved unilateral homogenous and non-specific resources.

3.4.5 Bilateral heterogeneous and bilateral high asset specific transaction.

The final transaction of interest involves heterogeneous and specific resource (r_{13}) in stage one, and heterogeneous and specific resources (r_{23}) in stage two. As mentioned in the section 3.4.4. above the bilateral high asset specificity condition can involve symmetrical or asymmetrical degrees of specific investment. Bilateral heterogeneous transactions involving asymmetrically high levels of asset specificity are economically similar to the transaction analyzed in section 3.4.2.

The bilateral heterogeneous transaction involving symmetric levels of high asset specificity differs from the SHS transaction analyzed in section 3.4.4 only in one aspect. While in the SHS transaction in section 3.4.4 only firm A faces cost disadvantage in adjacent stage, here either firm faces cost disadvantage in accessing resources required for the adjacent stage. Both RBV and TCE predict market exchange. In other words, cost disadvantage faced by both the exchange partners reinforces the TCE prediction of market exchange for transactions involving bilateral high asset specificity.

3.5 Discussion and Conclusion

The chapter takes a novel first step in explicitly integrating TCE and RBV perspectives on the firm's boundary choices, and it particularly focuses on the arguments involving asset specificity and productive capability differences across potential exchange partners. Importantly, the chapter is consistent with the central assumptions of both the TCE and RBV literatures. The transaction is treated as the fundamental unit of analysis, and asset specific investments are assumed to be value enhancing. Standard reasoning applies regarding the effects of asset specificity, cost of hierarchy, cost of a transaction in the market, and cost penalty due to scale diseconomies in hierarchy. Consistent with the RBV, firms are assumed to have irreducible differences in their ability to access productive resources. In particular, while the differences due to firm specific capabilities in accessing resources apply to all transactions in which these resources could be deployed, transaction specific investments are more valuable in the transaction where these investments are specific. Further, the analysis recognizes profits from potential deployment of resources in an alternative transaction, ex-ante, and the existence of and preference for profit maximizing alternatives for both the exchange partners. The analysis differs from the extant literature in precisely modeling these conditions.

The literature suggests that both TCE and RBV perspectives have direct and independent effects on the firms' boundary choices. The research recognizes that TCE and RBV perspectives on optimal organization at times reinforce and on others conflict. However, efforts to develop an integrated perspective through verbal theorizing and/or empirical work constrained by data limitations have yet to reveal deeper tractable insights. Further, despite earnest calls for integrating these perspectives (Madhok, 1997; Mahoney & McGahan, 2007; Williamson, 1999), it has remained unclear where such integration may provide unique insights over and above those offered by existing, independent examination of firm boundary conditions.

The analysis presented in this chapter reveals select situations where an integrated perspective provides novel insights regarding the optimal form of governance. As depicted in Figure 3, there are 16 potential transactions classified on two dimensions— the levels of asset specificity in either stage of a transaction and the degree of productive heterogeneity across potential exchange partners in accessing resources required for undertaking activities in a stage. Absent high levels of specific investment and consequent high threats of opportunism, the determination of the efficient form of governance in situations involving low asset specificity for either exchange partners or symmetrical bilateral high asset specificity are dominated by RBV arguments. Situations involving firms with negligible differences in their ability to access resources for either stage are dominated by TCE concerns. Out of remaining five distinct transactions where both conditions of high asset specificity and heterogeneity in resources are present, three unique transactions benefit from an integrated perspective. In two of these situations, an

integrated perspective may reverse the received transaction cost governance predictions. The model demonstrates that when a firm faces a cost disadvantage in undertaking operations in an adjacent stage it may have to increase the level of asset specificity in its own stage to enable market exchange with a potential exchange partner. This is especially true when the potential partner does not face a productive disadvantage in either stage. While some recent studies attribute unilateral investment by OEM manufactures to spillovers across transactions (Min-Ping, Mahoney & Tan, 2009), this chapter identifies situations where unilateral asset specific investments are rational choices even without any spillover benefits from other transactions between the same exchange partners. For instance, an upstream supplier's eagerness to incur unilateral investment for favor of business with firm's with superior downstream abilities such as Wal*Mart supports this analysis.

Further, as shown in Figure 4 below, the extant literature identifies situations where TCE and RBV predictions on governance choices are and are not in conflict. This figure focuses on a single party in a transaction. The focus on both potential exchange partners in this chapter further sharpens our understanding of governance choices. For example, when a focal firm undertake a stage involving low asset specificity and faces productive capability disadvantages in undertaking the adjacent stage (quadrant 4 in the Figure 4), in the extant literature both transaction cost and resource-based perspectives predict market exchange.



Figure 4: Reinforcing and Conflicting Predictions of TCE and RBV Perspectives

However, analysis in this chapter suggests that a potential partner may not prefer market exchange if the partner does not face productive disadvantages in undertaking either stage. The partner's preference in market exchange will be reduced when the stage it undertakes involves high levels of specificity. Thus, even in situations where the extant TCE and RBV logic suggest that market exchange is efficient for focal firm, bilateral concerns may render this choice infeasible. Further, the analysis suggests that received TCE predictions may flip in situations involving unilateral high asset specificity and productive disadvantages (e.g., quadrant 2 in Figure 4) for a firm that faces a partner who does not face productive disadvantage in either stage (e.g., quadrant 3 in Figure 4 from partner firm's perspective). The analysis in this chapter explicitly clarifies situations where TCE's cost economizing logic incorporates value maximization (Madhok, 1997). In the TCE paradigm a firm experiences value loss due to organizing costs. Organizing costs refer to: (i) costs due to bureaucratic distortions and productive disadvantages from scale diseconomies in hierarchy, and (ii) costs due to contracting costs and irreducible opportunism in market exchanges. TCE contends that economizing on organizing costs leads to value maximization across governance forms. However, if productive disadvantage due to resource heterogeneity exist, this chapter suggests that transaction cost logic may not result in a value maximizing form.

The insights in the chapter have important implications for empirical work. While extant research examines the effects of asset specificity and productive capability focusing from the perspective of a focal firm, our analysis underscores that governance choices may be significantly affected by concerns of potential exchange partners. This suggests that future empirical work may need to focus on productive capability differences in important competitive dimensions across potential exchange partners. Further, the analysis suggests that endogeneity in the level of asset specificity, cost penalties due to scale diseconomies, and the intensity of competitive imperfection in either stage of the transaction also need to be identified. The intricacies of these concepts and the nature of these interactions suggest the need for additional case work, or "midrange" empirical work focused on a single industry or sector.

The chapter presents several opportunities for future conceptual research. First of all, the scope of analysis in the chapter focuses only on asset specificity and productive disadvantages due to resources applied in adjacent stages. Opportunities exist to integrate several other important aspects such as uncertainty and transaction management capabilities. Further, while the analysis allows for imitation via direct duplication and substitution, it does not explicitly analyze the competitive consequence of simultaneous use of hierarchy by potential partners in the market. Extending the present analysis to incorporate competitive dynamics may lead to novel insights. Further, it is plausible that productive capability differences may be endogenously linked to governance choices over time, and spillover effects across transactions may undermine the predictions derived from this integrated perspective.

The chapter begins to explicitly integrate TCE and RBV perspectives on governance choices. The analysis in this chapter emphasizes that, though only in select situations, an integrated perspective may offer important and unique insights. The analysis suggests that unilateral asset specific investment may need to be increased to enable market exchanges. The chapter offers several opportunities for future research and presents an approach that can be exploited to examine these opportunities.

Chapter 4: Examining the Relationship between Governance Capability and Governance Form: Does Productive Capability Matter?

Transaction cost economics (TCE) posits that organizing costs are the main driver of firm-boundary decisions (Williamson, 1991a) but it does not account for the possibility that firms may develop governance capabilities (Williamson, 1999). Governance capabilities refer to a firm's unique skills in managing organizing costs related to a specific governance form—market or hierarchy. Recent work, drawing on the resource-based view (RBV), has begun to acknowledge that firms may differ in managing organizing costs, and it argues that firm-boundary choices may also be influenced by such capabilities (Argyres & Mayer, 2007; Dyer & Singh, 1998; Mayer & Salomon, 2006).

Governance capabilities are usually hypothesized to favor the governance form (e.g. market or hierarchy) in which a firm has higher comparative efficiency (Mayer & Salomon, 2006). Existing work asserts that a firm may develop contract writing, monitoring and enforcing capabilities to manage market exchange efficiently and that, on the margin, this expertise leads firms to use the market more frequently than their less capable rivals. For instance, after controlling for a variety of firm- and exchange-level factors, Leiblein and Miller (2003) note that semiconductor firms with greater levels of prior sourcing experience are more likely to outsource production. Although research on firm specific governance capabilities has begun to offer valuable insights, many aspects remain to be examined. Contrary to extant arguments, situations may exist where firm specific contracting capability reduces the likelihood of market exchange. For instance, if potential partners are aware of a firm's superior contracting capability, their interest in collaborating may be adversely affected. Specifically, a partner firm's interest is likely to be more important when it has required productive capabilities, and has also developed capabilities to manage organizing costs in hierarchy.

The purpose of this paper is to explicitly examine the effects of governance capabilities on governance form choices by integrating asset specificity, productive capability, and governance capability perspectives on firm-boundary choices. The paper focuses on: (i) hierarchical management capability (HMC)— firm's capabilities in managing bureaucratic distortions and incentive degradations in hierarchy, and (ii) market contracting capability (MCC)— firm's capabilities in managing opportunistic losses in market exchange to examine how and when differences in productive capabilities across potential partners, and partner firm's governance capabilities affect the relationship between a focal firm's governance capabilities and its selection of particular governance forms. Using a semi-formal modeling approach (Williamson, 1991a: 270) and applying assumptions that are widely accepted in TCE (Riordan & Williamson, 1985; Williamson, 1991a) and the RBV (Barney, 1991; Peteraf, 1993) the paper demonstrates that only in select conditions does a firm's comparative efficiency in governance capabilities favor a particular governance form. Based on the levels of asset

specificity and differences in productive capabilities across potential partners a firm's governance capabilities may be irrelevant or counterproductive in obtaining governance form that maximizes its profit. Further, differences in productive capabilities across potential exchange partners asymmetrically affect hierarchy and market management capabilities relationship with the governance form.

The chapter proceeds as follows: Section 4.1 offers brief review of the relevant literature. Section 4.2 introduces the model. Section 4.3 describes necessary and sufficient conditions for governance mode choices. Building on prior sections, the relationship between governance capabilities and governance forms is examined in section 4.4. Discussion and conclusions follow in the section 4.5.

4.1 Literature Review

In order to develop an integrated model of the influence of governance capabilities, productive capabilities, and asset specificity on governance choices, it is helpful to precisely define the primary assumptions and insights provided by each of these perspectives. As several papers provide detailed reviews of the logic underlying TCE (e.g. Macher & Richman, 2008), the capability perspective (e.g. Barney & Arikan, 2001), or both perspectives on firms' boundary choices (e.g. Leiblein, 2003; Williamson, 1999), we restrict our comments to a brief review of the arguments that are central to this chapter.

Williamson (1979, 1985, 1991a) offers a theory of economic organization that suggests how organizing costs affect governance form choices. The theory argues that

while organizing within a firm (hierarchy) is costly due to bureaucratic distortions, incentive degradations, and diseconomies of scale; organizing via market involves contracting costs and opportunistic losses. The theory culminates in fundamental propositions that discriminately align transaction characteristics— asset specificity, uncertainty and frequency— with cost economizing governance forms (Riordan & Williamson, 1985; Williamson, 1991). Williamson (1985: 56) asserts that "asset specificity is a locomotive to which TCE owes much of its predictive power." TCE contends that absent asset specificity market governance is more efficient than hierarchy. This difference in efficiency is hypothesized to decline and eventually reverse as asset specificity rises. Hierarchical governance is also argued to suffer from the cost penalty due to diseconomies that result when a firm ends up producing for its own needs. This cost penalty is assumed to decline in both the level of specificity in adjacent stage and its scale (Riordan & Williamson 1985; Williamson 1979, 1985, 1991a). Further, although Williamson (1991b: 82) suggests that asset specificity is a design variable, the implications of this treatment have not always been incorporated into governance analysis (Macher & Richman, 2008). Furthermore, while transaction cost theory regards organizing costs as the main driver of governance form decisions; it does not account for the possibility of firm-specific capabilities that may influence governance form decisions (Williamson, 1999).

The resource based view (RBV) posits that firms can be enduringly heterogeneous in their resources and capabilities (Barney, 1991; Peteraf, 1993). This and similar logic contends that both firm specific governance capabilities and differences in firm specific productive capabilities affect governance choice decisions (Argyres, 1996; Barney, 1999; Demsetz, 1988; Jacobides & Winter, 2005; Madhok, 2002). Governance decisions therefore may not be solely influenced by organizing costs but also by heterogeneously distributed productive and governance capabilities. Differences in capabilities may help explain why firms facing similar levels of contractual hazards might rationally select different forms of governance (Argyres & Mayer, 2007; Dyer & Singh, 1998; Mayer & Salomon, 2006). Below we briefly review the governance capability and productive capability perspectives on governance forms.

Firms may differ in their governance capabilities—their ability to manage organizing cost (Argyres, Bercovitz & Mayer, 2007; Argyres & Mayer 2007; Argyres & Zenger, 2008; Kale, Dyer, & Singh, 2002; Mayer & Salomon, 2006). A firm may develop a capability to efficiently manage a transaction via market or in hierarchy via experience (Leiblein & Miller, 2003). Firm specific capabilities in initiating, writing, negotiating, monitoring and enforcing contracts, and technology transfer may be pertinent in managing market exchange (Hoetker, 2005; Leiblein & Miller, 2003; Martin & Salomon, 2003). Similarly, capabilities such as communication, coordination and control may be vital in managing influence activities, bureaucratic distortions and resource combination within hierarchy (Gibbons, 2005; Madhok, 1996; Nickerson & Zenger, 2008; Williamson, 1985). Productive and Organizational governance capabilities are argued to influence TCE predicted relationships between asset specificity and governance form by favoring internal and market organization, respectively. For example, a firm will favor market exchange when, compared to an average firm, it has higher efficiency in

organizing a transaction via market than managing costs in hierarchy. It is suggested that in the presence of such capabilities a higher level of hazard will be required to lead to hierarchy (Mayer & Salomon, 2006). Similarly, scholars (Helfat & Campo-Rembado, 2009; Madhok, 1996) propose that firms with integrative capabilities are likely to organize activities within hierarchy.

Resource-based arguments that emphasize persistent differences across firms' productive capabilities have also been applied to explain firm boundaries (Argyres, 1996; Barney, 1999; Demsetz, 1988; Jacobides & Winter, 2005; Madhok, 2002). The basic idea in this work is that if productive resources are heterogeneously distributed across firms and barriers to imitation exist, i.e., there is a significant cost disadvantages in accessing a capability through internal development or acquisition, then a firm should internally govern activities where its resources provide a comparative advantage and transact via market where it is at a comparative disadvantage.

In addition to their independent effects, productive and governance capabilities are also suggested to impact governance form choices interactively. For example, it is argued that while productive capabilities may enhance monitoring capabilities they are less likely to be effective in mitigating appropriability concerns (Mayer & Salomon, 2006).

The distinct and complementary focus of these perspectives have led many scholars including Williamson (1999) to call for an integration of the resource-based and transaction cost perspectives (Langlois & Foss, 1999; Leiblein, 2003; Madhok, 1997; Silverman, 2002). The existence of similar assumptions (e.g., boundedly rationale

decision makers) and shared emphases on the role of the firm in resolving conflicts of interest, coordinating resource development, and applying distinctive resources suggests that integration is likely to be quite fruitful. As proffered by Santos & Eisenhardt (2005), "many intriguing insights are likely to come from studies that explore the relationships among [RBV and TCE] boundary conceptions."

Prominent scholars have noted the difficulties in capturing theoretical richness in integrating these perspectives (Gibbons, 2005; Jacobides & Winter, 2005; Makadok, 2006). Additionally, challenges of synthesizing TCE and RBV lie in bridging the theories' different units of analysis (transaction vs. resource) and in identifying and integrating relevant transaction and resource characteristics into a parsimonious framework. Nevertheless, attempts have been made to jointly consider asset specificity based arguments with either productive capability based arguments (e.g. Jacobides & Winter, 2005) or governance capability based arguments (e.g. Argyres & Mayer, 2007). Further, extant arguments largely focus on a single party in a transaction (Zajac & Olsen, 1993). Though it is plausible that governance capabilities may affect potential partner's interest adversely and differences in productive capabilities across potential partners may moderate the relationship between governance capability and governance form; we are unaware of the efforts that aim to explicitly integrate all the three perspectives on governance choices.

We proceed by developing arguments that more clearly identify the roles that difference in productive capabilities across potential partners, and levels of asset specificity play in affecting the relationships between governance capabilities and governance forms. Our analysis treats the concerns of potential partners symmetrically.

4.2 The Model

The chapter examines decisions facing firms seeking to organize a transaction when either firm may have firm specific governance capabilities. As shown in the Figure 5, the model considers two firms, labeled A and B, and a transaction that can be divided into two stages— upstream stage two, and downstream stage one. A transaction is said to be organized in hierarchy when a single firm undertakes both stages internally, and to be organized via market when a firm contracts for one of the stages with another firm.



Figure 5: Transactions Involving Asset Specificity and Resource Heterogeneity

The model follows the standard TCE and RBV assumptions reviewed below. In

particular, the model incorporates four assumptions consistent with standard TCE reasoning (Riordan & Williamson, 1985; Williamson, 1991a: 284). First, the cost of organizing via hierarchical governance is assumed to be greater than the cost of transacting in the market at low levels of asset specificity. Second, the costs of organizing via hierarchy and the market are assumed to be increasing functions of asset specificity with the cost of transacting in the market are assumed to be increasing functions of asset specificity with the cost of transacting in the market rising faster than the cost of hierarchy. Third, transactions organized within a firm (hierarchy) are assumed to suffer a production cost penalty relative to exchanges organized in the market due to scale diseconomies. Fourth, consistent with Williamson (1991a) the model incorporates the revenue enhancing effects of specific investment.

The model is also consistent with standard RBV logic and focuses on both firm specific governance and productive capabilities. First, the model assumes that firms differ in their ability to manage organizing costs (e.g. Argyres, 1996; Dyer & Singh, 1988; Leiblein & Miller, 2003; Mayer & Argyres, 2004). Further, as these capabilities are usually gained through experiential learning with a governance form (e.g. Leiblein & Miller, 2003), it is specifically assumed that a firm may be more efficient than an average firm in managing either market exchange or hierarchy, but not both. Second, it is assumed that firms differ in their productive capability, and these differences may persist, possibly due to luck, endowment, *ex ante* and *ex post* barriers to competition (Barney, 1986, 1991; Lippman & Rumelt, 1982; Peteraf, 1993). Consequently, in comparison to a potential exchange partner, a firm may face irreducible cost disadvantages in accessing resources required to conduct a particular stage of a transaction (Barney, 1999). By

explicitly accounting for heterogeneous productive capability across potential exchange partners, it is possible to examine whether and how such heterogeneity influences the effects of governance capabilities on organization forms.

The model incorporates the assumptions mentioned above via following six points. First, downstream stage one generates revenue $R_1(k_1)+R_2(k_2)$. Parameters k_1 and k_2 indicate the levels of asset specificity in stage one and 2 respectively. When a firm undertakes both the stages it captures the entire revenue. When it undertakes only downstream stage one and chooses to contract with another firm to conduct upstream stage two, the partner firm receives revenue $R_2(k_2)$. The revenue attributable to a stage increases in the level of asset specificity associated with that stage; formally, for $k_1 > 0$, $R_1(k_1) > R_1(0)$. $R_1(0)$ represents the maximum revenue that can be derived from deploying generic resources in stage one to an alternative transaction, ex-post. While increasing the level of asset specificity, k_1 , increases the overall revenue credited to activities in a stage, it also raises the possibility that this additional revenue may be opportunistically appropriated by the exchange partner. It costs amount, γ_1k_1 , to specialize the resources in stage one to the transaction.

Second, the resources, \mathbf{r}_1 , that are required to enable the activities in stage one cost firm A, C_{1A} and the firm B, C_{1B}. Without any loss of generality, when a transaction involves exchange partners with heterogeneous productive capabilities the model assumes that firm A incurs lower cost than firm B in accessing the resources required for stage one, and firm B may have a cost advantage over firm A with respect to the resources required for stage two (Barney, 1991, 1999; Peteraf, 1993). Firms may also be homogenous in their productive capabilities, however; formally, it is plausible that: $C_{1A} \le C_{1B}$, and $C_{2B} \le C_{2A}$.

Third, to mitigate exchange hazards, the focal firm incurs contracting costs $T_c(k_1)$ towards writing, negotiating, monitoring and enforcing the contract with the potential partner. Due to complexity, uncertainty, or both, contracting essentially remains incomplete, however. $t_1(k_1)$ represents the fraction of the revenue that can be captured by an opportunistic potential partner despite contracting; and $t_1(k_1)*R_1(k_1)$ captures the expected monetary loss due to opportunism. Thus, $t_1(k_1)$ is bounded between 0 and 1— it is 0 when there is no specific investment, and revenue attributable to stage one in the transaction is just equal to the maximum revenue from potential redeployment of stage one resources in an alternative transaction, ex-post. It is 1 when there is a high degree of asset specificity and the maximum revenue from a potential redeployment of downstream stage one resources in an alternative transaction, ex-post, is negligible compared to the stage one revenue in the transaction. In sum, the total transaction cost in managing the exchange relations for an average firm undertaking stage one is given by $M^1(k_1)=T_c(k_1)+t_1(k_1)*R_1(k_1)$.

Fourth, we operationalize a firm specific capability in market contracting via its superior ability with respect to an average firm in mitigating opportunistic losses for a given level of contracting costs. Thus, for $T_c(k_1)$ in contracting costs firm A's opportunistic losses are given by $v^m{}_A*t_1(k_1)*R_1(k_1)$ where firm specific efficiency in managing opportunism $v^m{}_A$ is bounded between 0 and 1; formally, $0 \le v^m{}_A \le 1$. Firm A is as efficient as an average firm in managing market transaction when $v^m{}_A = 1$; it is more

efficient than an average firm when $v^m_A < 1$. Thus, firm A's organizing costs in managing market exchange is given by $M^1_A(k_1) = T_c(k_1) + v^m_A * t_1(k_1) * R_1(k_1)$. Analogical reasoning applies to firm B.

Fifth, the term H(k₁, r₁) represents the cost of hierarchy that an average firm incurs in managing the level of asset specificity k₁ and resources r₁ in stage one (Williamson, 1991X: p. 282). However, due to its specific culture, information flow, control or coordination mechanisms a firm may be more efficient than an average firm in managing bureaucratic distortions and incentive degradations in hierarchy (Nickerson & Zenger, 2008; Williamson, 1975). Organizing costs incurred by firm A in hierarchy, H_A(k₁, r₁), is given by v^h_A *H(k₁, r₁) firm specific efficiency in managing organizing costs within hierarchy, v^h_A , is bounded between 0 and 1; formally, $0 \le v^h_A \le 1$. Firm A is as efficient as an average firm in managing hierarchy when v^h_A = 1; it is more efficient than an average firm when $v^h_A < 1$.

Finally, based on the level of asset specificity in upstream stage two, k_2 , the firm undertaking stage one may gain $v^m{}_B*t_2(k_2)*R_2(k_2)$ by behaving opportunistically. If firm A were to conduct stage one when a transaction is organized via market exchange, it could capture profit $\Pi_a{}^m(k_1, k_2)$ where k_1 and k_2 represent the level of asset specificities in stage one and stage two respectively. Formally,

$$\Pi_{a}^{m}(k_{1}, k_{2}) = R_{1}(k_{1}) - C_{1A} - \gamma_{1}k_{1} - M_{A}^{1}(k_{1}) - H_{A}(k_{1}, r_{1}) + \nu_{B}^{m}*t_{2}(k_{2})*R_{2}(k_{2}),$$
(1)

Alternatively, if firm A were to internalize both stages, it captures revenue $R_1(k_1)+R_2(k_2)$. Resources, r_1 and r_2 , that are required to conduct activities in stage one and two, cost firm A, C_{1A} and C_{2A} , respectively. The amounts $\gamma_1 k_1$ and $\gamma_2 k_2$ capture the

investments required to specialize the resources in stage one and stage two to the transaction. $H_A(k_1+k_2, r_1+r_2) = v^h_A * H(k_1+k_2, r_1+r_2)$, represents the cost firm A incurs in managing the two stages via hierarchical governance.

Furthermore, as discussed earlier, the model allows for a cost penalty due to loss of demand aggregation (scale diseconomies) under the assumption that when a firm internalizes adjacent stage, it produces only for its own consumption. $C_1(x, k_2)$ represents the scale related cost penalty firm A undertaking stage one would incur from internalizing upstream stage two. Here, x represents the scale of the transaction such that $C_1(x, k_2)$ declines with increase in both x and k_2 (Riordan and Williamson, 1985). $\Pi_a^{h}(k_1, k_2)$ represents the profit that firm A could capture if it were to organize the transaction in hierarchy. Formally,

$$\Pi_{a}^{h}(k_{1}, k_{2}) = R_{1}(k_{1}) + R_{2}(k_{2}) - C_{1A} - C_{2A} - \gamma_{1}k_{1} - \gamma_{2}k_{2} - H_{A}(k_{1} + k_{2}, r_{1} + r_{2}) - C_{1}(x, k_{2}),$$
(2)

The cost of hierarchy represented as $H_A(k_1+k_2,r_{1+}r_2)$ implies it to be a function of asset specificity as well as the scale and scope of resources being managed. Riordan & Williamson (1985) and Williamson (1991a) assume the cost of hierarchy to primarily be a function of asset specificity. Accordingly, it is possible to simplify the notation by replacing $H_A(k_{1+}k_2, r_1+ r_2)$ with $H^{12}{}_A(k_{1+}k_2)$, and $H_A(k_1, r_1)$ with $H^1{}_A(k_1)$ in the profit equations. Further, consistent with TCE, at low levels of asset specificity for an average firm the cost of organizing in hierarchy is greater than the organizing cost in market; while beyond some level of asset specificity, say k_{1*} , hierarchy has a lower cost than market. Formally, for $k_1 \approx 0$, $\{M^1(0) + H^1(0)\} < H^{12}(0+0)$; and for $k_1 > k_{1*} > 0$, $\{M^1(k_1) + H^1(k_1)\} > H^{12}(k_1+0)$.

Analogously, $\Pi_b^{m}(k_1, k_2)$ represents the profit that could be captured by firm B when it participates in the market exchange undertaking upstream stage two; and $\Pi_b^{h}(k_1, k_2)$ represents the profit that firm B could capture if it were to conduct both the stages via hierarchy. Formally,

$$\Pi_{b}^{m}(k_{1}, k_{2}) = R_{2}(k_{2}) - C_{2B} - \gamma_{2}k_{2} - M^{2}_{B}(k_{2}) - H^{2}_{B}(k_{2}) + \nu^{m}_{A}*t_{1}(k_{1})*R_{1}(k_{1}),$$
(3)

$$\Pi_{b}^{\ h}(k_{1}, k_{2}) = R_{2}(k_{2}) + R_{1}(k_{1}) - C_{2B} - C_{1B} - \gamma_{2}k_{2} - \gamma_{1}k_{1} - H^{12}_{\ B}(k_{1}+k_{2}) - C_{2}(x, k_{1}),$$
(4)

Our model also accounts for the possibility that a firm may deploy the resources to an alternative transaction, ex-ante. If the presence of heterogeneous resource stocks implies that firms differ in the cost of accessing these resources, then firms will differ in the expected profits from deployment of resources in alternative transactions, ex-ante. In the model, Π^{1A} and Π^{2A} , respectively, indicate the maximum profits that could be earned by firm A deploying resources, $\mathbf{r_1}$ and $\mathbf{r_2}$, to an alternative transactions. Further, for the ease of demonstration we assume that: $\Pi^{1A} \ge 0$; and $\Pi^{2A} \ge 0$. Analogous assumptions for firm B apply. In the extant literature these conditions are implicitly assumed to have been met.

4.3 Necessary and Sufficient Conditions for Governance Forms

We assume that a firm chooses the governance form that maximizes its expected profit. A firm chooses hierarchy (i.e. owns resources to conduct both stages 1 and 2) when its expected profit in hierarchy is higher than the expected profits from either participating in market transaction (i.e. undertaking only one of the stages) or deploying the resources in an alternative transaction, ex-ante. However, in order for market governance to arise, a second condition must be met. Namely, both the focal firm and a partner firm must expect to capture a higher expected profit through exchange than either can capture by organizing the transaction within hierarchy or deploying their resources in an alternative transaction, ex-ante. It is noteworthy that while extant arguments focus on a single party in a transaction (Zajac & Olsen, 1993), the model presented in this chapter recognizes that market exchange requires that it be profit maximizing alternative for both the exchange partners.

Appendices C.1 and C.2 respectively discuss the necessary and sufficient conditions for a firm to choose a particular governance form— market for a transaction involving asymmetric level of asset specificity or hierarchy for a transaction involving low levels of asset specificity. The appendices provide algebraically simplified expressions of these conditions that are derived from the profit equations, 1, 2, 3 and 4, presented in the section 4.2. Next we examine the effects of governance capabilities on governance form.

4.4 Examining the Effects of Governance Capability on Governance Form

The analysis in this section has two objectives. First, it examines if, compared to an average firm, a firm's higher efficiency in managing market exchange than hierarchy favors market form of organization. Second, it examines if, compared to an average firm, a firm's higher efficiency in managing hierarchy than market exchange favors hierarchical form of organization. To achieve these objectives this section analyses select transactions that combine various levels of asset specificity in either stage, firm specific capabilities in managing a governance forms, and differences in productive capabilities across potential exchange partners. The analysis draws on the necessary and sufficient conditions for a governance form mentioned in section 4.3, and presented in the appendix C.1 and C.2.

4.4.1 Market Contracting Capabilities (MCC) and Governance Form

A firm has market contracting capabilities (MCC) when compared to an average firm it has higher efficiency in managing market exchange than managing hierarchy. A firm can be more efficient in managing market exchange when for the same contracting costs it incurs less opportunistic losses than the losses faced by an average firm.

TCE posits that as conditions of asset specificity deepens market contracting costs and losses from opportunism rise faster than the cost of hierarchy. Eventually, beyond a certain level of asset specificity hierarchy becomes more efficient (Riordan & Williamson, 1985). However, extant research on governance capability suggests that, compared to an average firm, a firm with MCC would favor market exchange at higher levels of asset specificity (Mayer & Salomon, 2006). Therefore, to examine how and where MCC might favor market governance form, below we focus on transactions involving high levels of asset specificity in stage one and low level of asset specificity in stage two, and examine the effect MCC of firm A has on its governance form choices. Analogous arguments can be made from the perspective of firm B for transactions involving high levels of asset specificity in stage two and low levels of asset specificity in stage one. MCC for firm A implies that for a given level of asset specificity in stage one and the level of contracting costs, compared to an average firm, firm A faces lower levels of opportunistic hazards in the market. Further, firm A is as efficient as an average firm in managing costs within hierarchy. Formally, $v_A^m < 1$ and $v_A^h \approx 1$.

Inequalities 5 to 8— expressed as inequalities (ix) to (xii) in appendix C.1 specify necessary and sufficient conditions that must hold for a transaction with high level of specificity in stage one and low level of specificity in stage two to be organized via market. Inequalities 5 and 6 represent conditions that must hold for firm A managing downstream stage one to prefer market exchange over both hierarchy and deploying resources to an alternative transaction, ex-ante, respectively. Inequalities 7 and 8 represent analogous conditions for firm B managing upstream stage two. For market exchange to occur both firms must simultaneously prefer market exchange over all other alternatives.

$$-\Delta G_{A}(k_{1},0) > R_{2}(0) - C_{2A} - C_{1}(x,0),$$
(5)

$$\mathbf{R}_{1}(\mathbf{k}_{1}) - \mathbf{C}_{1A} - \gamma_{1}\mathbf{k}_{1} - \mathbf{M}^{1}_{A}(\mathbf{k}_{1}) - \mathbf{H}^{1}_{A}(\mathbf{k}_{1}) > \Pi^{1} \ge 0,$$
(6)

$$v^{m}{}_{A}*t_{1}(k_{1})*R_{1}(k_{1}) - \Delta G_{B}(k_{1}, 0) > R_{1}(k_{1}) - C_{1B}-\gamma_{1}k_{1} - C_{2}(x, k_{1}),$$
(7)

$$R_{2}(k_{2}) - C_{2B} - H^{2}_{B}(k_{2}) + v^{m}_{A} * t_{1}(k_{1}) * R_{1}(k_{1}) > \Pi^{2} \ge 0,$$
(8)

As depicted in the Figure 6 below, transaction involving high level of asset specificity in stage one and low level of asset specificity in stage two can be further characterized into four different types based on the heterogeneity across partners in their ability to access resources required to conduct activities in stage one and 2. First, firm A with productive capability advantages in stage one ($C_{1A} < C_{1B}$) may be as productive as firm B in stage two ($C_{2B}\approx C_{2A}$). Second, both firms may be homogenous with respect to their productive capabilities for either stage ($C_{1A}\approx C_{1B}$ and $C_{2B}\approx C_{2A}$). Third, either firm may face productive disadvantages in adjacent stage ($C_{1A} < C_{1B}$ and $C_{2B} < C_{2A}$). Finally, while firms may be homogenous in productive capabilities for stage one($C_{1A}\approx C_{1B}$), firm A may face productive disadvantage in stage two ($C_{2B} < C_{2A}$).



Figure 6: Productive Heterogeneity and Types of Transactions

We begin by analyzing a transaction where firm A with productivity advantages in stage one enjoys homogenous capabilities for stage two. Traditionally, this transaction has been a focus of examination within TCE literature. $\Delta G_A(k_1, 0) = [M^1_A(k_1) + H^1(k_1) - H^{12}(k_1+0)]$ in inequality 5 represents the difference between organizing costs in the market and hierarchy for firm A. Consistent with TCE, $\Delta G_A(k_1, 0)$ rises in k_1 . MCC for firm A implies that for the same level of asset specificity marketing transaction costs $M^1_A(k_1)$ is smaller than it is for an average firm. Thus, firm A requires higher level of asset specificity than what is necessary for an average firm to favor hierarchical governance over market exchange. Similarly, marketing transaction costs $M_{A}^{1}(k_{1})$ in inequality 6 suggests that firm A requires higher level of asset specificity than what is necessary for an average firm to favor an alternative transaction ex-ante over market exchange. In other words, in the presence of MCC a higher level of the exchange hazards will be required for firm A to favor hierarchy or deployment of resources in alternative transaction ex-ante over market exchange.

The conclusions above are consistent with the extant governance capability arguments (Mayer & Salomon, 2006). The conclusions may not always be valid for the following two reasons, however. First, it follows from inequality 5 that despite MCC firm A may not prefer market exchange when (i) firm A does not suffer from cost disadvantage ($C_{2A}\approx C_{2B}$) in accessing resources required for stage two, (ii) adjacent stage is highly profitable (($R_2(0) - C_{2A}$) > > 0), and (iii) scale of operation closely matches the minimum efficient scale required for the adjacent stage ($C_1(x, 0) \approx 0$). In other words, absent productive capability disadvantage for a profitable adjacent stage involving efficient scale MCC for a firm may not be relevant.

Second, more importantly, for market transaction to occur firm B must also opt for market exchange, i.e., inequalities 7 and 8 must also hold. However, inequalities 7 and 8 both imply that MCC for firm A ($v^m_A < 1$) adversely affects firm B's interest in the market exchange ($v^m_A * t_1(k_1) * R_1(k_1) < t_1(k_1) * R_1(k_1)$). Particularly so, when firm B (i) has comparative efficiency in managing hierarchy (- $\Delta G_B(k_1, 0) \approx v^h_b * H^{12}(k_1+0)$, where $v^h_b <$ 1), and (ii) stage one has high profit potential ($R_1(k_1) - C_{1A} > 0$). However, positive effect of A's MCC on the likelihood of market exchange might prevail if firm B faces sufficient productive disadvantage in stage one ($C_{1B} > C_{1A}$).

The arguments above focus on the transaction where only firm B faces productive disadvantage in undertaking adjacent stage. These arguments indicate that either firm's productive capability in undertaking profitable adjacent stage may limit the influence/relevance focal firm's MCC may have on increasing the likelihood of market exchange. Stated differently, focal firm's MCC is less likely to be effective when potential exchange partners may be homogenous with respect to their productive capabilities in undertaking either profitable stages ($C_{1A} \approx C_{1B}$ and $C_{2B} \approx C_{2A}$). Further, focal firm's MCC is less likely to be less effective the higher is the HMC for potential partner. Furthermore, it follows that focal firm's MCC is more likely to favor market exchange when both firms face productive disadvantages in undertaking adjacent stages ($C_{1A} < C_{1B}$ and $C_{2B} < C_{2A}$).

Finally, we turn to analyzing a transaction with high specificity in stage one where firms are homogenous in productive capabilities for stage $one(C_{1A}\approx C_{1B})$, but firm A faces productive disadvantage in stage two ($C_{2B} < C_{2A}$). Following inequalities 7 and 8, and as argued above, firm A's MCC will adversely affect firm B's interest in the market exchange. Unlike the transactions analyzed above, as firm B does not face productive disadvantage in undertaking stage one, consideration for firm B's interest in market exchange is vital. Firm B is less likely to be interested in market exchange when: (i) stage one is highly profitable ($R_1(k_1) - C_{1A} > 0$), and (ii) firm B has comparative efficiency in managing hierarchical governance form. In these situations, absent potential partner's interest (here firm B), market exchange will not result. Importantly, as firm A faces productive disadvantage in undertaking adjacent stage it might be rational for firm A to increase asset specificity to attract a potential partner to a market exchange. Indeed it is plausible that, against firm A's interest, firm A's MCC may dissuade potential partner from participating in the market exchange. Formally, while inequalities 5-8 may hold for low or negligible levels of MCC for firm A ($v_A^m \approx 1$), beyond a certain level of higher MCC ($v_A^m \rightarrow 0$) inequalities 7 and 8 may not hold.

In sum, productive heterogeneity across exchange partners supports the positive influence of focal firm's MCC on the likelihood of market exchange. However, absent productive capability disadvantage for a profitable adjacent stage involving efficient scale MCC for a firm may not be relevant. Further, exchange partner's HMC may nullify the influence of focal firm's MCC on governance choice. Importantly, in transaction where focal firm faces productive disadvantage in undertaking adjacent stage MCC may even be counterproductive, and adversely affect the likelihood of market exchange.

4.4.2 Hierarchical Management Capabilities (HMC) and Governance Form

A firm has hierarchy management capabilities (HMC) when, compared to an average firm, it has higher efficiency in managing hierarchy than managing market exchange. A firm can be more efficient in managing hierarchy when it manages bureaucratic distortions, influence activities and incentive degradation within hierarchy more efficiently than an average firm. Firms may have HMC due to its experience, culture, information or control systems (Nickerson & Zenger, 2008; Leiblein and Miller, 2003; Williamson, 1985).

TCE posits that at low levels of asset specificity market exchange is more efficient form of governance than hierarchy (Riordan & Williamson, 1985). Extant research on governance capability suggests that, compared to an average firm, a firm with HMC would favor hierarchical form of governance at lower levels of asset specificity (Mayer & Salomon, 2006). Therefore, below we focus on transaction involving low levels of asset specificity in either stage to examine how and where HMC might favor hierarchical governance form. We particularly discuss transaction involving low levels of asset specificity and the effect HMC of firm A has on its governance form choices. Analogous arguments can be made for firm B if it enjoys HMC.

HMC for firm A implies that, compared to an average firm, firm A would organize a transaction within hierarchy at lower levels of asset specificity. Further, firm A is as efficient as an average firm in managing market exchange. Formally, $v_A^h < 1$ and $v_A^m \approx 1$.

Inequalities 9 to 10— expressed as inequalities (xvii) to (xviii) in appendix C.2 mathematically state necessary and sufficient conditions that must hold for firm A to organize a transaction involving low levels of specificity in either stage via hierarchy. Inequalities 9 and 10 represent conditions that must hold for firm A to prefer hierarchy over market exchange, and over deploying resources to an alternative transaction, exante, respectively.

$$R_{2}(k_{2}) - C_{2A} - v_{A}^{h} * (H_{A}^{12}(k_{1+}k_{2}) - H^{1}(k_{1})) - C_{1}(x, k_{2}) > 0,$$
(9)

$$R_{1}(k_{1}) - C_{1A} + R_{2}(k_{2}) - C_{2A} - \nu^{h}_{A} * H^{12}_{A}(k_{1+}k_{2}) - C_{1}(x, k_{2}) > \Pi^{1A} + \Pi^{2A} \ge 0,$$
(10)

As discussed earlier and depicted in the Figure 6, transaction involving low levels of asset specificity in either stage can be further characterized into four different types based on heterogeneity across partners in their ability to access resources required to conduct activities in stage one and two. First, firm A with productive capability advantages in stage one ($C_{1A} < C_{1B}$) may be as productive as firm B in stage two ($C_{2A}\approx C_{2B}$). Second, both firms may be homogenous with respect to their productive capabilities for either stages ($C_{1A}\approx C_{1B}$ and $C_{2B}\approx C_{2A}$). Third, either firm may face productive disadvantages in adjacent stage ($C_{1A} < C_{1B}$ and $C_{2B} < C_{2A}$). Finally, while firms may be homogenous in productive capabilities for stage one($C_{1A}\approx C_{1B}$), firm A may face productive disadvantage in stage two ($C_{2B} < C_{2A}$).

We begin by analyzing a transaction where firm A with productivity advantages in stage one enjoys homogenous capabilities for stage two. According to the model specification, $(H^{12}{}_{A}(k_{1+}k_{2}) - H^{1}(k_{1}) - M^{1}{}_{A}(k_{1}))$ represents the difference in organizing costs between hierarchy and market exchange for firm A. Consistent with low level of asset specificity in stage one market transaction costs are negligible (at $k_{1}\approx 0$; $M^{1}{}_{A}(k_{1})\approx$ 0,), thus inequality 9 ignores market transaction costs. TCE suggests that at low levels of asset specificity hierarchical form is less efficient; formally, $(H^{12}{}_{A}(k_{1+}k_{2}) - H^{1}(k_{1}) M^{1}{}_{A}(k_{1})) > 0$. Further the theory posits that as asset specificity deepens cost of market exchange rises faster than hierarchical costs (.i.e. for k_{1} marginal rate for $M^{1}{}_{A}(k_{1}) >$ marginal rate for $H^{12}{}_{A}(k_{1+}k_{2}))$. Therefore, the difference in organizing costs in hierarchy and market is higher the lower is the level of asset specificity, and as asset specificity deepens it begins to decline and eventually reverses. HMC for firm A implies that firm A is more efficient than an average firm in managing hierarchical costs ($v_A^h < 1$). In the light of the discussion in the preceding paragraph it follows from inequalities 9 that firm A would favor hierarchical governance over market exchange at lower levels of asset specificity than what is necessary for an average firm. Similarly, hierarchical costs, $v_A^h * H^{12}{}_A(k_{1+}k_2)$, in inequality 10 suggest that at any given level of asset specificity firm A, as compared to an average firm, is more likely to prefer hierarchy over deploying resources in an alternative transaction ex-ante. The analysis so far focuses only on firm A's interest. As firm B faces cost disadvantages in accessing resources required to conduct stage one, it may favor market exchange. However, as firm A does not face disadvantages in accessing resources for stage two which involves low levels of asset specificities, firm A's preference for hierarchy is not influenced by firm B's preferences.

The arguments above can be extended to analyze transaction where both firms have homogenous capabilities in accessing resources required for either stage. While arguments above will apply for firm A, given homogeneity in accessing resources required to conduct the transaction via hierarchy, firm B is also more likely to prefer hierarchical governance. It is more likely if firm B also enjoys HMC. Consistent with the observation in real world it is conceivable that firms may opt for integrated governance structure and compete in the product market instead of operating only in a part of value chain and exchanging via market.

In sum, consistent with the capability arguments (Mayer & Salomon, 2006), when firms do not face cost disadvantages in accessing resources required for transaction, in the presence of HMC a lower level of the hazard will lead to integration. The conclusions may not always be valid for the following two reasons, however. First, it follows from inequality 9 that despite HMC firm A may not prefer hierarchy when (i) firm adjacent stage is not profitable (($R_2(0) - C_{2A}$) ≈ 0), and (ii) scale of operation does not closely match the minimum efficient scale required for adjacent stage ($C_1(x, 0) > 0$). In other words, absent profit potential in adjacent stage and efficient scale HMC for a firm may not be relevant.

Second, more importantly, despite HMC ($v_A^h < 1$) firm A may not favor hierarchy when firm A faces cost disadvantage in accessing resources required to conduct stage two ($C_{2B} < C_{2A}$). While firm A may favor market exchange, as argued earlier firm B may favor hierarchical governance if it does not face cost disadvantage in accessing resources required for stage one ($C_{1B} \approx C_{1A}$), stage one is highly profitable (($R_1(0) - C_{1A}$) > 0), and firm B enjoys HMC ($v_B^h < 1$). Thus, when potential partner may not be interested in market exchange and firm A faces only marginal cost disadvantages in undertaking adjacent stage, HMC may encourage firm A to organize transaction via hierarchy. However, in the transactions where either firm faces cost disadvantages in accessing resources required to conduct adjacent stages ($C_{1A} < C_{1B}$, and $C_{2B} < C_{2A}$) both firms, despite having HMC, may favor market exchange.

In sum, as shown in Figure 7 below, comparative productive capability for adjacent stage, and attractiveness— profitability and efficient scale— of adjacent stage for either firm combine to affect the influence of focal firm's HMC on governance form choice. HMC leads to integration at lower levels of asset specificity when a firm does not

face productive disadvantages and finds adjacent stage attractive. However, HMC of focal firm may not lead to integration at lower levels of asset specificity when (i) adjacent stage is just marginally profitable, if at all, and potential partner firm faces productive disadvantages in undertaking focal stage that does not match efficient scale, and (ii) either firm faces productive disadvantages in adjacent stage. Interestingly, if a firm only faces marginal productive disadvantage in adjacent stage HMC of the firm may still increase the likelihood of organizing via hierarchy when potential partner has both productive and governance capabilities to conduct attractive focal stage via hierarchy.



Figure 7: HMC and the Choice of Governance Form

4.5 Discussion and Conclusions

This chapter takes a novel first step in examining relationship between governance capability and governance form by integrating governance capability, productive capability, and asset specificity based arguments on governance form choices. Importantly, the paper is consistent with the central assumptions of both the TCE and RBV literatures.

Consistent with the RBV, it is assumed that firms may be enduringly heterogeneous in their transaction governance capabilities and in their abilities to access resources. Specifically, it is assumed that, compared to an average firm, a firm may be more efficient in managing either a market exchange or hierarchy. A firm is assumed to have market contracting capabilities (MCC) when, for the same contracting costs, it incurs less opportunistic losses than the losses faced by an average firm. A firm is said to have hierarchy management capability (HMC) when it manages bureaucratic distortions, influence activities and incentive degradation within hierarchy more efficiently than an average firm. Further, it is assumed that firms may face irreducible differences in the costs of accessing resources required for a stage in a transaction.

Consistent with TCE, the transaction is treated as the fundamental unit of analysis, and asset specific investments are assumed to be value enhancing. Standard reasoning applies regarding the effects of asset specificity, cost of hierarchy, cost of a transaction in the market, and cost penalty due to scale diseconomies in hierarchy.

Furthermore, the analysis recognizes profits from potential deployment of resources in an alternative transaction, ex-ante, and the existence of, and preference for

profit maximizing alternatives for both the exchange partners. The analysis differs from the extant literature in integrating these perspectives and precisely modeling above mentioned conditions.

In the extant literature governance capabilities are usually hypothesized to favor the governance form in which a firm has a higher comparative efficiency. A firm will favor market exchange when, compared to an average firm, it has higher efficiency in organizing a transaction via market than managing costs in hierarchy. It is suggested that in the presence of such capabilities a higher level of the hazard will be required to lead to integration (Mayer & Salomon, 2006). Similarly, hierarchical management capabilities are hypothesized to lead to integration at lower levels of asset specificity.

The analysis presented in this paper reveals that governance capabilities favor particular governance form only in specific conditions. In general, heterogeneous productive capabilities across exchange partners support the positive influence of market contracting capabilities on market exchange. Absent productive disadvantages across partners in undertaking a profitable adjacent stage involving efficient scale, MCC for a firm may not be relevant. Further, the influence of focal firm's MCC on governance choice may be nullified by the exchange partner's HMC. Moreover, in transactions where only a focal firm faces productive disadvantage in undertaking adjacent stage MCC may even be counterproductive, and adversely affect the likelihood of market exchange.

As shown in the Figure 7, the comparative productive capability and attractiveness of an adjacent stage for either a focal firm or its partner affect the influence of focal firm's HMC on governance form choice. HMC leads to integration at lower

levels of asset specificity when potential partner firms do not face productive disadvantages in undertaking attractive adjacent stage, and the partner firm has a superior hierarchical management capability. However, a focal firm with superior HMC may not lead to integration at lower levels of asset specificity when (i) the focal firm faces cost disadvantages in the adjacent stage, (ii) the adjacent stage is just marginally profitable, if at all, and potential partner firm faces productive disadvantages in undertaking focal stage that may not match efficient scale, and (iii) either firm faces productive disadvantages in the adjacent stage. Interestingly, despite marginal productive disadvantage in an adjacent stage, HMC of the focal firm may increase the likelihood of hierarchical governance at lower level of asset specificity when potential partner has productive and governance capabilities to conduct transaction via hierarchy profitably.

In the context of the conclusions presented above three points needs to be acknowledged. First, it is assumed that a firm can have productive advantages over potential partner only in one stage of a transaction. However, as commonly observed, in less developed and emerging economies, a firm can have productive advantages over potential exchange partner in undertaking either of the separable stages of a transaction. Second, the analysis compares hierarchy and market exchange for a firm at a given level of asset specificity. The level of asset specificity and the type of governance form can be endogenously determined, however (Williamson, 1991 b: 82). Further, as the optimum level of asset specificity for a stage in market exchange and hierarchy may differ (Riordan & Williamson; 1985: 372), comparing market exchange and hierarchy at a given level of asset specificity may result in misleading conclusions. Third, differences in
productive capabilities across potential exchange partners and governance forms may also be endogenously linked over time (Argyres & Zenger, 2008). For example, hierarchical governance may encourage investments that may lead to differences in productive capabilities over time. Below we discuss the implication of each of these three points.

First, a firm's productive advantages over potential exchange partners in undertaking either stage will have asymmetric effect on the relationship of HMC and MCC of the focal firm with its governance choices. While superior productive capability would strengthen the effect of HMC on governance choice, they would weaken the independent effect of MCC on governance choice. Second, the effect of endogeneity between asset specificity and governance form on the relationship between governance capability and governance form is also likely to be conditional. When the focal firm does not face productive disadvantages in undertaking either stage, endogenous determination of high levels of asset specificity and hierarchy will enhance the influence of HMC on governance choice. Similarly, when both firms face productive disadvantages in undertaking adjacent stage, endogenous determination of low levels of asset specificity and market exchange will enhance the influence of MCC on governance choice. Third, endogenous determination of productivity advantages and governance choice over time can occur in either direction. For example, while hierarchy through productivity enhancing investment may result in productive advantages over time, it may also result in productive disadvantage due to inertia, isolation and lack of learning over time. When hierarchy leads to productive advantages it would likely have positive effect on HMC's

influence on the likelihood of hierarchical governance. Similarly when market exchange through increased specialization leads to productive disadvantage in adjacent stage for either firm, it would likely have positive effect on MCC's influence on the likelihood of market exchange.

The paper presents several opportunities for future research. First, the scope of analysis can be enhanced to include hybrid governance forms, value creation beyond the efficient management of organizing costs via efficient resource combination, and the mediating effects between productive and governance capabilities (Mayer & Salomon 2006). Opportunities exist to integrate several other important aspects such as uncertainty and its effects on the governance capabilities' influence on governance choice. Further, while the analysis allows for imitation via direct duplication and substitution, it does not explicitly analyze the competitive consequence of simultaneous use of hierarchy by potential partners in the market. Extending the present analysis to incorporate competitive dynamics may lead to novel insights. Moreover, it is plausible that spillover effects across transactions may undermine the predictions derived from integrated perspective focusing on single transaction.

The research on the relationship between governance capability and governance is in its nascent stage. The insights in this chapter have important implications for both theoretical as well as empirical work. While extant research examines the effects of governance capability from the perspective of a focal firm, our analysis explicitly integrates asset specificity, productive capability and governance capability perspectives. It underscores that the relationship between focal firm's governance capabilities and governance choices may be significantly affected by comparative productive capabilities and governance capabilities of potential exchange partners as the potential partner attempts to maximize her profit. The analysis in this chapter reveals that only in specific conditions governance capabilities favor governance form in which a firm has higher comparative efficiency. The paper offers several opportunities for future research and presents an approach that can be exploited to examine these opportunities.

Chapter 5: Discussion and Conclusions

This dissertation takes a novel first step in explicitly examining the boundary conditions of the central prediction of transaction cost economics (TCE) and in integrating TCE and resource-based view (RBV) explanations of firm-boundary choices. In particular, the dissertation focuses on the TCE's predication regarding the relationships between asset specificity and governance forms and the RBV based arguments related to firm specific productive capabilities and governance capabilities and their influence on firm-boundary decisions.

Importantly, the analysis is consistent with the central assumptions of both the TCE and RBV literatures. Consistent with TCE, the transaction is treated as the fundamental unit of analysis, asset specific investments are assumed to be value enhancing, standard reasoning regarding the effects of asset specificity on the costs of hierarchy and market exchange apply, and a cost penalty due to scale diseconomies is assumed to exist (Riordan & Williamson, 1985; Williamson, 1991a).

Consistent with the RBV, firms are assumed to have irreducible differences in their ability to access productive resources (Barney, 1986, 1991; Lippman & Rumelt, 1982; Peteraf, 1993). Particularly in chapter 3, it is assumed that firms may irreducibly differ in the cost of accessing and deploying resources required to enable activities in a transaction (Barney, 1999). Such enduring difference may exist due to ex-ante and/or ex-

post limits to competition. These differences due to firm specific capabilities in accessing resources apply to all transactions in which these resources could be deployed. Imitation through direct duplication or strategic substitution may also be possible, however.

Chapter 4 explicitly assumes that a firm may develop unique governance capabilities in managing a governance form (e.g. Argyres, 1996; Leiblein & Miller, 2003; Mayer & Argyres, 2004). Specifically, compared to an average firm, a firm may be more efficient in managing either a market exchange or hierarchy. A firm is assumed to have market contracting capabilities (MCC) when, for the same contracting costs, it incurs less opportunistic losses in market exchange than the losses faced by an average firm. A firm is said to have hierarchy management capability (HMC) when it manages bureaucratic distortions, influence activities and incentive degradation within hierarchy more efficiently than an average firm.

Further, several concerns— such as diminishing returns to specific investment, endogeneity in asset specificity and governance form choices, lack of focus on both parties in a transaction, and ex-ante alternatives— often acknowledged but rarely examined in the extant research have been taken into consideration.

This dissertation differs from the extant literature in integrating these perspectives and precisely modeling the above mentioned conditions.

Chapter 2 examines the boundary conditions of the standard transaction cost logic relating asset specificity to governance forms. It focuses on the transactions where differences in productive and governance capabilities across firms are assumed away. The analysis reveals two primary boundary conditions. First, contrary to the standard TCE prediction, it turns out that high asset specificity, in itself, is neither a necessary nor a sufficient condition for hierarchy. High asset specificity may not be a necessary condition for hierarchy when a firm does not face competitive disadvantages in undertaking profitable adjacent stage. If such a transaction involving low asset specificity were to be organized via the market, profit in the adjacent stage, which could have been realized by the focal firm, would be captured by the potential partners. Optimum level of asset specificity in the market exchange may not be a sufficient condition for hierarchy when exchange hazards in the market are bounded from above due to diminishing marginal returns to specific investments and significant cost penalty from diseconomies of scale exist. Further, the analysis reveals that while high levels of asset specificity may not be necessary or sufficient for hierarchy, hierarchy may endogenously lead to high levels of asset specificity. It underscores that high asset specificity is strongly associated with the hierarchy and it may not be causally linked, as often argued.

Second, it follows from the above conclusions that, in itself, low asset specificity is neither a necessary nor a sufficient condition for market exchange. Further, the analysis reveals that market exchange between partners with homogenous capabilities is subject to stringent conditions. Contrary to the standard TCE predictions, despite low asset specificity, market exchange may not be feasible for the following three reasons: (i) both firms must find market exchange profit maximizing; (ii) in the absence of preexisting commitment, homogeneity across partners requires that exchange firms capture equal profit in market exchange; (iii) endogeneity in asset specificity and hierarchy requires that either firm captures more profit in market exchange at low asset specificity than it can by organizing the transaction within a hierarchy at optimum levels of asset specificity in both stages. These inferences are consistent with Riordan & Williamson (1985: 367) who arguably did not see low asset specificity as a driver of governance form when stating, "neoclassical analysis is well suited for transactions involving non-specific investments."

Chapter 3 focuses on integrating TCE's asset specificity and RBV's heterogeneous productive capability-based arguments on governance form. The analysis reveals that only in specific situations an integrated perspective provides novel insights regarding the optimal form of governance. The chapter considers 16 different types of transactions. RBV arguments dominate when partners differ in their productive abilities, and transactions involve low asset specificity or symmetrical bilateral high asset specificity, where threat of opportunism for either partner is negligible. TCE concerns are paramount in transactions involving asymmetric levels of asset specificity, where potential partners do not differ in their ability to conduct either stage of a transaction. An integrated perspective provides insights only in 3 out of 5 distinct transactions (discussed in appendix B) where both conditions of asymmetric high asset specificity and heterogeneity across partners exist. In two of these transactions, an integrated perspective may reverse the received transaction cost governance predictions. While some recent studies attribute unilateral specific investment by OEM manufactures to spillovers across transactions (Min-Ping, Mahoney & Tan, 2009), analysis in chapter three identifies situations where unilateral asset specific investments are rational choices even without any spillover benefits from other transactions between the same exchange partners. The

model demonstrates that when a firm faces a cost disadvantage in undertaking operations in an adjacent stage, it may be rational for it to increase the level of asset specificity in its own stage to enable market exchange with a potential exchange partner. This is especially true when the potential partner does not face a productive disadvantage in either stage. For instance, an upstream supplier's eagerness to incur unilateral investment for favor of business with firms with superior downstream abilities, such as Wal*Mart, supports this analysis.

Further, the extant understanding is based on a standard logic that focuses on a single party in a transaction. The symmetrical focus on both the potential exchange partners in this chapter non-trivially qualifies this understanding. For example, as depicted in Figure 4, the extant research undertakes that when a focal firm undertakes a stage involving low asset specificity and faces productive capability disadvantages in undertaking the adjacent stage, both transaction cost and resource based perspectives reinforce and predict market exchange. However, the analysis in chapter 3 reveals that market exchange may not occur if the potential partner does not face productive disadvantages in undertaking either profitable stage. Thus, in situations where extant arguments from both perspectives, focused on a focal firm, offer the same prediction, incorporating potential partner's concerns may render the prediction invalid.

Furthermore, the analysis in this chapter explicitly clarifies situations where TCE's cost economizing logic incorporates value maximization (Madhok, 1997). TCE contends that economizing on organizing costs leads to value maximization across governance forms. However, if productive disadvantages due to resource heterogeneity

exist, the analysis suggests that the transaction cost logic may not result in a value maximizing form.

Chapter 4 examines the relationship between governance capabilities and governance forms by integrating asset specificity, productive heterogeneity, and governance capability perspectives on governance forms. The chapter assumes that in addition to productive capabilities, firms may also differ in their governance capabilities. Extant research on governance capabilities suggests that a firm favors a governance form in which it has higher comparative efficiency. The analysis in this chapter reveals that only in specific situations such favor may be valid. A firm's market contracting capabilities (MCC) increase its favor for market exchange only when productive heterogeneity across exchange partners exists. Absent productive disadvantages across partners in undertaking a profitable adjacent stage involving efficient scale, MCC for a firm may not be relevant. Further, the influence of a focal firm's MCC on governance choice may be nullified by the exchange partner's hierarchy management capability (HMC). Moreover, in transactions where only a focal firm faces productive disadvantage in undertaking adjacent stage MCC may even be counterproductive, and it may adversely affect the likelihood of market exchange.

As shown in Figure 6, comparative productive capability for adjacent stage and attractiveness— profitability and efficient scale— of adjacent stage for either firm combine to affect the influence of the focal firm's HMC on its governance form choices. HMC leads to integration at lower levels of asset specificity when any of the potential partners does not face productive disadvantages in undertaking attractive adjacent stage.

Interestingly, HMC of the focal firm, despite productive disadvantage in an adjacent stage, may still lead to hierarchy at lower levels of asset specificity when the potential partner has homogenous productive capability to undertake attractive focal stage. However, in general, HMC of a focal firm may not lead to integration at lower levels of asset specificity when (i) focal firm faces cost disadvantages in the adjacent stage, (ii) the adjacent stage is just marginally profitable, if at all, and the potential partner firm faces productive disadvantages in undertaking focal stage that may not match efficient scale, and (iii) either firm faces productive disadvantages in an adjacent stage. In general, a potential partner firm's HMC and MCC positively affect relationship between a focal firm's HMC's and the likelihood of hierarchy at lower levels of asset specificity.

Additionally, the analysis explicitly considers deployment of resources in alternative transactions, ex-ante. This underscores that market or hierarchical organizations are not the only alternatives; firms can opt for alternative transactions, and the focal transaction itself may not exist. This implies that decisions regarding resource allocation across transactions and governance form for a transaction are essentially interdependent. Acknowledging ex-ante alternatives reveals boundary conditions by highlighting the paradox—on one hand it is necessary for either stage of the transaction to be profitable to attract resource allocation; on the other hand, regardless of asset specificity, higher profitability of either stage and productive homogeneity across exchange partners makes hierarchy more attractive than market organization.

In summary, the thesis underscores that explicitly considering diminishing marginal returns to specific investment, endogeneity in the levels of asset specificity, profit potential of the adjacent stage, homogeneity in productive capability across potential exchange partners, ex-ante alternatives, and potential partner's profit maximizing alternatives and interest reveal the boundary conditions of the TCE's central predictions relating asset specificity to governance forms. Though the boundary conditions exist, in general, productive homogeneity across exchange partners favors extant predictions relating asset specificity and governance capability to hierarchy. It turns out that productive heterogeneity across potential partners non-trivially influences the effects of both asset specificity and governance capability on governance forms choices. Particularly, productive disadvantages experienced by either partner in undertaking adjacent stage have a critical positive influence on the existence of market exchange, and MCC's positive influence on market exchange. Further, the standard effects of both TCE and governance capability on governance forms may flip when a firm has significant productive disadvantages in undertaking adjacent stage and potential partner does not suffer from competitive disadvantages in focal stage. Furthermore, the productive advantages in a stage may not be effective in mitigating opportunistic hazards faced due to higher asset specificity in that stage. Moreover, in general potential partner firm's HMC and MCC positively influence relationship between focal firms HMC and hierarchical governance form, while both adversely affect extant prediction for market exchange.

The model also underscores that factors— such as endogeneity in the relationship between asset specificity and governance form, and governance capability— have asymmetric effects on hierarchy and market exchange. For example, the reverse causality between high asset specificity and hierarchy is reinforcing— asset specificity beyond some level leads to hierarchical governance, and hierarchical governance in turn may lead to further increases in asset specificity. However, decisions on lowering asset specificity within its stage of transaction by one exchange partner may have non-trivial adverse effects on other partner's interest in market exchange. In general, while HMC may positively affect firm's preference for hierarchical governance at lower levels of asset specificity, MCC's effects on market forms at higher level of asset specificity are more constrained due to interdependence in market exchange.

There are at least two factors underlying the conclusions that warrant further discussion. First, it is assumed that a firm, if at all, can have productive advantages over potential partner only in a stage of a transaction. However, as commonly observed, in less developed and emerging economies, a firm can have productive advantages over potential exchange partners in undertaking either stage of a transaction. The analysis in this thesis indicates that consistent with RBV productive advantages in either stage for a firm will affect its choices in favor of hierarchical governance. Absence of a willing potential partner due to its productive advantage in either stage will significantly weaken the standard TCE predictions favoring market exchange. Moreover while the HMC will enhance the effect of firms productive advantages in either stage, MCC will not be relevant.

Second, considering imitation via duplication or strategic substitution of resources and abilities, the model allows for the possibility of simultaneous use of hierarchy by potential exchange partners. This appears consistent with the real life examples where firms that could have undertaken only a stage in the transaction and worked with each other in the market, choose hierarchy and compete in product markets. Potential simultaneous use of hierarchy may have competitive implications, however. For example, when one firm chooses hierarchy to enter the product-market first, the other firm despite having the homogenous productive capability, based on the demand conditions may stay out of the market entirely. While fully formal analysis is ideally desirable, it appears that in many situations insights provided in the analysis may not differ qualitatively.

Additionally, several factors indicate potential research opportunities where approach presented in this thesis can offer novel and tractable insights. For example, it is possible to explicitly examine how and when pre-existing specific investments (Williamson, 1999) affect the standard TCE and RBV predictions. Further, in the extant literature on governance form knowledge based view (KBV) which emphasizes loss of value in transferring tacit knowledge across firm boundaries is often grouped with the RBV which underscores enduring heterogeneity in productive resources across firms (Williamson, 1999). The analysis in this paper indicates that, due to strategic imitation and substitution, tacit knowledge may not necessarily lead to productive advantages in undertaking adjacent stage. Analyzing KBV arguments via approached used in this paper may reveal novel insights. Furthermore, the approach could also be utilized to analyze the effects of uncertainty on governance forms and integrate real option (Kogut, 1991; Leiblein, 2003) based arguments with RBV and TCE explanations on firm-boundary choices. Moreover, chapter 4 focuses on the effects of a firm's ability to mitigate opportunistic losses in market exchange via its market contracting capabilities (MCC). It

appears that the effects of trust and reputation (as a trust worthy exchange partners) that may encourage potential partner to make specific investments may significantly differ from the effects of MCC analyzed here. However, concerns related to productivity disadvantages may dominate. For example, regardless of trust, in the absence of productivity disadvantages, it is rational for a firm making asset specific investment to integrate a profitable adjacent stage. Similarly, reputation is more likely to lead to market exchange when a firm with reputation undertaking less profitable stage faces productive disadvantage in adjacent profitable stage involving high asset specificity. Finally, for empirical work the insights revealed in this thesis underscore the need for comprehensive data on the firms and their potential partners. Such data is often difficult to access. Fortunately, approach followed may allow us to design experiments and conduct qualitative case studies to empirically test these insights.

The essays in this thesis begin to explicitly examine and integrate TCE and RBV perspectives on governance choices. The analysis in the thesis reveals the boundary conditions of central TCE prediction, and identifies select situations where integrated perspective offer novel insights. Importantly, the thesis offers several opportunities for future research and presents an approach that can be exploited to examine these opportunities.

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Appendix A: Asset Specificity and the Choice of Governance Form

A.1 Necessary and Sufficient Conditions for a Hierarchical Governance form

A firm chooses hierarchy (i.e. undertakes both stages 1 and 2) when expected profit in hierarchy for the firm is greater than the expected profits from participating in market transaction (i.e. undertaking only one of the stages) or deploying the resources in an alternative transaction, *ex-ante*. Formally, the inequalities (i) and (ii) below provide the necessary and sufficient conditions for firm A to choose hierarchy. Inequality (i) simply states that the profit firm A could capture in hierarchy must at least be equal to the profit firm A could capture in market transaction undertaking stage one(while setting up the model, we arbitrarily assigned stage one to firm A in market exchange). Inequality (ii) states that the profit firm A could capture in hierarchy must at least be equal to the model, we arbitrarily assigned stage one to firm A in market exchange). Inequality (ii) states that the profit firm A could capture in hierarchy must at least be equal to the maximum profit firm A could capture by potentially deploying the resources required for stages 1 and 2 in an alternative transaction, *ex-ante*.

$$\Pi_{a}^{h}(k_{1},k_{2}) \ge \Pi_{a}^{m}(k_{1},k_{2}), \tag{i}$$

$$\Pi_{a}^{\ h}(k_{1}, k_{2}) \ge \Pi^{1} + \Pi^{2} \ge 0, \tag{ii}$$

We substitute for $\Pi_a^{m}(k_1, k_2)$ and $\Pi_a^{h}(k_1, k_2)$ from the equations 1 and 2 in the inequality (i) above. Further, the anticipated revenue derived from stage one, $R_1(k_1)$, cost of the resources for stage one, C_1 , and cost due to level of asset specificity in stage one, $\gamma_1 k_1$, that appear on the both sides of the inequality cancel each other off. Thus, inequality

(i) simplifies into the following:

$$R_{2}(k_{2}) - C_{2} - \gamma_{2}k_{2} - H^{12}(k_{1+}k_{2}) - C_{1}(x, k_{2}) > t_{2}(k_{2}) * R_{2}(k_{2}) - M^{1}(k_{1}) - H^{1}(k_{1}),$$
(iii)

Similarly, below we re-state inequality (ii) after substituting for $\Pi_a^{h}(k_1, k_2)$:

$$R_{1}(k_{1}) - C_{1} - \gamma_{1}k_{1} + R_{2}(k_{2}) - C_{2} - \gamma_{2}k_{2} - H^{12}(k_{1}+k_{2}) - C_{1}(x, k_{2}) > \Pi^{1} + \Pi^{2} \ge 0,$$
 (iv)

Hierarchical governance for transaction involving asymmetric level of asset specificity. In the model, transaction involving high asset specificity in stage one $(k_1 > 0)$, and low asset specificity in stage two $(k_2 \approx 0)$ represents transaction with asymmetric level of asset specificity. Consistent with the characteristics of the transaction, the standard TCE reasoning implies that there is: negligible cost due to transaction specific investment in stage two $(\gamma_2 k_2 \approx 0)$, and limited market transaction costs in stage two $(M^2(k_2) \approx 0)$. However, there may be a cost penalty in organizing the transaction in the hierarchy if the scale of the transaction does not match with the efficient scale $(C_1(x, 0) >$ 0). Further, the difference in the organizing costs of market and hierarchy for firm A, $\Delta G(k_1, k_2)$ is positive where $\Delta G(k_1, k_2) = [M^1(k_1) + H^1(k_1) - H^{12}(k_1+k_2)]$. Consistent with TCE assumptions, $\Delta G(k_1, 0)$ increases in k_1 . Given the characteristics of the transaction under consideration, inequality (iii) above simplifies as follows:

$$R_2(0) - C_2 - C_1(x, 0) > -\Delta G(k_1, 0), \qquad (v)$$

Hierarchical governance for transaction involving low asset specificity. To arrive at the expression for necessary condition for transaction involving low asset specificity, we build on the inequality (v), and further assume low asset specificity in stage one($k_1 \approx 0$). Consistent with TCE, at low levels of asset specificity there will be significantly higher organizing cost in hierarchy than in the market. Formally, for $k_1 \approx 0$, $H^{12}(0+0) > 0, M^{1}(k_{1}) \approx 0, \text{ and } \Delta G(0,0) \approx [M^{1}(k_{1}) + H^{1}(0) - (H^{12}(0+0)] < 0.$

Incorporating the expression for $\Delta G(k_1,0)$ at $k_1 \approx 0$ into inequality (v) and rearranging, we get:

$$R_2(0) - C_2 - C_1(x, 0) - [H^{12}(0+0) - H^1(0)] > 0,$$
 (vi)

A.2 Necessary and Sufficient Conditions for a Market Governance form

In order for either firm to choose market governance (i.e., one firm is undertaking only one stage), market transaction must be the profit maximizing alternative for both the firms. Inequalities vii to x provide the necessary and sufficient conditions for a transaction to be organized within the market. Inequalities vii and viii simply state that the profit firm A could capture in undertaking stage one alone must at least be equal to the profit the firm could capture either by undertaking both the stages or by deploying the resources required for stage one in an alternative transaction, *ex-ante*. Inequalities ix and x offer analogous conditions for firm B.

$$\Pi_{a}^{m}(k_{1}, k_{2}) \ge \Pi_{a}^{n}(k_{1}, k_{2}), \tag{vii}$$

$$\Pi_a^{\ m}(k_1,k_2) \ge \Pi^1 \ge 0, \tag{viii}$$

$$\Pi_{b}^{m}(k_{1},k_{2}) \ge \Pi_{b}^{n}(k_{1},k_{2}), \qquad (ix)$$

$$\Pi_{b}^{\ m}(k_{1},k_{2}) \ge \Pi^{2} \ge 0, \tag{X}$$

Inequalities xi-xiv below result from substituting for profit expressions from the equations 1, 2, 3 and 4 into the inequalities vii-x above, and further simplifying them algebraically.

$$t_{2}(k_{2})*R_{2}(k_{2}) - M^{1}(k_{1}) - H^{1}(k_{1}) > R_{2}(k_{2}) - C_{2} - \gamma_{2}k_{2} - H^{12}(k_{1+}k_{2}) - C_{1}(x, k_{2}),$$
(xi)

$$R_{1}(k_{1}) - C_{1} - \gamma_{1}k_{1} - M^{1}(k_{1}) - H^{1}(k_{1}) + t_{2}(k_{2})* R_{2}(k_{2}) > \Pi^{1} \ge 0, \qquad (xii)$$

$$t_1(k_1) * R_1(k_1) - M^2(k_2) - H^2(k_2) > R_1(k_1) - C_1 - \gamma_1 k_1 - H^{12}(k_{1+}k_2) - C_2(x, k_1),$$
(xiii)

$$R_{2}(k_{2}) - C_{2} - \gamma_{2}k_{2} - M^{2}(k_{2}) - H^{2}(k_{2}) + t_{1}(k_{1}) * R_{1}(k_{1}) > \Pi^{2} \ge 0, \qquad (xiv)$$

It is noteworthy that extant TCE arguments and heuristic models focus on a single party in a transaction (Zajac & Olsen, 1993). Further, from the perspective in this paper, the extant TCE analysis of make or buy decision focuses on the single stage of a transaction (in the model, it would be stage two). Thus, only inequality xi that results from comparing firm A's potential profit in market exchange with firm A's potential profit in hierarchy is emphasized (Riordan & Williamson, 1985; Williamson, 1991). Inequality xii is implicitly assumed to have been met. Inequality xiii representing the possibility that firm B may organize the transaction in hierarchy (forward integrate) is implicitly ignored. With respect to inequality xiv, it is usually assumed that stage two employs common knowledge production technology, and partner B only needs to break even to participate in the exchange (Riordan & Williamson, 1985; Williamson, 1991). In other words, by assuming away some of the alternatives and the broader range of profits in the alternatives, the extant literature limits the scope of its analysis.

Market governance for transaction involving low asset specificity. Consistent with the characteristics of the transaction involving low asset specificity in both stages, i.e. for $k_1 \approx k_2 \approx 0$, standard TCE reasoning implies that: (1) there would be negligible specialization costs, i.e. $\gamma_1 k_1 \approx \gamma_2 k_2 \approx 0$; (2) both firms would face limited market transaction costs, i.e. $M^1(k_1) \approx M^2(k_2) \approx 0$; (3) either firm will incur non-trivial cost of hierarchy, i.e., $[H^{12}(0+0) - H^1(0,)] > 0$ and $[H^{12}(0+0) - H^2(0)] > 0$; and (4) either firm will face significant cost penalty due to scale diseconomies in hierarchy, i.e., $C_*(x, 0) > 0$. On incorporating these implications into inequalities xi-xiv, and algebraically simplifying them we get inequalities xv-xviii. Formally,

$$0 > R_2(0) - C_2 - [H^{12}(0+0) - H^1(0)] - C_1(x, 0),$$
 (xv)

$$R_1(0) - C_1 - H^1(0) > \Pi^1 \ge 0,$$
 (xvi)

$$0 > R_1(0) - C_1 - [H^{12}(0+0) - H^2(0)] - C_2(x, 0),$$
 (xvii)

$$R_2(0) - C_2 - H^2(0) > \Pi^2 \ge 0,$$
 (xviii)

Appendix B: Integrating TCE and RBV Explanations of a Firm's Boundary Choices

B.1 Necessary and Sufficient Conditions for Hierarchical Governance Form

We assume that a firm chooses a governance form that maximizes its expected profit. A firm chooses hierarchy (i.e. undertakes both stages 1 and 2), when expected profit in hierarchy for the firm is greater than the expected profits from participating in market transaction (i.e. undertaking only one of the stages) or deploying the resources in an alternative transaction, ex-ante. Formally, the inequalities (i) and (ii) below provide the necessary and sufficient conditions for firm A to opt for hierarchy. Inequality i simply states that the profit firm A could capture in hierarchy must at least be equal to the profit firm A could capture in market transaction undertaking stage one(while setting up the model, we arbitrarily assigned stage one to firm A in market exchange). Inequality ii states that the profit firm A could capture in hierarchy must at least be equal to the profit firm A could capture by potentially deploying the resources required for the focal transaction in an alternative transaction, ex-ante.

$$\Pi_{a}^{n}(k_{1},k_{2}) \ge \Pi_{a}^{m}(k_{1},k_{2}), \tag{i}$$

$$\Pi_{a}^{\ h}(k_{1},k_{2}) \ge \Pi^{1A} + \Pi^{2A} \ge 0, \tag{ii}$$

We substitute for $\Pi_a^{\ m}(k_1, k_2)$ and $\Pi_a^{\ h}(k_1, k_2)$ from the equations 1 and 2 in chapter three in the inequality (i) above. Further, the anticipated revenue derived from stage one(R₁(k₁)), cost of the resources for stage one (C_{1A}), and cost due to level of asset specificity in stage one($\gamma_1 k_1$), that appear on the both sides of the inequality cancel each other off. Thus, inequality (i) simplifies into the following:

$$R_{2}(k_{2}) - C_{2A} - \gamma_{2}k_{2} - H^{12}(k_{1+}k_{2}) - C_{1}(x, k_{2}) > t_{2}(k_{2}) * R_{2}(k_{2}) - M^{1}(k_{1}) - H^{1}(k_{1}),$$
(iii)

Similarly, below we re-state inequality (ii) after substituting for $\Pi_a^{\ h}(k_1, k_2)$:

$$\mathbf{R}_{1}(\mathbf{k}_{1}) - \mathbf{C}_{1A} - \gamma_{1}\mathbf{k}_{1} + \mathbf{R}_{2}(\mathbf{k}_{2}) - \mathbf{C}_{2A} - \gamma_{2}\mathbf{k}_{2} - \mathbf{H}^{12}(\mathbf{k}_{1+}\mathbf{k}_{2}) - \mathbf{C}_{1}(\mathbf{x},\mathbf{k}_{2}) > \Pi^{1} + \Pi^{2} \ge 0,$$
(iv)

B.2 Necessary and Sufficient Conditions for Market Governance Form

In order for either firm to choose market governance (.i.e., one firm is undertaking only one stage), market transaction must be the profit maximizing alternative for both the firms. Inequalities v to viii provide the necessary and sufficient conditions for a transaction to be organized within the market. Inequalities v and vi simply state that the profit firm A could capture in undertaking stage one alone must at least be equal to the profit the firm could capture either by undertaking both the stages or by deploying the resources required for stage one in an alternative transaction, ex-ante. Inequalities vii and viii offer analogous conditions for firm B.

$$\Pi_{a}^{\ m}(k_{1}, k_{2}) \ge \Pi_{a}^{\ n}(k_{1}, k_{2}), \tag{v}$$

$$\Pi_a^{\ m}(\mathbf{k}_1,\mathbf{k}_2) \ge \Pi^{1\mathbf{A}} \ge 0,\tag{vi}$$

$$\Pi_{b}^{m}(k_{1}, k_{2}) \ge \Pi_{b}^{h}(k_{1}, k_{2}), \qquad (vii)$$

$$\Pi_{b}^{m}(k_{1},k_{2}) \ge \Pi^{2B} \ge 0, \tag{viii}$$

Inequalities ix-xii below result from substituting for profit expressions from the equations 1, 2, 3 and 4 in chapter three into the inequalities v-viii above, and further simplifying them algebraically.

$$t_{2}(k_{2})*R_{2}(k_{2}) - M^{1}(k_{1}) - H^{1}(k_{1}) > R_{2}(k_{2}) - C_{2A} - \gamma_{2}k_{2} - H^{12}(k_{1+}k_{2}) - C_{1}(x, k_{2}),$$
(ix)

$$R_{1}(k_{1}) - C_{1A} - \gamma_{1}k_{1} - M^{1}(k_{1}) - H^{1}(k_{1}) + t_{2}(k_{2})^{*} R_{2}(k_{2}) > \Pi^{1} \ge 0, \qquad (x)$$

$$t_1(k_1) * R_1(k_1) - M^2(k_2) - H^2(k_2) > R_1(k_1) - C_{1B} - \gamma_1 k_1 - H^{12}(k_{1+}k_2) - C_2(x, k_1),$$
(xi)

$$R_2(k_2) - C_{2B} - \gamma_2 k_2 - M^2(k_2) - H^2(k_2) + t_1(k_1) * R_1(k_1) > \Pi^2 \ge 0, \tag{xii}$$

All inequalities ix-xii must hold simultaneously for market exchange to occur. It is noteworthy that both RBV and TCE extant arguments focus on a single party in a transaction (Zajac & Olsen, 1993). Thus, only inequality ix that results from comparing firm A's potential profit in market exchange with firm A's potential profit in hierarchy is emphasized (Barney, 1999, Riordan & Williamson, 1985; Williamson, 1991). Inequality x is implicitly assumed to have been met. Inequality xi representing the possibility that firm B may organize the transaction in hierarchy (forward integrate) is implicitly ignored. With respect to inequality xii, it is usually assumed that stage two employs common knowledge production technology, and partner B only needs to break even to participate in the exchange (Riordan & Williamson, 1985; Williamson, 1991). In other words, by assuming away some of the alternatives and the broader range of profits in the alternatives, the extant literature limits the scope of its analysis.

B.3 Necessary and Sufficient Conditions for Governance Forms for Unilateral Homogenous and Specific Transaction

Hierarchical governance form. In the unilateral homogenous and specific transaction firm A undertakes stage one with high asset specificity while stage two has low asset specificity, i.e., $k_2 \approx 0$. TCE assumptions for the transaction under consideration

would imply that: the stage two has insignificant risk of losses due to opportunism, i.e., $t_2(k_2) \approx 0$; stage two has no specialization cost, i.e., $\gamma_2 k_2 \approx 0$; if the scale of the transaction does not match with the efficient scale, there may be a cost penalty due to technical inefficiency in the hierarchy under the firm A, i.e., $C_1(x, 0) > 0$; and the difference in the organizing costs in the market and hierarchy, $\Delta G(k_1, k_2)$, is positive where $\Delta G(k_1, k_2) = [M^1(k_1) + H^1(k_1) - H^{12}(k_{1+}k_2)] > 0$. Consistent with TCE assumptions, $\Delta G(k_1, 0)$ increases in k_1 . Further, while B does not face cost disadvantages in accessing resources for stage one, firm A incurs higher cost than firm B in accessing resources for stage two, i.e., $C_{1A} = C_{1B}$ and $C_{2A} > C_{2B}$. Under these assumptions, inequality iii mentioned in appendix B.1 simplifies as follows:

$$R_2(0) - C_{2A} - C_1(x, 0) > -\Delta G(k_1, 0), \qquad (xiii)$$

Market governance form. As discussed in appendix B.2, inequalities ix-xii represent the necessary and sufficient conditions for a transaction to be organized in the market. Under the implication mentioned above for unilateral homogenous and specific transactions, inequalities ix-xii simply as follows:

$$-\Delta G(k_1,0) > R_2(0) - C_{2A} - C_1(x,0), \qquad (xiv)$$

$$R_{1}(k_{1}) - C_{1A} - \gamma_{1}k_{1} - M^{1}(k_{1}) - H^{1}(k_{1}) > \Pi^{1A} \ge 0, \qquad (xv)$$

$$t_1(k_1) * R_1(k_1) - H^2(0) > R_1(k_1) - C_{1B} - \gamma_1 k_1 - H^{12}(k_{1+}0) - C_2(x, k_1),$$
(xvi)

$$R_2(0) - C_{2B} - H^2(0) + t_1(k_1) * R_1(k_1) > \Pi^{2B} \ge 0, \qquad (xvii)$$

B.4 Types of Transactions

As indicated in the Figure 3 and argued in section 3.4, based on the levels of asset specificity in the stage, and heterogeneity across partners, resource enabling a stage can be classified into one of the four types. A transaction can be classified based on the combination of resources types in two stages that enable it. As there are four types of resources in either stage, 16 different types of transactions result. As argued below via following four points, out of these 16 transaction types, only 5 types of transactions provide unique economic context to examine the integrated effects of asset specificity and heterogeneity.

First, 4 types of transactions with only homogenous resources in both the stages do not provide the context for integrating the effects of asset specificity and heterogeneity.

Second, another 4 types of transactions that involve homogenous resource from firm B (either r_{21} , or r_{22} in the Figure 3) with heterogeneous resources of firm A (either r_{13} , or r_{14}) are economically analogous to the transactions that combine homogenous resources of the firm A (either r_{11} or, r_{12}) with heterogeneous resources of the firm B (either r_{23} , or r_{24}), and are redundant.

Ignoring the column that depicts homogenous resources of B eliminates the 8 transactions mentioned above.

Third, another 4 types of transactions involve heterogeneous and non-specific resource, r_{24} , from the stage two with each of the four different types of resources from the stage one. However, out of these four transactions two transactions that combine r_{24} with non-specific assets of stage one, r_{14} and r_{12} , do not provide the context that involves

high asset specificity. Further, the transaction that combines r_{24} with r_{13} is economically analogous to the transaction that combines r_{23} with r_{14} . Thus, out of these four transactions, only one transaction that involves r_{24} with r_{11} is of interest to us.

Finally, only 5 transactions— one that involves r_{24} with r_{11} and mentioned above, and the 4 transactions that involve the heterogeneous and asset specific resource, r_{23} , from the stage two with the four different types of resources from the stage one— offer unique economic context to study the integrated effects of asset specificity and heterogeneity.

Appendix C: Governance Capabilities and the Choice of Governance Form

C.1 Asymmetric Levels of Asset Specificity and Market Governance Form

Necessary and sufficient conditions for market governance. We assume that a firm chooses a governance form that maximizes its expected profit. In order for either firm to choose market governance (.i.e., one firm is undertaking only one stage), market transaction must be the profit maximizing alternative for both the firms. Inequalities i to iv provide the necessary and sufficient conditions for a transaction to be organized within the market. Inequalities i and ii simply state that the profit firm A could capture in undertaking stage one alone must at least be equal to the profit the firm could capture either by undertaking both the stages or by deploying the resources required for stage one in an alternative transaction, ex-ante. Inequalities iii and iv offer analogous conditions for firm B.

$$\Pi_{a}^{\ m}(k_{1}, k_{2}) \ge \Pi_{a}^{\ h}(k_{1}, k_{2}), \tag{i}$$

$$\Pi_a^{\ m}(\mathbf{k}_1, \mathbf{k}_2) \ge \Pi^{1\mathbf{A}} \ge 0,\tag{ii}$$

$$\Pi_{b}^{\ m}(k_{1}, k_{2}) \ge \Pi_{b}^{\ h}(k_{1}, k_{2}), \tag{iii}$$

$$\Pi_{b}^{m}(k_{1},k_{2}) \ge \Pi^{2B} \ge 0, \tag{iv}$$

Inequalities v-viii below result from substituting for profit expressions from the equations 1, 2, 3 and 4 presented in the section 4.2 into the inequalities i-iv above, and further simplifying them algebraically.

$$v_{B}^{*} * t_{2}(k_{2}) * R_{2}(k_{2}) - M_{A}^{1}(k_{1}) - H_{A}^{1}(k_{1}) > R_{2}(k_{2}) - C_{2A} - \gamma_{2}k_{2} - H_{A}^{12}(k_{1+}k_{2}) - C_{1}(x, k_{2}), \quad (v)$$

$$R_{1}(k_{1}) - C_{1A} - \gamma_{1}k_{1} - M^{1}_{A}(k_{1}) - H^{1}_{A}(k_{1}) + \nu^{m}_{B}*t_{2}(k_{2})*R_{2}(k_{2}) > \Pi^{1} \ge 0, \quad (vi)$$

$$v_{A}^{*} t_{1}(k_{1}) * R_{1}(k_{1}) - M_{B}^{2}(k_{2}) - H_{B}^{2}(k_{2}) > R_{1}(k_{1}) - C_{1B} - \gamma_{1}k_{1} - H_{B}^{12}(k_{1}+k_{2}) - C_{2}(x, k_{1}), \quad (vii)$$

$$R_{2}(k_{2}) - C_{2B} - \gamma_{2}k_{2} - M^{2}_{B}(k_{2}) - H^{2}_{B}(k_{2}) + \nu^{m}_{A} * t_{1}(k_{1}) * R_{1}(k_{1}) > \Pi^{2} \ge 0,$$
(viii)

All inequalities v-viii must hold simultaneously for market exchange to occur. It is noteworthy that both RBV and TCE extant arguments focus on a single party in a transaction (Zajac & Olsen, 1993). Thus, only inequality v that results from comparing firm A's potential profit in market exchange with firm A's potential profit in hierarchy is emphasized (Barney, 1999, Riordan & Williamson, 1985; Williamson, 1991). Inequality vi is implicitly assumed to have been met. Inequality vii representing the possibility that firm B may organize the transaction in hierarchy (forward integrate) is usually ignored. With respect to inequality viii, it is assumed that stage two employs common knowledge production technology, and partner B only needs to break even to participate in the exchange (Riordan & Williamson, 1985; Williamson, 1991). In other words, by assuming away some of the alternatives and the broader range of profits in the alternatives, the extant literature limits the scope of its analysis.

Market governance for transaction involving asymmetric level of asset specificity. In the model, transaction involving high asset specificity in stage one $(k_1 > 0)$, and low asset specificity in stage two $(k_2 \approx 0)$ represents a transaction with asymmetric level of asset specificity. Consistent with the characteristics of the transaction, the standard TCE reasoning implies that stage two involves negligible transaction specific investment $(\gamma_2 k_2 \approx 0)$. Subsequently, agent managing stage two faces limited market
transaction costs $(M_B^2(k_2) \approx 0)$, and negligible losses due to opportunism $(v_B^m * t_2(k_2) * R_2(k_2) \approx 0)$. However, there may be a cost penalty in organizing the transaction in the hierarchy if the scale of the transaction does not match with the efficient scale (C(x, k_2=0) > 0). Further, the difference in the organizing costs of market and hierarchy for firm A, $\Delta G_A(k_1, k_2)$ is positive where $\Delta G_A(k_1, k_2) = [M_A^1(k_1) + H_A^1(k_1) - H_A^{12}(k_1+k_2)]$. Consistent with TCE assumptions, $\Delta G_A(k_1, 0)$ increases in k₁. Given the characteristics of the transaction under consideration, inequalities v to viii above simplify as follows:

$$-\Delta G_{A}(k_{1},0) > R_{2}(0) - C_{2A} - C_{1}(x,0), \qquad (ix)$$

$$R_{1}(k_{1}) - C_{1A} - \gamma_{1}k_{1} - M^{1}_{A}(k_{1}) - H^{1}_{A}(k_{1}) > \Pi^{1} \ge 0, \qquad (x)$$

$$\nu^{m}{}_{A}*t_{1}(k_{1})*R_{1}(k_{1}) - \Delta G_{B}(k_{1}, 0) > R_{1}(k_{1}) - C_{1B} - \gamma_{1}k_{1} - C_{2}(x, k_{1}), \qquad (xi)$$

$$R_{2}(k_{2}) - C_{2B} - H^{2}_{B}(k_{2}) + v^{m}_{A} * t_{1}(k_{1}) * R_{1}(k_{1}) > \Pi^{2} \ge 0,$$
(xii)

Analogous expressions can be obtained for transaction involving high asset specificity in stage two ($k_2 > 0$), and low asset specificity in stage one ($k_1 \approx 0$).

C.2: Low Levels of Asset Specificity and Hierarchical Governance.

Necessary and sufficient conditions for hierarchical governance. We assume that a firm chooses a governance form that maximizes its expected profit. A firm chooses hierarchy (i.e. undertakes both stages 1 and 2), when expected profit in hierarchy for the firm is greater than the expected profits from participating in market transaction (i.e. undertaking only one of the stages) or deploying the resources in an alternative transaction, ex-ante. Formally, the inequalities (xiii) and (xiv) below provide the necessary and sufficient conditions for firm A to opt for hierarchy. Inequality xiii simply states that the profit firm A could capture in hierarchy must at least be equal to the profit firm A could capture in market transaction undertaking stage one. Inequality xiv states that the profit firm A could capture in hierarchy must at least be equal to the profit firm A could capture in hierarchy must at least be equal to the profit firm A could capture by potentially deploying the resources required for the focal transaction in an alternative transaction, ex-ante.

$$\Pi_{a}^{h}(k_{1}, k_{2}) \ge \Pi_{a}^{m}(k_{1}, k_{2}), \tag{xiii}$$

$$\Pi_{a}^{\ h}(k_{1}, k_{2}) \ge \Pi^{1A} + \Pi^{2A} \ge 0, \tag{xiv}$$

We substitute for $\Pi_a^{\ m}(k_1, k_2)$ and $\Pi_a^{\ h}(k_1, k_2)$ from the equations 1 and 2 in the section 4.2 into inequality (xiii) above. Further, the anticipated revenue derived from stage one(R₁(k₁)), cost of the resources for stage one (C_{1A}), and cost due to level of asset specificity in stage one($\gamma_1 k_1$), that appear on the both sides of the inequality cancel each other off. Thus, inequality (xiii) simplifies into the following:

$$R_{2}(k_{2}) - C_{2A} - \gamma_{2}k_{2} - H^{12}{}_{A}(k_{1+}k_{2}) - C_{1}(x, k_{2}) > \nu^{m}{}_{B}*t_{2}(k_{2})*R_{2}(k_{2}) - M^{1}{}_{A}(k_{1}) - H^{1}(k_{1}), \quad (xv)$$

Similarly, below we re-state inequality (xiv) after substituting for $\Pi_a^{h}(k_1, k_2)$:

$$R_{1}(k_{1}) - C_{1A} - \gamma_{1}k_{1} + R_{2}(k_{2}) - C_{2A} - \gamma_{2}k_{2} - H^{12}{}_{A}(k_{1+}k_{2}) - C_{1}(x, k_{2}) > \Pi^{1A} + \Pi^{2A} \ge 0, \quad (xvi)$$

Hierarchical governance for transaction involving low levels of asset specificity. In the model, transaction involving low levels of asset specificity in either stage would be characterized by $k_1 \approx 0$, and $k_2 \approx 0$. Consistent with the characteristics of the transaction, the standard TCE reasoning implies that either stage would have negligible transaction specific investment ($\gamma_1 k_1 \approx 0$ and $\gamma_2 k_2 \approx 0$). Subsequently, agents face limited market transaction costs ($M_A^1(k_1) \approx 0$ and $M_B^2(k_2) \approx 0$), and negligible losses due to opportunism $(v^m_A * t_1(k_1) * R_1(k_1) \approx 0 \text{ and } v^m_B * t_2(k_2) * R_2(k_2) \approx 0)$. However, given low asset specificity in adjacent stage both firms would face cost penalty in organizing the transaction in the hierarchy if the scale of the transaction does not match with the efficient scale (C(x, k_1=0) > 0 and C(x, k_2=0) > 0). Further, either firm would incur an additional hierarchical costs from managing both the stages within hierarchy { v^h_A * ($H^{12}_A(0+0) - H^1_A(0)$) > 0 and v^h_B * ($H^{12}_B(0+0) - H^2_B(0)$) > 0]. Given the characteristics of the transaction under consideration, inequalities xv to xvi above simplify as follows:

$$R_{2}(k_{2}) - C_{2A} - \nu^{h}{}_{A}^{*}(H^{12}{}_{A}(k_{1+}k_{2}) - H^{1}(k_{1})) - C_{1}(x, k_{2}) > 0, \qquad (xvii)$$

$$R_{1}(k_{1}) - C_{1A} + R_{2}(k_{2}) - C_{2A} - \nu_{A}^{h} * H^{12}{}_{A}(k_{1+}k_{2}) - C_{1}(x, k_{2}) > \Pi^{1A} + \Pi^{2A} \ge 0,$$
(xviii)

Analogous expressions can be obtained for firm B organizing transaction with low asset specificity via hierarchy.