Alliance Re-formation: Uncertainty, Inexperience, Complexity and Termination
Experience in the Thoroughbred Horse Industry, 2005-2010

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In *Nichomachean Ethics,* Aristotle once questioned, 'what is the use of riches and power without friends?' My dissertation reflects the culmination of the collective efforts of many people. For me to get through my dissertation it involved the support and beneficence of many friends.

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My husband Robert Kamal has encouraged and supported every possible dream or idea I have had. Our first year of marriage coincided with my first year in the PhD program. Needless to say, it was not an ideal year for newlyweds. Rob was in Canada and I was experiencing the 'shock and awe' of the PhD program. Despite all of this, Rob arrived in Minnesota at the beginning of my second year and has been at my side ever since. Rob has witnessed every ounce of my PhD journey. He has worked late in my office so that I could work late without missing his companionship. Rob has enviable patience when alliances, Kentucky and the Thoroughbred industry consume my thoughts and attention. I only hope that I can enable his dreams in the same way as he has done for me.

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Horse Industry

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DEDICATION

This dissertation is dedicated to my husband Robert Kamal, without his unconditional love and support none of this would be possible. I also dedicate my work in memory of Kaiak, 1990-2010, the only horse I had the privilege of calling my own.

ABSTRACT

My dissertation investigates the effects of alliance termination conditions on alliance re-formation by the former partners. While the existing literature assumes that an alliance forms after termination in the same way as it formed initially, I treat termination as the beginning of a process rather than as an independent event. I argue that alliance re-formation is distinct from alliance formation due to the attributions the former partners develop concerning their prior termination. Alliance terminations are often ambiguous and subject to multiple interpretations. I identify typical alliance termination antecedents, such as primary uncertainty, task inexperience and complexity, as important conditions under which the termination occurs that counter intuitively facilitate alliance re-formation. These factors frame the termination as a positive attribution, based upon incidents which are exogenous, uncontrollable and rare. Further, I find greater alliance termination experience enhances alliance re-formation, allowing firms to adjust expectations from alliance terminations. I test these ideas on a longitudinal sample of 2,256 terminated alliances that include alliance re-formations in the Thoroughbred horse industry, where alliance partners breed and co-own horses to sell at auction. Using this unique data set to account for the fit and the performance of the terminated alliances, I find support for my hypotheses for primary uncertainty and termination experience. My dissertation makes a number of important theoretical contributions by showing that alliance re-formation has a set of antecedents distinct from factors informing initial formation, and that termination experience is an important antecedent to the trust and the re-creation of trust. These findings have valuable practical implications for strategic management and organizational practitioners.

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1.0 INTRODUCTION AND STATEMENT OF RESEARCH QUESTION

The literature on alliances has looked at alliance creation and alliance termination but not at what happens to a given relationship after the termination of an alliance. It is assumed that the former partners pursue alternate strategies and do not re-form their alliance. At first glance, the antecedents to alliance formation and alliance re-formation seem identical. Prior literature on alliance formation assumes either that partners create an alliance each time for first time (e.g. Gulati, 1995; Rothaermel and Boeker, 2008) or that prior alliances between the same partners are only beneficial, that they can move seamlessly from one alliance with each other to the next (e.g. Gulati and Gargiulo, 1999). However, the interactions and experience, particularly at termination, between the partners may alter the antecedents for a re-formation (e.g. Arino and de la Torre, 2005; Faems, Janssens, Madhok, and Van Looy 2008). Perhaps even more compelling, the decision to terminate an alliance and the decision to reform one are not always driven by opposite reasons—in some cases, the termination itself is shaped by attributions and experiences that make possible re-formation of an alliance.

An alliance is a cooperative agreement or relationship in which organizations share resources such as capital, technology or assets for the execution of common goals (Gulati, 1995). However, alliances often become unstable, with the result that organizations are unable to capitalize on their benefits. Research suggests that premature

alliance dissolution[1] is common, and failure rate estimates range from 50 to 70 percent (Slowinski and Sagal, 2003). While existing scholarship addresses alliance creation (e.g., Walker, Kogut and Shan, 1997), and scholars have recently turned their attention to the dynamics of alliance termination (e.g., Reuer and Zollo, 2005), scholarship to date has largely ignored the consequences of alliance termination for an organization's future partnering prospects in general or the prospect of re-forming the past alliance in particular.

Almost no scholarship so far has examined alliance re-formation. A single qualitative case study of an R&D alliance for inkjet printers by Faems, et al. (2008) found that the alliance partners had used what they learned from their first failed alliance to re-form a new alliance. Without the knowledge the partners gained of each other leading up to and during the termination of their first alliance, they could not have achieved their later success in a re-formed alliance.

Re-formation occurs when the same partners enter into an alliance after a previous alliance between them has been terminated. A key distinction is that the partners have clearly terminated their relationship by a lapse in cooperation, and have signaled the termination to other firms. It also follows that re-formation involves more than a recurring alliance (e.g., Gulati and Gargiulo, 1999) or re-negotiation of the alliance tasks (e.g., moving from a research and development to a marketing alliance). Economic

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[1] While not all alliance terminations are failures to the parties involved, it is not always clear what truly happened to cause the termination. Organizations have strong incentives to spin the termination in a positive manner in order to protect their reputations. Hence, the actual failure rate of alliances could be higher than reported.

incentives may compel an organization to return to a past partner (Faems et al., 2008): In a finite universe of partners with the appropriate strategic and resource fit, firms may heed the dictum, "Better the devil you know than the devil you don't."

As alliance partners interact with each other, they become familiar with and embedded with one another (Ring and Van de Ven, 1994; Gulati and Gargiulo, 1999), and the knowledge thus gained suggests that the antecedents for the re-formation of an alliance between them, in the event of termination, are not directly comparable to the antecedents of an original formation. The former partners may have developed shared routines and tacit knowledge of how to interact with each other so that they are more efficient at carrying out shared tasks than they would be in an entirely new relationship. The dynamic unfolding in their partnering decisions is more complex and involved than the single-shot game that occurs at an alliance formation.

The alliance termination may be particularly informative for the alliance re-formation. Alliances may terminate on such poor terms that the partners are unwilling to re-form in the future. For instance, alliances suffering from partners' repeated opportunism brimming of "deceit with guile" (e.g. Williamson, 1975) or from miscalculations so frequent that they call into question one partner's integrity and competence (e.g. Ferrin, Kim, Cooper and Dirks, 2007) may be detrimental to the prospects of re-formation. The termination may be the last moment of contact between the alliance partners and subject to recency bias. Further, any potentially negative encounters during the process of termination may also contribute to a negativity bias

(Kahneman and Tversky, 1984). Yet, even these biases at the point of alliance termination may be ambiguous and complex. Even if the underlying reason for termination is clear, the partners may face social or monetary costs to uncover such causes. While partners may ascribe particular causes publicly, the attributions for the termination may diverge privately. The attributions the partners form surrounding the termination may affect the partners' willingness to commit with each other in a subsequent alliance.

To resolve the gap of contrasting antecedents of an alliance, I look at how the antecedents differ based on the attributions the partners make for the prior termination. I ask: *After an alliance terminates, under what conditions surrounding the termination do the same two organizations subsequently re-form their alliance?*

I develop a theoretical framework according to which previously partnered firms may re-form their alliance despite seemingly hazardous causes or conditions of alliance termination. Existing scholarship suggests that certain conditions affect the survival of an alliance, leading to alliance termination. These adverse conditions include primary uncertainty (Pfeffer and Nowak, 1976), task inexperience (Burt, 2000), and complexity (Park and Ungson, 2001). Building on this foundation, I propose that these conditions associated with the termination, coupled with general termination experience, actually enable alliance re-formation. I account for important drivers of alliance formation and termination, such as alliance performance and complementarity.

My theoretical framework develops four key propositions to explain why the hazards for alliance termination may increase the likelihood of alliance re-formation. I link attribution theory which suggests that circumstances that are exogenous, rare, or uncontrollable to repair trust (Tomlinson and Mayer, 2009) to alliance termination conditions that involve primary uncertainty, task inexperience, complexity or accumulated alliance terminations to illustrate why these hazards may lead to beneficial attributions and experiences. I argue that alliances that terminate under greater primary uncertainty are more likely to re-form because primary uncertainty is driven by exogenous factors. In contrast, task inexperience, which also leads to greater alliance re-formation, does so because of its rarity. Task inexperience is an excuse that is plausible once, but repeated occurrences of the attribution will begin to suggest that the partner is indeed the problem. If the attribution is used sparingly, indicative of rarity, however, partners are more likely to re-form. Complexity, like task inexperience, is an internal attribution, but one that emphasizes the uncontrollability of the alliance partners' circumstances. An alliance may become so scope inefficient that partners are unable to maintain it. Again, this attribution draws attention away from the culpability or deliberate actions of either partner, so the alliance partners are more likely to re-form in the future.

The last hypothesis diverges from attribution theory and instead emphasizes adjusting expectations through experience (e.g. March, Sproull and Tamuz, 2001). While general termination experience could suggest alliance instability for the partners, I argue that termination experiences across alliances may help the alliance partners adjust their

expectations. Former alliance partners are more likely to re-form an alliance with more realistic expectations.

I test this perspective with a sample of 2,256 alliances terminated in the Thoroughbred horse industry from 2005 to 2010. While the industry context is new to the alliance literature, it offers valuable empirical properties due to the availability of project level details that are not available in more commonly cited alliance-driven industries, such as airlines, biotechnology and telecommunications. Alliances are a strategy frequently used by firms in the horse industry to spread risk and access complementary resources such as genetics. Consistent with my overarching theory, in which attributions shape subsequent alliance re-formation, alliances which terminate under conditions of greater primary uncertainty are more likely to re-form. However, I do not find support for either task inexperience or complexity increasing the likelihood of alliance re-formation. Lastly, termination experience does increase the likelihood of alliance re-formation, accounting for the performance and fit of the partnering firms.

While existing scholarship typically characterizes termination as the end of a process (e.g., Reuer and Zollo, 2005; Polidoro, Ahuja and Mitchell, 2011), my research takes termination as a starting point and argues that it can provide insights into dynamic alliance re-formation processes. Furthermore, by integrating theory on alliance termination, experience related to failure, and trust repair, my research reveals counterintuitive reasons that alliances are able to re-form despite previous alliance

terminations. Relationship failures may be overcome by the use of attributions that divert attention away from internal failures leading up to prior terminations.

The remaining chapters follow the following sequence: Chapter Two reviews the pertinent literature associated with the theoretical framework developed in this dissertation and formulates the theoretical arguments and the hypotheses by grounding my reasoning in extant literature and case studies; Chapter Three describes the empirical context, data, and econometric models used for the dissertation's analysis; and the concluding chapter provides a discussion of the theoretical and practical importance of the dissertation.

2.0 THEORETICAL FRAMEWORK

2.1 Literature Review

I draw upon previous work on alliance formation and the conditions of termination to develop a theory for subsequent alliance re-formation. I provide below an overview of the literature on alliance formation and alliance termination antecedents. I begin by using the present literature on alliance formation and alliance termination to ground my argument for alliance re-formation as a key outcome. Attributions associated with the termination and the experience from other alliance terminations provide a unique and distinct set of antecedents. Moreover, work on repeated ties suggests that former alliance partners can be motivated to re-form.[2] However, I will argue that in instances of alliance re-formation, the partners must first manage the attribution for the alliance termination.

2.1.1 Alliance Formation

Alliance formation has received extensive attention in the literature. A strategic alliances is defined as "any voluntarily initiated interfirm cooperative agreement that involves exchange sharing, or codevelopment, and it can include contributions of partners of capital, technology, or firm-specific assets" (Gulati, 1995, p. 621). Formation of alliances results for reasons of resource sharing (Harrigan, 1986; Contractor and Lorange, 1988), transaction cost (Williamson, 1985), interdependence (Pfeffer and Nowak, 1976), knowledge transfer (Kogut, 1988; Khanna Gulati and Nohria, 1994), positional (Porter

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[2] In a similar line of thought to the endowment effect, once a relationship is absent it becomes more valuable. Evidence has supported this in the divorce literature (e.g., Kitson, 1982)

and Fuller, 1986) and social structure (Gulati, 1995). Potential alliance partners may form an alliance relationship to execute tasks that neither firm is able to perform on its own. Typically, firms form alliances with other firms that enhance or reinforce the firms' existing strategic positions (e.g. Rothaermel and Boeker, 2007).

Alliance formation decisions are treated as a single-shot game in which two firms form a relationship based on their desirability as partners given an entire universe of options. Antecedents to alliance formation such as uncertainty, task inexperience, and prior alliance experience change when the same alliance partners encounter re-formation. At high levels of uncertainty, firms may avoid forming alliances in favor of internalizing the transaction in the hope of reducing uncertainty and controlling the environment (e.g. Williamson, 1985). Similarly, inexperienced firms may desire alliance partners to improve their position and transfer knowledge, but the very same inexperience can make it difficult to attract suitable partners. Firms already endowed with task experience and resources are more likely to form beneficial alliances (Powell, Koput and Smith-Doerr, 1996; Gulati, 1995; Ozcan and Eisenhardt, 2009). Further, firms with prior experience forming alliances are also more likely to form other alliances (Gulati, 1995; Gulati, 1999).

2.1.2 Alliance Maintenance

The existing literature on alliance maintenance and termination (e.g., Polidoro, Ahuja and Mitchell, 2011) suggests that ongoing alliances do not share the same antecedents as initial formation. The partners' rationale for maintaining a relationship

differs from their rationale for the initial alliance formation. The partners may establish an alliance for particular instrumental reasons, but as they collaborate, the alliance partners will adjust their expectations about their ability to achieve their goals. An alliance may also form collaboratively, but such joint interactions change over time; in some cases the information revealed between the partners may be inconsistent with the understanding at formation, causing the alliance to terminate.

Ideally, as they interact with each other, two firms will develop shared processes, beliefs, and trust which enable their alliance to continue (Ring and Van de Ven, 1994; Doz, 1996). Ring and Van de Ven (1994) emphasize the role of formal (e.g., negotiation, roles, and legal contracts) and informal (sensemaking, interpersonal interaction, and psychological contracts) processes which co-evolve as the alliance relationship grows after formation. These formal and informal processes provide stability and reinforce the partners' commitment to the alliance. Importantly, the continuation of the alliance relies on the partners' ability to adjust expectations and learn throughout the alliance (Doz, 1996). Alliance partners face unmet expectations from the initial formation and frictions during the execution of the alliance. The partners' ability to learn and adjust positively reinforces their willingness to maintain the alliance. Indeed, while there appears at first glance to be a similar set of antecedents for alliance formation and for alliance maintenance, these antecedents diverge as the partners interact and learn about each other.

Work on prior partner-specific experience on alliance formation has assumed that the partners move between alliances by maintaining a relationship despite the ending of a contract. Greater prior partner-specific experience increases alliance re-formation. Partners who have dealt with each other in the past are more likely to deal with each other in the future (Gulati, 1995). However, Chung et al.'s study (2000) of investment banking syndicates finds an inverted-U shaped relationship between prior experience and formation. Partner-specific experiences at high levels are less likely to lead to alliance re-formation. An unusually high level of partner-specific experience may suggest an overly turbulent relationship, or a relationship that has exhausted its potential opportunities. The effect of prior partner experience on subsequent ties is difficult to unravel without understanding the context of the partners' previous relationships.

In maintaining alliance relationships, partner-specific experience yields mixed findings. In particular, Gulati, Lavie and Singh (2009) find that partner-specific experience increases stock market returns following joint venture announcements, especially when firms have larger financial and technological resources. Such performance benefits of prior partner-specific experience suggest that partners would have an incentive to continue their alliance viewed favorably by stockholders. But in studies of alliance termination (the hazard of ending an ongoing alliance), partner-specific experience maintains an indirect relationship. Reuer and Zollo (2005) find that partner-specific experience was non-significant as an antecedent to alliance termination severity. On further analysis they found that partner-specific experience mitigated the

severity of alliance termination for equity-based alliances. Firms that lack such partner-specific experience may benefit from additional governance mechanisms such as equity-based forms of alliances to gain cooperation. Polidoro et al. (2011) encountered the same pattern of results in their study of unilateral alliance terminations. Partner-specific experience was non-significant as a direct cause but was significant when considered along with the partners' network position. Taken together, the mixed findings regarding partner-specific experience suggest that alliance partners may reconsider their past encounters particularly at the point of termination.

2.1.3 Alliance Termination

When alliance partners terminate their alliance, the partners' willingness to leave is also likely to deviate from initial formation and to be shaped by the type of termination. Such a dynamic suggests that the former partners' view of the termination may also change when the partners reflect on the termination. Partners must ascribe causes to termination which may not be easy to identify. Alliance terminations are often subject to multiple interpretations. Furthermore, even in cases where the primary reasons for the alliance termination is clear, there may be a significant financial or social cost to the former partners in publicly citing these reasons. As a result, former alliance partners may spend considerable time formulating an attribution for the alliance termination.

Termination is typically defined as the end of an activity. The verb "to terminate," as defined by the Oxford English Dictionary, means "to bring to an end." The definition of alliance termination used in this study is the cessation of activities associated with the

objectives of a relationship between two or more parties. Endings can result from different forces such as changes in the external environment or result from positive (e.g., goal achievement) or negative (e.g., partner malfeasance) circumstances.

The literature on alliance termination thus far has been directed at explaining the antecedents to termination (e.g., Rowley, Greve, Rao, Baum and Shipilov, 2005; Nakamura, Shaver and Yeung, 1996) and its severity (Reuer and Zollo, 2005; Polidoro et al., 2011). Reuer and Zollo (2005) study termination severity in research and development alliances, finding that greater complexity of an alliance increases the severity of the alliance termination. Similarly, in a study of exits from Canadian investment bank cliques, Rowley et al. (2005) find that complementarity and inequality hastened terminations from the cliques, while the more similar the members' roles, the less likely such terminations. Nakamura et al. (1996) study US-Japanese joint ventures and show that there is an inflection point to benefits of similarity—when there is too much of an overlap, alliances are more likely to terminate. In the context of unilateral defection, Polidoro et al. (2011) replicated the finding that asymmetry in structure hastened alliance termination, but also found that the cohesion of the alliance partners would dampen such an effect. They also added the role of other common alliance partners whose multi-partner defections would increase the hazard of alliance termination. In sum, the extant literature on alliance terminations suggests that alliance partners who are either too similar or too different may be more likely to terminate an alliance. Further, alliances which are complex in scope are also more likely to terminate.

In terms of alliance dissolution, an often-cited reason is the failure to fulfill the expected outcomes of the relationship, resulting in a lapse of motivation and commitment to the relationship (Ring and Van de Ven, 1994). However, the partners' understanding of the extent to which the alliance is a failure or success is likely to vary based on the information available to the partners at the point of termination. Furthermore, the view of such conditions for termination may change after the termination has happened because of the partners' learning and efforts to frame the reasons for the termination. Consequently, termination must also be qualified by the circumstances under which the parties terminate. Moreover, the former partners always have compelling incentives to continue the prior relationship. Former partners face search costs (e.g., money and time used to gain information to seek other alternatives) and become more and more embedded with each other as they interact throughout the alliance. Literature on repeated ties (Gulati, 1995; Gulati and Gargiulo, 1999) assumes that former partners move from one alliance to the next with little disruption. The past is often considered to be a predictor of future behavior. For example, Ring and Van de Ven (1994) propose that as the length of the cooperative relationship increases, the alliance partners will develop more embedded routines and organizational practices that make future cooperation more likely. Research on repeated alliances finds the passage of time spent in an alliance(s) reflects a positive accumulation of experience between the alliance partners (Gulati and Gargiulo, 1999). The past history of the relationship is often considered as the years the partners have cooperated in any form of alliance or as a count of alliances between the

partners (Gulati and Gargiulo, 1999; Zollo, Reuer and Singh, 2002). Existing alliances may terminate or continue. In contrast, recurring alliances repeat consecutively, continuing without the disruption of a termination (re-formation, highlighted in Figure 1, can only occur for a terminated alliance).

Yet, recurring alliances are unlikely to propel the former partners into formulating attributions and learning in the same way as alliances that experience termination. In a case study of a research and development alliance, Faems et al. (2008) find that the termination of the initial alliance motivated the former partners to learn. They learned by engaging in sense-making on prior failures, which paved the way for success in the subsequent alliance between the same partners. Both alliance partners reflected on the previous alliance and made proactive changes in structure and strategy. In another case study, Arino and de la Torre (1998) uncover alliance partners who used their learning from frictions within the alliance to save and continue it. However, unilateral action by the one of the partners still leads to a termination. Thus, it is not clear that the partners were able to fully improve upon their earlier mistakes.

2.1.4 Attribution Theory and Alliance Termination

Among partners who develop attributions to explain the causes of their termination, not all causes will be detrimental to trust and cooperation in future exchanges. I use the literature on relationship repair drawing on attribution theory to explain why partners' view of the antecedents to termination may enable subsequent alliance re-formation. Scholars writing on relationship repair argue that alliance partners

are motivated to shape attributions to explain why the alliance terminated and whether the termination affects the trustworthiness of a particular partner (Dirks, Lewicki and Zaheer, 2009). Based upon the attribution, the partners' reason for alliance termination may also be their reason for re-formation.

The alliance partners interpret their interaction, and these interpretations shape the partners' psychological contracts (Van de Ven and Walker, 1984; Ring and Van de Ven, 1994). Interpretive approaches claim meaning is derived from the actors' efforts to understand an interaction (e.g. Blumer, 1969; Berger and Luckmann, 1966; Weick, 1995). The underlying mechanism for change is a dialectical force, in which either conflict or dissonance spurs the actors to interpret a negative or ambiguous interaction (Weiner 1985). One facet of these interpretative approaches occurs when actors attempt to ascribe causality for an event (White, 1959; Kelley, 1973). In the effort to answer *why* a negative or ambiguous event happened, the actors must assess whether it was caused by the alliance partners or by the situation. The basic tenet of attribution theory claims that actors will ascribe causality to factors actually caused by the actor or to factors external to the actor (Heider, 1982; Rotter 1966).

However, empirical findings provide conflicting support for the basic internal (actor) versus external (situation) causal attributions (Ross and Nisbett, 1991; Kim, Dirks, Cooper and Ferrin, 2006). Scholars such as Weiner et al. (1971) argue an additional dimension of attributions is needed, since of both internal and external attributions, some are stable (e.g. trait) while others fluctuate (e.g. learning). For instance, an actor might

claim inclement weather as an appropriate external attribution for a delay. However, others will only accept the external attribution if the actor could not have predicted (forewarned the others) or prepared (taken necessary precautions) for the weather in advance. If the actor was expected to take precautions and did not do so, then the actor is culpable for the delay.

In order to resolve attribution theory's conflicting empirical results, Weiner (1985) identified an additional two dimensions to the classic internal-versus-external framework. These two other attributions can occur when the source of the incident is either *uncontrollable* or *rare*. Tomlinson and Mayer (2009) bring Weiner's (1985) theory to the context of relationship repair to explain instances in which parties may be able to reframe an incident in order to avoid blaming the relationship. *Exogenous* attributions are identified by the locus of causality, i.e., according to whether the incident is caused by a force outside of the relationship or by the focal partners. *Uncontrollable* attributions refer to the lack of controllability either party has over an event. *Rare* attributions consider the instability of the behavior, implying the incident is unlikely to repeat. Thus, a valid reason for terminating an alliance such as a change in the external environment, a known hazard of alliance terminations, may not damage the trust between the alliance partners. Attributions occur in a dynamic setting and terminated partners may interpret a variety of causes for the termination. A static approach of examining the antecedents to the alliance termination may provide an accurate view of the alliance partners' reason for terminating at the time they do so. But after the termination, the alliance partners' view of the

termination may change, so a dynamic view of termination and re-formation is necessary to understand learning between the alliance partners. For example, prior work on alliance termination uses media reports to measure the gravity of the termination (e.g., Polidoro et al, 2011). While the prior partners may publicly announce a justification for the termination, the private attributions invoked by the former partners may be complex. Media reports of the termination may capture the former alliance partners' view at the point of termination, but are unable to capture whether other conditions surrounding the termination will influence the partners' view of the termination in the future. A dynamic approach to relationship repair needs to include the full set of conditions surrounding the termination as well as considering the way they may be interpreted post-termination. Consistent with this approach, I investigate factors which may motivate the termination itself, but also which may enable the partners to view the prior termination differently in the lead up to re-formation.

2.2 Hypotheses

I develop a theoretical framework based on the premise that the antecedents for re-formation, and consequently their willingness to re-form the alliance, are based on the partners' attributions of the termination. I view a common set of alliance termination antecedents through the lens of attribution theory using Weiner's (1985) conception of locus of causality, controllability and stability. Alliance antecedents such as primary uncertainty, task inexperience, alliance complexity, and alliance termination experience may mitigate negative effects from the termination. Alliances terminate for a variety of

reasons,[3] and I treat these reasons as conditions under which termination takes place. Figure 2 summarizes the theoretical framework and hypotheses.

Case studies by Arino and de la Torre (1998) and Faems et al. (2008) suggest that alliance termination plays an important role in altering the former partners' views and routines related to alliances. Other sources of experience beyond the focal dyad may include the partners' other termination experiences. For example, more general sources of experience can be particularly valuable in times of failure or accidents (e.g., Ingram and Baum, 1997; Baum and Ingram, 1998; Haunschild and Miner, 1997).

I consider both the conditions leading up to the termination and the experience motivated by the termination, controlling for the past history of the partners and other possible causes for termination, and argue that the antecedents for termination which shape alliance re-formation are largely determined by the partners' ability (or inability) to identify and ascribe causes to the strategic actions. Potential causes for the termination may include: changes in the external environment, such as macroeconomic or technological conditions (e.g., Pfeffer and Nowak, 1976), inexperience (e.g., Burt, 2000), and the complexity of the alliance (Park and Ungson, 2001).

Alliance partners are motivated to shape attributions through a sense-making process of determining whether a failure in the alliance occurred to trigger the termination, and, if so, whether it affects the trustworthiness of a particular partner (Dirks, Lewicki and Zaheer, 2009). Theorizing on trust repair highlights three dimensions

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[3] Other primary reasons for alliance termination, such as competitive uncertainty, performance failures, and misfit, which are not directly related to my hypotheses, are used as controls in the empirical analysis.

in which parties may be able to attribute a negative incident away from blaming a particular partner: when the source of the incident is *exogenous*, caused by a force outside of the relationship; *uncontrollable*, taking place beyond the control either party has over the event; or *rare*, caused by behavior that is unlikely to repeat (Tomlinson and Mayer, 2009). These three dimensions operate independently (Weiner, 1985). In contrast, incidents which are internal to the relationship are controllable, or which repeat is likely to direct blame at a transgression within the relationship. For example, the termination of an alliance in which the partners repeatedly under-invest in the alliance activities and pursue similar avenues of product development that cannibalize the alliance's activities would place have to place blame for the termination squarely on the failure of the alliance partners. In order to explain alliance re-formation, I bring these causal attribution dimensions to bear on the antecedents of alliance termination.

Primary uncertainty is derived from exogenous sources, such as changes in the external environment, e.g., market preferences, technology, or regulation (Sutcliffe and Zaheer, 1998). Primary uncertainty is also an antecedent to alliance termination. Firms adjust their strategies and relationships to adapt as the market environment shifts (Pfeffer and Nowak, 1976). However, primary uncertainty may be beneficial in instances of alliance re-formation. Williamson (1985) argues that strategic behavior related to primary uncertainty may be viewed as "innocent," a necessary means of survival which all firms must undertake. Primary uncertainty also provides a cause for termination which is

exogenous, uncontrollable, and rare and alliance partners who terminate due to exogenous reasons are less likely to attribute the causes of the termination to the partner.

I argue that causes such as primary uncertainty shift the attribution away from the alliance partners for three reasons. First, as already shown, primary uncertainty is exogenous in nature, and so the locus of causality cannot be placed on the alliance partners. An industry-wide event naturally relieves any two given partners from causal responsibility. Second, primary uncertainty is uncontrollable by the partners. The partners are not expected to have control over changes in the external environment. Third, events which create primary uncertainty are rare. Primary uncertainty represents an insufficient amount of information, unlike secondary uncertainty which refers to a more general longstanding uncertainty (Sutcliffe and Zaheer, 1998). As a result, neither party has to engage in extensive face-saving to justify the causes of the termination or incur any penalties to restore the relationship with the past partner. Moreover, the exogenous cause of the termination implies that external information to verify the cause is widespread, and therefore more readily available than internal partner-specific information, which is often private, would be. When organizations attribute the termination of an alliance to external conditions—such as changes in the market environment—fewer resources must be mobilized to re-form the relationship because the cause of the termination is well known throughout the industry. As the exogenous reason for the termination dissipates, the partners, recognizing that neither party was culpable for the prior termination, become free to re-form their alliance. If the alliance terminated due to a shift in market

conditions, it may be that the underlying motivation for the alliance still exists but was simply executed at an inopportune time. Thus, the alliance partners are more likely to re-form the relationship when the prior alliance terminated under conditions of greater primary uncertainty. Therefore, I suggest:

Hypothesis 1: Termination under conditions of <u>greater</u> primary uncertainty <u>increases</u> the likelihood that the past partners will re-form the alliance relationship.

In contrast to primary uncertainty, which is exogenous, lack of experience, the next antecedent, is internal to the alliance relationship in terms of causality. Lack of experience is known to increase the likelihood of alliance termination (Reuer and Zollo, 2005). However, I argue that task inexperience may actually provide a valuable foundation for the reinstatement of an alliance. Task inexperience,[4] in an alliance context, refers to the partners' skill at performing a task, such as gaining FDA approval for a pharmaceutical (a task many firms in the pharmaceutical industry must carry out). Nascent firms may be particularly susceptible to alliance termination due to the liability of newness (Stinchcombe, 1965); however, inexperience may actually be beneficial for instances of alliance re-formation. Task inexperience places the locus of causality internally to the alliance partners. But Lewicki and Bunker (1996) argue that causes which are uncontrollable and rare reduce the culpability of the actor and ease relationship repair and, holding opportunism constant, the attribution of task inexperience is also

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[4] In the Thoroughbred horse industry, task experience is gained by breeding and selling horses at auction.

uncontrollable and rare, and so despite the cause of termination being internal, an alliance may still re-form.

Inexperience may also be uncontrollable because the alliance partners cannot automatically change their experience level. When partners engage in an activity that is new to both of them, lack of task experience is an important antecedent for the outcomes of the relationship. At the point of alliance formation, the inexperienced partners may be overly optimistic (Dushnitsky, 2010) with respect to their ability to contribute towards the shared alliance activities. For example, horse breeding alliances involving new entrants may terminate due to inexperienced partners' unrealistic expectations of the price that can be earned at auction. Inexperienced partners lack the necessary knowledge to anchor the horses' value appropriately, gauge the market, and react accordingly. Thus, inexperienced partners' actions to improve the horses' valuation are largely outside of their control. While terminated, the former partners may continue to individually breed horses for auction and gain experience. Upon reflection, the former partners may have reasoned either their skills improved to control the past cause for termination or the partners created more realistic expectations, so that, after a period, the reason for their prior termination may no longer apply.

Absence of task-related experience can also be related to rarity of a transgression (Tomlinson and Mayer, 2009). Task inexperience is rare because novice mistakes which may have motivated the partners' termination are not expected to recur. Rarity addresses the expectations of the partners' behavior in the future. However, if the overestimation

occurs only once, alliance partners may be able to make an appeal that the problems associated with the alliance termination are singular and uncommon, due to their inexperience. Incompetence may be a less serious transgression for inexperienced partners (Gillespie and Dietz, 2009). In contrast, failures for experienced partners are more likely to signal longer standing issues in the relationship, calling into question the partners' competence and reliability. For either alliance partner, the presence of inexperience provides a plausible excuse for the termination that neither party will view as damaging because the state of inexperience is temporary. Therefore, I argue that re-formation is more likely when the alliance partners lack task-related experience at the time of termination. Therefore, I suggest:

Hypothesis 2: The <u>less</u> task-specific experience of the partners at the time of termination, the <u>greater</u> the likelihood that organizations will reinstate the alliance relationship following the termination.

Complexity is also an internal attribution for the alliance partners because it concerns the scope of the activities carried out in the alliance. Whereas task inexperience emphasized rarity, complexity stresses uncontrollability attribution, as scale issues can impede even well-established partners. Complex alliances can cause strains on the alliance partners due to problems of equity and efficiency (Oxley, 1997, Reuer and Zollo, 2005; Ring and Van de Ven, 1994). Alliances that are broad in scope, involving complicated division of labor, make it difficult for the alliance partners to assess whether the gains from the alliance are equitable given their inputs. Such a complicated division

of labor is often described as "social complexity," because the alliance partners may occupy multiple roles (Pratt and Rafaeli, 1997). Clear formal roles defined by functions or titles in organizations can be used to maintain alliances (Ring and Van de Ven, 1994). On the other hand, the alliance may become so unwieldy that the partners may decide they can perform the task more efficiently alone.

I argue that alliance partners will avoid trust violations when they terminate the alliance if they ascribe the termination to the alliance's excessive complexity. The more reasons for the alliance termination, the less likely the former partners are to re-form the alliance. However, by avoiding focus on a single cause and instead attributing the termination to multiple factors, the former partners' can reinstate trust due to the lack of controllability of the causes leading to the alliance termination. For example, alliances between two vertically integrated firms may find the partners are already burdened with their own respective vertical integration problems (e.g. Van de Ven, Rogers, Bechara and Sun, 2008) to cope with even before coordinating the activities for the alliance. Rather than the former partners' missteps being viewed as intentional or deliberate, it may be that the partners had unrealistic expectations in light of their existing commitments of resources due to scope.

The role of complexity in re-formation involves both attribution and learning between the former partners. Organizations are more likely to probe and to learn from failures associated with complex tasks (Haunschild and Sullivan, 2002). When task complexity increases, organizations undertake intensive investigations of the causes of

termination, thereby dampening the importance of the partners' missteps as other complex causes are identified. When firms enter into alliances with each other that involve both vertical and horizontal activities simultaneously, these may involve multiple social roles. What may be considered appropriate in one setting may not be in the other. Therefore when a violation occurs, the social rules governing behavior may not be clear. I argue that under such social complexity what may appear as a violation in one social context may not be in another, heightening the termination's causal ambiguity. Causal ambiguity points to the controllability of the circumstances—a large and unwieldy alliance may become so scope inefficient that neither partner could be expected to manage the alliance successfully. As the partners engage in deeper search, they may increasingly realize that the alliance was well beyond their control. Thus, terminations of socially complex alliances may not directly attribute problems with opportunism or gross negligence in the alliance for the termination. The causal ambiguity leads to a deeper search that ascribes multiple causes to the termination, stressing the controllability of the circumstances, and allowing partners to re-form their alliance in the future. Therefore, I suggest:

Hypothesis 3: The <u>more</u> complex the alliance prior to termination, the <u>greater</u> the likelihood that the former alliance partners will re-form the alliance relationship following the termination.

Additional alliance experience might suggest the alliance partners are regularly committing the same mistakes, akin to the stability assumption of attribution theory.

However, I argue that alliance termination experiences may be beneficial. Former alliance partners may find that attributing the focal alliance termination away from blaming internal causes eases with other alliance termination experiences. Prior literature has emphasized the positive role of general and partner-specific alliance experience (Gulati, et al., 2009; Reuer and Zollo, 2005). Likewise, I argue that alliance partners may acquire a unique set of experiences from alliance termination which are favorable to alliance re-formation. I suggest that expectations are adjusted from general termination experience with multiple partners.

My argument for the benefits of termination experience is grounded in the literature associated with learning by doing and learning spillovers (Arrow, 1962; Udayagiri, 1991; Jaffe, Trajtenberg and Henderson, 1993). Learning spillover means the transfer of knowledge from one situation to another. Firms learn by doing only by engaging in a problem firsthand to gain experience (Arrow, 1962). As the firm's experience increases, the firm develops a more streamlined way of performing the identical action (Boston Consulting Group, 1970). A firm's ability to incorporate and apply the knowledge is known as absorptive capacity (Cohen and Levinthal, 1990). Knowledge spillovers, from one activity to other activities, ensure that firms enhance their absorptive capacity (Udayagiri, 1991). Such diverse knowledge helps identify the salience of an activity and the transfer of knowledge from one activity to other related activities. In the context of other organizational events, such as bankruptcy (Ingram and

Baum, 1997; Baum and Ingram, 1998) and acquisitions (Beckman and Haunschild, 2002), knowledge spillovers from broad experience has greater benefits for the firms.

In the context of alliance termination, I argue that knowledge spillover from other alliance terminations may be particularly beneficial for re-formation.[5] Prior literature on alliance maintenance emphasizes the positive role of learning and adjusting expectations within the alliance (Doz, 1996; Ring and Van de Ven, 1994). However, this literature is focused on learning during the alliance and within the dyad. At the point of termination, the former alliance partners may use their prior terminations outside of the relationship to help learn from past mistakes and adjust expectations.

Such general experiences, for example, may allow alliance partners to better handle the negative effects of internal problems, (e.g., termination involving opportunistic actions of one of the partners), by causing the partners to adjust their expectations. Expectations influence the partners' willingness to commit to and maintain an alliance. Firms develop optimistic expectations of the alliance outcomes to confirm their partnering choice (Harrison and March, 1984). But such optimistic expectations are prone to lead to disappointment because they are often unrealistic. The former partners are motivated to adjust their expectations of the alliance to confront the unforeseen result (e.g. March, et al., 2001), particularly as a reaction to uncertain circumstances (Cyert, Dill and March, 1958), such as an alliance termination.

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[5] The benefits of alliance termination might be expected to accrue only up to a point, but in subsequent empirical analysis, I find the inflection point does not achieve organizational significance (Shaver, 2007).

Alliance partners may adjust expectations due to their alliance termination experiences. For instance, partners' shared use of "pardons and paroles" may instill commitment in the relationship despite violations (Doz and Hamel, 1998), and is a routine that may be associated with adjusting expectations following alliance terminations. Alliance partners who have other costly prior experiences of terminating due to internal problems may expect subsequent alliances to terminate due to a complex set of factors rather than their partners' opportunistic behavior. The realistic expectations allow both partners to appear benevolent to each other and less likely to get drawn into frustrations over unmet expectations that could prevent the partners from re-forming in the future.

Furthermore, prior termination experience may permit the former partners to reduce the search costs of seeking out other partners. The former partners more realistic expectations from their other alliance terminations coupled with the assets the partners' brought to the past alliance thereby reducing search costs of finding an entirely new partner. Such termination experience enables the former partners to set bounds on the re-formed alliance so as to avoid any overly optimistic expectation. In my fieldwork, I found that a number of terminated alliances re-formed on a smaller scale and with a narrower focus after great reflection on the previous alliance. The partners re-formed using the information they had gained through the termination of the prior alliance. Thus, re-formation is more likely for partners with greater termination experience. Therefore:

Hypothesis 4: Re-formation of the alliance following the termination is <u>more</u> likely when the partners have <u>greater</u> general termination experience.

2.3 Grounding the Theory: Illustrative Case Studies from the Thoroughbred Horse Industry

The Thoroughbred horse industry is best known for the sport of horse racing, but the primary economic activity of the industry involves horse breeding and horse sales at auction.[6] The key resource for these firms is the genetic bloodlines of their horses and the key capability is the firms' ability to enhance those bloodlines by breeding these horses. While many enthusiasts are exposed to the industry through horse racing as personal entertainment, breeding involves significant investments and highly organized activities. Therefore, many firms will focus their attention on the short-term profits potentially available in the yearling (one-year-old horse) auctions where racing enthusiasts purchase prospective racehorses. The long-term goal of the firms involved in breeding is for the offspring to become champion racehorses, which increases the value of a set of genetics, but many of these firms do not participate in racing activities directly.

In contrast to an arm's length exchange, in which the firm that owns the mare (female) pays another firm for the stallion (male) service and then retains sole ownership of the offspring, an alliance in this industry is the collaboration of two firms to co-own a minimum of one offspring to sell at auction as shown in Figure 3. Alliances between the firms in the industry develop well in advance of the auction, and are consistent with estimates of a strategic alliance's average duration of three to five years (Kogut, 1988;

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[6] A horse in race training offers little value for a breeding farm to break even, as the costs increase exponentially from training and nomination fees. Moreover, the purse money at races is both an unreliable source of income and insufficient to cover training costs. A recent survey prepared for the Commonwealth of Kentucky's Legislative Research Commission found that less than one-third of firms reported a gross income of $100,000 or below, while 20% of the firms indicated a gross income of greater than $1,000,000 with more than half the income generated by breeding and sales.

Schilling and Phelps, 2007). The alliance partners interact repeatedly over the three-year period from the breeding decision to the sale of the horses at auction, coordinating everything from the care of the offspring through to the actual sale (Figure 4). Many alliances span generations of horses. For example, the collaboration between the Phipps Farm and Claiborne Farm, both based in Kentucky, has produced several generations of quality horses over more than 30 years. The alliance does not necessarily terminate after the auction.

A contract traditionally forms around the horse bred by the partners since the Jockey Club assigns first ownership rights based on the breeders. Partners typically begin planning the breeding in the fall by purchasing mares and evaluating stallions. In spring, the breeding contract is signed and the mare is brought to mate with the stallion. The gestation period for horses is 11 months and three days. The offspring born in spring must spend the next year maturing. Based on industry standards dictated by the Jockey Club registry, the offspring all celebrate the same birthday of January 1, becoming yearlings. The Jockey Club birth date will occur two and a half years after the partners planned the breeding. At minimum, another six months will pass before the first auction of the year in July, which kicks off an annual season of nine auctions spanning the four months from July through October. During this period, it is impossible for the alliance partners to extract their investment; a horse cannot be split apart. The alliance partners' resources are intertwined through their co-investment. The natural termination of the contract occurs as soon as the horse is sold at auction and the partners no longer

collaborate with each other. Likewise, an unnatural termination happens when the partners are unable to sell the offspring offered at auction and no longer breed horses together.

In contrast to the contract, the alliance relationship may continue across multiple horses and breeding seasons. Alliance partners may use a single breeding contract as a way to breed additional horses in the future. Typically, once the alliance is started the partners expect the relationship will continue past the breeding of one horse. As time passes, the alliance partners' resources become more complementary. For example, the practice of line-breeding involves producing offspring with a high concentration to the same ancestors on both the male and female side. As the partners breed horses, each generation increasingly belong to similar families, particularly as breeders attempt to replicate past successes. Furthermore, the partners become increasingly embedded in their relationship through the frequent interaction required to breed, rear, and sell the offspring at auction. Partners develop trust as the offspring gestate and develop. Unpredictable veterinary problems and decisions relating to the care and management of the offspring provide occasions for positive reinforcement of psychological contracts which build trust (e.g Ring and Van de Ven, 1994). Outsiders also think of the two partners as related because of their joint presence at the auctions and through references to the "connections"[7] of the horses the partners breed. Any horse which receives press coverage will also have its breeders identified.

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[7] "Connections" is a term used in the Thoroughbred industry to refer to the breeder, owners, agencies, and trainers associated with a horse.

I focus on the breeding and sales of yearling horses at auction because there is no information available to sellers and buyers on a yearling horse's true racing ability. This component of the research design is important because it allows me to tease out the role of uncertainty on termination while holding the uncertainty associated with the product (the horse's racing ability and prospects) constant. The age of the horse allows for such control because it has not yet physically matured and will not begin training and racing until it is two years of age. Once a horse reaches the age of two, the costs increase dramatically as the horse enters race training, creating a strong incentive for breeders to sell the offspring as yearlings. Thus, in the yearling and breeding sale context used in this dissertation, no information is available on the horses' actual performance, allowing for uncertainty regarding the horse to be fixed across the sample. As a result of the uncertainty surrounding the horse's actual ability, the price achieved by the horse at auction reflects the partners' decision-making and cooperation more than the physical attributes of the horse. Thus, the setting allows me to observe the alliance partners' efforts. Furthermore, as I explain below, by looking at the yearling auctions, as opposed to other alliance settings, I am able to obtain a clear measure of termination as the industry operates on an annual basis. There is a finite window for each of the industry activities, such as racing, auctions, and breeding, all of which occur on an annual basis determined by the age of the horses.

The setting is also ideal for capturing internal and external sources of attributions. Breeders may act as sole owners and participate in alliances, which creates a risk of

competitive uncertainty as a source of internal attribution for the alliance termination. A breeder may have a horse with similar genetics as another horse co-owned in an alliance. Friction develops between alliance partners when the sole-owned horse achieves greater sales prices[8] at the auction than the similarly bred horse owned by the alliance. Alliance partners must trust each other as each decision can be very costly. The horse industry is unlike other industries in which a product can be refurbished. A horse once injured or ill-prepared for the auction can have its value destroyed instantly. External attributions occur through the unpredictable nature of reproduction and racing performance. Industry rules ban the use of reproductive technology such as artificial insemination and embryo transfer commonly found in other breeds of horses and agricultural animals.[9] The potential of an offspring for the alliance is subject to the virility of the stallion and the fertility of the mare, which are largely outside of the breeder's control. Furthermore, the outcomes of horse races are completely exogenous. Market preferences may shift based on recent successful horses winning races. For example, a breeder may have a yearling with similar bloodlines as the three-year old that won the Kentucky Derby. Such an

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[8] The anticipated sale price for yearling auctions is largely determined by the quality of the horses' genetics. A well-bred horse that fails as a racehorse may still have value as breeding stock. The physical attributes of the horse are also taken into account in valuation. However, the physical assessment is completely subjective as there is little empirical evidence to support the relationship between ideal physical conformation and racing ability. Moreover, yearling horses tend to change in physical appearance until they mature between 5 and 6 years of age. Buyers are aware that sellers will use corrective shoeing, extra feed, in some cases steroids, and daily walking to improve the appearance of a horse. The Consignors and Commercial Breeders Association publishes educational pamphlets to debunk myths and inform buyers of purchasing horses at auction.

[9] One reason given for the ban of the reproductive technology stems from Aristotle, who believed "heat" created by conception was important. Removal of the semen or egg cell from the parents would risk a loss of "elements" created by the parents at conception (Cassidy, 2007).

outcome would be impossible to predict at the point the breeder would have made the decision to breed the yearling.

In the summer of 2010 I engaged in fieldwork in Lexington, KY, the epicenter of the horse industry,[10] which helped me gain access to the archival data. I observed the stakeholders of the organizations in action. The informants introduced me to several of their network partners, explained why they avoided and re-formed with past partners, and allowed me to observe critical conversations associated with the focal transactions for the alliances, which provided me with a deep understanding of the context. I provide grounded qualitative examples of three alliances: a successful alliance, an alliance that terminates and a terminated alliance that re-forms, in order to illustrate the activities of the alliances in this setting. In the next chapter, I incorporate these findings into my empirical set-up and discuss the sample I used for quantitative analysis.

Three cases drawn from my fieldwork illustrate the differences between alliance maintenance, alliance termination, and alliance re-formation. The first case illustrates the ideal alliance relationship, which spans across many generations of horses. The second case highlights the challenge of maintaining the relationship beyond the contract. The partners both intended for the relationship to continue beyond the breeding of one horse, but failed to commit to continue the relationship which therefore ended in termination.

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[10] Lexington, KY, is known as the "Horse Capital of the World" for its concentration of horse-breeding farms and volume of horses sold through auctions (comparable to the global importance of New York and the NYSE for financial services). In the area known as the "Blue Grass" immediately surrounding Lexington, there are at least 460 firms (Cassidy, 2007). In 2010, 7,854 offspring sold of the 10,744 yearlings offered at auction. The total receipts from the sales were $302,542,657. Lane's End, one of the top breeders, sold 210 horses at the Keeneland September sale for $17,731,900 with a maximum price of $2,050,000 paid for one horse.

The third case provides an instance of alliance re-formation, in which the alliance partners previously terminated their relationship due to problems of social complexity.

Providence Farm and Aurora Stable[11] Alliance. The Providence Farm and Aurora Stable alliance lasted more than 50 years and spanned several generations of horses. Through the years, Aurora Stable had focused its efforts on building a collection of top-quality broodmares (female horses used for breeding). The stable made a fortunate move in the 1940s and bought most of the horses from a dispersal of bloodstock which belonged to a historic farm in an earlier era. Aurora Stable became known for having the best-bred horses in the industry. The stable typically owned about 45 horses. However, Aurora Stable's sole emphasis on mares meant they required stallions of a similar quality from an external source. At the same time, Providence Farm, tracing its history back to a civil war veteran, had developed a group of prominent stallions, many of which were imported from Europe. Providence was well known for its excellent advisory services, and was socially connected to the elite "blue-blood" owners in American horse racing. Nevertheless, Providence needed a pipeline of top mares to maintain the stallions' success. Providence Farm's owner was once quoted as saying: "If you control the bloodlines, you control the industry." The alliance between Providence and Aurora assured both breeders' access to top quality horses but also gave them the opportunity to experiment and take breeding risks that neither party would consider on their own. Moreover, with each new generation of horses, Providence Farm's and Aurora Stable's horses became even more compatible. Through the concept of line-breeding, an offspring

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[11] Names and numbers have been altered to provide anonymity.

may be bred with the focus on a particular ancestor to give a higher probability of the ancestor's trait passing on to the offspring. Over each generation, line-breeding becomes easier, as the genetic pool becomes more concentrated.

While the two partners maintained distinct operations, the two breeders shared many horses and offspring. Aurora Stable kept all of its horses at Providence Farm. The two parties would meet regularly at formal and informal social gatherings, inspect the horses as they developed, and observe the horses in training in the early morning on the racetrack. Despite the close ties between the two partners, both indicated they respected each other's separate input. Providence Farm's decisions to acquire stallions were made without the input of Aurora Stable. Likewise, Aurora's stable of top mares was so well-regarded that Aurora would also make independent decisions about the procurement of its mares. The alliance was so successful that the partners bred more than 300 stakes-race winners. Their relationship over the generations was built on trust. One of the members of Aurora Stable was quoted as saying, about their relationship with Providence Farm: "Surround yourself with a few individuals that you can trust and have lengthy relationships with [them]. Promote an air of trust and make a legitimate effort towards what you aim to accomplish. That's the nature of the relationship we've had working together." Nevertheless, the alliance experienced a number of challenges. In one famed deal, Aurora had a choice of two horses and selected the less talented of the two horses based on advice from Providence.

Woodrow Station and Sunset Farm Alliance Termination. Woodrow Station offers stallions at stud for breeding in Kentucky. Woodrow's primary breeding division is located in the bluegrass region of Kentucky. Stud farms such as Woodrow Station,manage stud books for each sire, referring to the maximum number of mares one stallion will breed in a season. Stallion managers fill the stud book based on their assessment of the mare's genetic compatibility with the stallion.

Sunset Farm is a sole proprietorship, located in a state which is two airplane flights away from Woodrow's breeding division. There are 10 horses at Sunset; half of the horses are broodmares. Sunset's owner had expressed interest in breeding a higher quality horse than what was currently available in their existing broodmare band. Through conversations with other farms, Sunset was able to purchase a mare that had good quality bloodlines. After purchasing the mare, Sunset was not able to afford to also pay the stud fee and the transportation expenses to send the mare to Kentucky to be bred.

Colleagues in the industry encouraged Sunset's owner to contact Woodrow's stallion manager. Woodrow's stallion manager advised Sunset to go into a foal-sharing alliance using the stallion Friday-Friday. This horse was in the early stages of his breeding career. The market had not yet seen the offspring of his first foal crop, so Friday-Friday's stud fee was set at $20,000 on speculation of his quality and racing ability. Woodrow's stallion manager was looking for quality mares to breed with Friday-Friday that could enhance the stallion's value. The manager had kept a few spaces in the breeding book open for a possible foal-sharing agreement, whereby Woodrow Station

and another breeder could co-own one of Friday-Friday's offspring. The foal-sharing agreement allows the mare owner, by giving up part of the ownership rights of the offspring, to receive a discounted stud fee. Moreover, the mare owner gains access to and advice from one of the top stud farms in Kentucky, with the hope that the relationship will continue into subsequent breeding seasons.

As part of the agreement, Sunset would transport the mare to Woodrow Station for breeding. The mare would reside at Woodrow Station over the breeding season until she was confirmed pregnant. Over these months, the partners would speak weekly over the phone. The mare had ulcers and was known as a challenging horse to maintain. Once she was confirmed in foal, she was sent back to Sunset Farm. Once there, the owner was challenged with the mare's health issues, and was concerned that the mare would not be able to deliver the offspring. When the mare gave birth, the stallion manager from Woodrow Station made plans with the owner of Sunset Farm to fly to the farm and inspect the foal.

During the visit, the partners made plans for the foal's future and discussed other opportunities and the next breeding. The foal-sharing agreement required Sunset to send the foal back to Kentucky as a yearling for the Keeneland auction. After a few days of touring farms and going to dinner, Woodrow Station's stallion manager headed back to Kentucky. Sunset Farm would follow Woodrow Station's instructions on how to prepare the offspring for the auction, which involved a routine of feeding, shoeing, and walking.

A few months before the auction, the yearling was sent to Kentucky and appeared smaller than other yearlings. His physical attributes were not ideal, but not yet problematic, either. Sunset Farm sent the owner of another nearby farm down to Kentucky to check on the offspring and report on his progress. Sunset's owner was unable to attend the auction in person due to the distance between the farm and Kentucky. Typically, both breeders are present to evaluate the auction and advertise the horse at the auction. Instead, Sunset was relying on their local colleague and Woodrow Station's stallion manager to market the offspring. Sunset Farm's owner had regular phone calls with both parties to discuss the auction and get feedback on the market's reaction to the yearling. Sunset Farm's owner did not have a clear sense of a potential buyer for the yearling, especially in the last few hours before the yearling was to walk in the auction. The yearling sold for $25,000, which was just slightly more than the stud fee. Sunset Farm's owner was disappointed at the outcome and became concerned that Woodrow Station had neglected to represent the offspring sufficiently. Sunset Farm's perception was that other yearlings whose breeders were on location at the auction received greater attention from the stallion manager. However, Woodrow Station's stallion manager was relieved that the horse sold at all. Woodrow Station's stallion manager said that the disappointment of Sunset Farm's owner was typical for breeders who are inexperienced with the Kentucky auctions. The stallion manager said that breeders' most frequent complaint is not getting a high enough price at auction. As a result of these mixed reactions, none of the negotiations materialized to continue the relationship and the

alliance was terminated. In subsequent years, Sunset Farm bred the mare to lesser quality stallions from other farms and retained sole ownership of the offspring.

Easy Line Farm and Oak Hill Farm Alliance Re-formation. Easy Line Farm and Oak Hill Farm are both sole proprietorships located in Kentucky. The owners of the two farms immigrated to Kentucky from Ireland. During that period, many who lacked economic opportunities in the Thoroughbred industry in Ireland came to Kentucky and maintained close ties in their immigrant community. Irish horsemen and horsewomen are renowned for their both their knowledge about horse racing and their reverence for the racehorses. The founders of Easy Line Farm and Oak Hill Farm quickly rose through the ranks of the historic Kentucky stud farms and started farms of their own. Both were particularly skilled horse agents who either consigned or bought horses for other owners and breeders who were less adept or too time-constrained to follow the nuances of the horse industry.

Given the two farms' primary activities as agencies, neither farm could dedicate themselves full-time to horse breeding. Horse breeding involved a greater financial and time investment on top of their consuming tasks as agents. In the alliance, though, one party could manage the daily care of the mares and offspring while the other party could arrange breeding rights to stallions. Thus, through the alliance, the two farms could be scale efficient. As a result of their close ties, Easy Line Farm and Oak Hill Farm entered into a breeding alliance. The two partners decided to co-own a set of broodmares and their subsequent offspring. In sum, the partners owned about 15 mares together in any of

the years of their alliance, which lasted over several years. The alliance was phenomenally successful, with yearlings fetching above average prices at auction and continuing on to become race winners. In spite of this success, though, the relationship failed when Oak Hill raised concerns over Easy Line's perceived unethical behavior. The unethical behavior arose from a competitive overlap amongst the horses they represented individually and the horses they represented as an alliance at auction. The market was hot, with plenty of opportunities for sellers. Both of the firms continued to maintain alliances with other longstanding partners during the period of termination. Nevertheless, others in the industry commented that the two were not as successful after the termination as they were together.

The two partners subsequently re-formed the relationship, on a more limited scale. Both partners tried to reduce the scale of their alliance activities to avoid competitive overlap with the horses from their agency work. However, the partners are back to their prior above average performance in terms of the market prices for their horses sold at auction.

These three case examples illustrate how alliance relationships are maintained, terminated or re-formed. The first case reveals that an alliance relationship can continue past a contract to produce a single horse. Indeed, such a longstanding alliance between the two firms reinforced their complementarity.

The second case terminated naturally at the point at which the horse was sold at auction, the end of the contract. However, the case also illustrates the partners' efforts to

maintain the relationship and the failure to successfully negotiate the breeding of further offspring beyond the first contract. Further, the case raises one partner's attempt to attribute the causes of the termination to task inexperience. While the partners were unable to re-form the alliance, the attribution of task inexperience was a common theme in my fieldwork. On several occasions, former partners would attribute a termination to being "new in the industry" or being "overly optimistic" about the valuation of the horse because the partners were unfamiliar with the breeding and yearling auctions.

The third case illustrates how re-forming an alliance can remain a viable strategy for two previously terminated partners. The partners terminated the alliance due to partners' suspicions of competitive uncertainty that were not revealed to the public. However, the partners were able to re-form the alliance by adjusting the scale of the alliance's activities, suggesting that the partners had attributed the termination to the complexity of the alliance. It is important to note that despite the firm's individual successes, the partners experienced superior performance in the alliance. Thus, the partners were not mistaken in their alliance strategy. While the alliance partners also had a valid reason for the alliance termination, the former partners also appeared to use an attribution of complexity to deflect attention away from the blaming the either of the alliance partners beyond the repair of the relationship.

2.4 Chapter Conclusion

My theoretical framework combines attributions and experience associated with the termination to identify factors which facilitate alliance re-formation. The theoretical

framework, hypotheses and case studies suggest that conditions, based on external, uncontrollable and rare attributions, surrounding alliance termination principally—primary uncertainty, task inexperience, and social complexity—which are often thought of as hazards for alliance relationships, may actually be positive in leading to alliance re-formation. These antecedents shift the blame away from the alliance partners allowing for alliance re-formation. Moreover, the previous experience gained from general alliance termination by the former partners is also important. The learning from general termination experience helps the partners re-form the alliance after termination, by giving them additional perspective to adjust their expectations of the subsequent alliances.

3.0 METHODS

3.1 Empirical Setting

In order to validate the theoretical framework I developed in my dissertation, I need the empirical context to have the following characteristics. Using the empirical context, to test my theoretical framework, I should be able to:

(a) *follow* alliances over time that include both termination and re-formation;

(b) *measure* the antecedents of termination, primary uncertainty, task experience, and social complexity;

(c) *measure* the duration, strength, and competitive uncertainty of the relationship in order to assess the trust between the partners;

(d) and finally, *measure* performance outcomes, resource fit, and network position of these firms and alliances which may also drive alliance termination.

I test the hypotheses using a unique longitudinal data set. The data include horizontal alliances in the Thoroughbred[12] horse industry (SIC 075208; NAICS 115210). This is an ideal setting to understand the effects of alliance termination because alliances are widely used in the industry. Alliance activities in horse breeding have similar features to other alliance-intensive industries, such as biotechnology and pharmaceuticals, where alliances combine technology to develop a superior technological standard. A successful

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[12] Thoroughbred is the name of the breed of horse predominantly used for racing. The breed descends from three foundational sires: the Darley Arabian, the Godolphin Arabian and the Byerly Turk. During the 17th and 18th centuries, traditional English horses were crossed with the three foundational sires traced to Middle Eastern breeds to create the Thoroughbred breed which excelled at racing. The etymology of the name comes from the adjective "thoroughbred" which means of pure breeding (*Oxford English Dictionary*, 2006).

breeding farm noted that by establishing the genetic standard for breeding Thoroughbreds the farm can control the industry. Similarly, in the horse industry, alliance partners combine resources and genetics to tap into promising genetic paths. Yet biotechnology and pharmaceutical industries, often studied in the alliance literature, can pose challenges in capturing the performance of the firm and alliance. In contrast, the Thoroughbred horse industry includes data on both performance (auction results)[13] and capabilities (racing genetics).

3.2 Sample

In order to test my theory, I combine proprietary *Blood-Horse Auction Edge* reports, containing detailed statistics on 60,547 horses bred for the purpose of entering the sale, with sales data available from the auction organizations (Keeneland, Fasig-Tipton, OBS, and Barretts) from 2005 to 2010, which includes 16,592 firms and 7,804 alliances, to create the data set. The *Blood-Horse Auction Edge*[14] publication is issued prior to a sale to inform buyers of the valuation (stud fee, genetics and past sale history) and performance history of the genetic family associated with the horses at sale at auction. Appendices A and B contain the explanation pages and an example sale entry.

The investigation of re-formation requires first identifying alliances and then identifying alliance terminations. The first two years of the data must be used to identify

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[13] The auctions use an English auction format. The auctioneer opens with a suggested opening bid and is disclosed to all of the bidders at auction (McAfee and McMillan, 1987). Each subsequent bid increases the price.

[14] The Blood-Horse provided the Auction Edge publications in pdf format. I used Python and MySQL programming languages to parse text from the pdf documents. Approximately 1.2 million lines of text were parsed.

alliance re-formation. The final sample contains alliances which previously terminated, involving a total of 2,256 "alliance-years." Moreover, the conditions surrounding the termination must precede the termination event; therefore all of the independent variables are lagged. Thus alliances are followed from their existence in 2005 through 2010. The auction sales data allow me to account for industry exit which may confound alliance termination. Throughout the sample, re-formation occurs for 495 of the previous alliances.

With the exception of 2009, when there was a spike in the number of alliance terminations due to the financial crisis, each year approximately 70% of the previous alliances terminated. For example, Figure 5 shows that of the 2097 alliances that existed in 2005, 1454 of these alliances terminated in 2006. In 2007, 163 of the alliances that terminated in 2006 had re-formed. In the years following 2006, 333 (264, 210, 91) additional alliances terminated in 2007 (2008, 2009, 2010), while 67 (30, 21) of these alliances re-formed. Of the alliances that existed in 2005, and 643 alliances continued in 2006, 11% alliances re-formed in 2007. Across the cohort of alliances from 2005, 6% (121) of the alliances continued without terminations through the observation period of 2005-2010. There is also a risk that the alliance terminations may be confounded with breeders that simply produce every other year. Across the cohort of alliances from 2005, only 8 alliances exhibited a pattern of terminating and re-forming every other year.

3.3 Description of Variables

In the empirical examination of the hypotheses, I use two levels of analysis in the measurement of the independent variables for the study. Specifically, I examine tie re-formation, the dependent variable, at the alliance level of analysis. The decision to re-form the alliance is, by definition, a dyadic phenomenon and therefore occurs at the alliance levels. I consider the remaining independent variables at both the alliance level and the firm level of analysis. Alliance level data were compiled from the horses produced and sold by the focal alliance. Past duration, strength, reputation, performance, competitive and environmental uncertainty, and complexity involve direct measures at the alliance level. Data related to the size and experience of the alliance partners was drawn from the partners' solely owned horses and experiences outside of the focal alliance. A key advantage of this data is that performance and reputation are measured at the alliance level, typically using proxy of stock market reaction or an aggregation of the two firms' performance. Descriptive statistics and correlations are provided in Table 1.

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Insert Table 1 about here

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3.3.1 Dependent Variable

Alliance re-formation conceptually occurs when two previously terminated alliance partners enter into an alliance. I operationalize re-formation as the presence of the alliance partners as breeders of at least one horse at auction following termination. In

the Thoroughbred industry termination occurs when the alliance partners cease to breed and sell horses as an alliance but continue to do so individually. I measure alliance re-formation as a dichotomous variable coded to specify whether the two previously partnering firms entered into an alliance in the year that followed the termination. As shown in Appendix C, I used the first two years of data to determine the re-formation. I began by coding a dichotomous variable to indicate the presence of an alliance in 2005 and the continuation of the alliance in the subsequent alliance-years, provided in the *Auction Edge* data. Next, I created another dichotomous variable for *termination*[15] that indicates the absence of an alliance across the sales for each subsequent alliance-year after its first detection in 2005.

3.3.2 Independent Variables

Primary uncertainty. Conceptually, primary uncertainty points to both uncertainty regarding changes in market preferences and exogenous forces in the external environment (Sutcliffe and Zaheer, 1998; Koopmans, 1957). Operationally, buyers and sellers face uncertainty in assessing the market value of the offspring when the sire has over-supplied the market with its offspring (Whiteley, 2010). The buyer can no longer rely on the signal of the bloodlines but must look at more subjective qualities of the horse to assess its value.

Subjective features of the horses cause uncertainty driven by changes in

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[15] The data also allow me to differentiate between a potential confound, bankruptcy (market exit of a firm) and termination (the dissolution of a relationship). In an auction setting, when a firm exits the industry the horses are sold without a reserve price.

preferences. For example, markings (the white hair on a horse's face and legs) might be preferred because of the similarity to a recent race winner even though markings are unrelated to actual ability. Furthermore, the alliance partners have little to no control over the virility of the stallion or the fertility of the mares crossed with a given stallion, which makes the number of offspring exogenous. Fertility is shaped by factors in the external environment outside the control of the alliance partners because of industry regulation forbidding the use of embryo transfer or artificial insemination. Thus, not only is the market uncertain, but so are the alliance partners in deriving an appropriate price for the offspring from stallions who have saturated the market.

The complexity in assessing the physical attributes of these horses overwhelms the information given by the increased number of observations. *Primary Uncertainty* is measured as the average number of offspring produced by the sires (fathers) used by the alliance partners. The sires' reproduction history and valuation is available through *Auction Edge*.

It is also possible that the number of offspring may simply be a function of luck for the alliance partners. The alliance partners make their breeding decisions well in advance of the auction. Consequently, the breeders may not be aware at the time of their breeding decision how many offspring the stallion will ultimately be able to produce. As a robustness check, I also included measures that may be considered even more exogenous. During the sample window, firms also faced great uncertainty with the 2008 economic crisis. Buyers of racehorses relied on bank loans to cover the inflated prices for

horses in the years leading up to the financial crises. In 2008, the banks constrained the amount of credit available to buyers, creating market uncertainty for the sellers. For alliances that terminated in 2008, I included a dummy for the year. As a robustness check, results are shown in Table 6. One measure is the number of horses at the auction listed as "reserves not attained" (RNA). A higher number of horses that did not sell across an auction suggest that sellers faced difficulty in assessing the market and buyers' willingness to pay. Another measure captures the change in state from one year to the next. The change in a stallion's number of offspring creates an additional difficulty for the alliance partners trying to gauge the market. The change in the number of sire's offspring produced used by the alliance is measured as the difference in sire crops from one year to the next.

Task experience. Conceptually, firms gain task experience by taking repeated action in a particular domain, such as a technology or market segment setting. Such experience can be useful in increasing the firm's ability to use existing knowledge to help the firm enter other technological or market spaces (Cohen and Levinthal, 1990; Gulati, et al., 2009). In the Thoroughbred horse industry, task experience operationally is represented by each auction experience that helps a partner decide which auction to sell the horse at and to estimate an appropriate reserve price. For example, for a relatively short and immature offspring, the alliance partners may choose to wait for a later sale if they expect their horse to grow in comparable size to the other horses at the later auction. Similarly, as the firms participate in additional auctions, they may develop decision rules

to derive the reserve prices. For instance, a horse that had multiple veterinary exams, involving x-rays and scoping of the airways, by potential buyers may cause the sellers to add substantially to the reserve price due to the signaling of buyer interest. Firms are listed as owners selling horses at a particular auction in the *Auction Edge* data. I measured, as *task experience,* the average number of auctions participated in each year between the two alliance partners.

Since task experience is a combination of the two firms' own experience, it is possible that differences between the two alliance partners' task experience might influence the relationship between task experience and alliance re-formation. As a robustness check I also included differences in task experience between the two partners, and the minimum and maximum value of either partner as alternate measures of task inexperience.

Complexity. Conceptually, alliances have greater complexity when the scope of activities increases (Reuer and Zollo, 2005). Alliances with greater scope often involve activities drawing from a variety of professional identities and norms. Partnering firms can also deepen their alliance relationship by occupying a variety of roles, creating multiplexity through pluralistic identities (Pratt and Rafaeli, 1997). Operationally, in the Thoroughbred horse industry, firms can freely assume roles as both breeding farms and consigning agencies, thereby creating complexity in the tasks and interactions of the alliance. Typically, consigning agencies operate in a contractual vertical exchange relationship with breeding farms by previewing the farm's horses to potential buyers at

the auction. Consigning agencies are subject to different norms governing their actions, and have a distinct professional organization known as the *Consignors and Commercial Breeders' Association*. In contrast, the breeding farms are primarily represented and protected by the *Thoroughbred Owners and Breeders Association.* The consigning agencies are listed in the auction results data while the breeders are provided in the *Auction Edge*. I measured *alliance complexity* as the ratio of the alliance's horses that had one of the partners as both a breeder and consignor to the number of horses offered for sale by the alliance. This ratio measure captures the extent and scale of the social complexity faced by the alliance partners.

As a robustness check to see whether the weighting of the social complexity relative to the number of horses offered by the alliance mattered, I measured *alliance complexity* by assigning a "1" to alliances where either partner operates both as breeder and consigning agent within each year, and a "0" otherwise. This dichotomous variable captures the mere presence of the social complexity.

Termination experience. Termination experience accumulates from any alliance termination experience a firm has had. Prior literature on alliance experience (Gulati et al, 2009; Reuer and Zollo, 2005), distinguishes general and partner-specific experiences. I emphasize the particular importance of general experience to alliance re-formation. Termination experience gained broadly from other alliance relationships improves the firm's ability to consider other external factors for a termination and therefore set expectations more appropriately. Operationally, as I stated earlier, termination occurs

when the partners continue breeding and selling horses at auctions individually but the alliance between the two partners is absent from the same set of auctions and crop of offspring. Each time a firm terminates a relationship with one of its partners, the firm gains experience in managing alliance terminations. I measure termination experience as the average of the alliance partners' respective accumulated number of terminations over the years of their alliance.

Alliance termination experience depends on the number of alliance formations. An alliance must be formed before an alliance can terminate. However, not all alliances terminate at the same time or in the same sequence that they were formed. Some partners may continue an alliance past its expected termination while other alliances might terminate prematurely. I include a variety of robustness checks in order to address the role of alliance termination experience as an antecedent to alliance re-formation. In addressing the concern that alliance termination experience moves in the same way as alliance formation experience, I use alliance formation experience as a control in Table 9, which is measured as the average of the two partnering firms' own formation experiences. I also provide an alternate measure of termination experience as a ratio of the partner's average termination experience to their average formation experience. Further, since the alliance partners' own termination experiences may differ, the partners may not share their experience with one another, potentially contributing to a competency gap. To determine whether extreme values of either partner's termination experience might influence alliance re-formation, I took the minimum, maximum, and the absolute

difference of the partners' termination experiences.

Control Variables. Competitive uncertainty is determined by the extent to which competitive overlap exists for the alliance (Pfeffer and Nowak, 1976; Polidoro et al., 2011). Overlap in the firms' resources can cause the partners to question the intent of the alliance partners' actions from innocent to strategic (Sutcliffe and Zaheer, 1998). Alliances that terminated because of competitive uncertainty may be less likely to re-form because the partners may suspect that opportunism played a part in the competitive behavior. Operationally, friction between the alliance partners, as well as competitive behavior, increase when a partner solely owns a horse which shares the same genetic strain as a horse sold in the alliance. I used the sire-dam sire genetic combination to map the genetics of the alliance's offspring to the partners' solely owned offspring, similar to work using patents to identify resource overlap (e.g., Polidoro et al, 2011). Each solely owned horse that matches the genetics of the alliance's horse was counted as an instance of competitive uncertainty when the horse was entered in the same sale as the alliance's horse. I measured competitive uncertainty as the overlap of genetics in each alliance-year.

Centrality. In line with previous studies of alliance evolution (e.g., Greve, Baum, Mitsuhashi and Rowley, 2010), where greater centrality increases alliance formation, I control for the alliance's structural position within the social structure of firms in which the alliance is embedded. Prominent actors in the social structure are deeply involved in multiple alliances, enhancing each actor's visibility in its network of relationships (Knoke and Burt, 1983). Central actors gain prominence by engaging in alliances which allow

information to flow readily between the partnering firms. A firm with multiple alliances to other prominent firms is privy to information that may be inaccessible to firms who are in relatively few alliances with less prominent firms. Less central actors will confer power to the firm by seeking it as a desirable partner for its access to information. The more powerful firm can form, terminate, and re-form alliances on a whim if several firms seek the firm as a partner. I measure *centrality* by creating an average of the two partnering firms' Bonacich centrality (Bonacich, 1987), which considers not only the number of ties a firm has but also the centrality of the other firms connected by the ties.

Another construct related to position is *reputation*. I measure reputation, which is also likely to influence firms' willingness to partner again. Alliance partners are also viewed as reputable partners when they control valuable resources (Podolny, 1994). Partners may be viewed as complementary and symmetric if they share a similar quality of resources. For instance, operationally, alliance partners who breed champion racehorses together are going to produce an offspring that is of similarly high genetic quality. Reputation is measured as the average quality of horses sold by the partners, using the percentage of winners produced by the same sire–dam sire (father–mother's father) combination, which is used to classify each horse's quality of breeding. The sire–dam sire combination identifies possible recessive traits, such as heart size,[16] which may pass on racing ability if the trait is present in both parents' genetics. The dam sire is

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16 In the book *The X Factor*, Haun (1996) traces racing ability in an attempt to identify a large heart gene through pedigrees of successful racehorses. For example, Secretariat, a Triple Crown winning champion racehorse, was found to have an abnormally large heart during his necropsy. The pedigrees revealed the large heart trait through the dam-sire line.

believed to be the most influential genetic contributor in a horse's pedigree (Cassidy, 2007).

Past Duration and Strength. Relational embeddedness reflects the cohesiveness between partnering firms in the alliance (Gulati, 1995). The partners cooperate effectively and gain cohesiveness through the shared history of the partners in the relationship and the strength of the relationship, developed through the frequency of interaction (e.g., Ring and Van de Ven, 1994; Granovetter, 1973). Relationally embedded partners may be more likely to give each other the benefit of the doubt when the alliance terminates (Uzzi, 1997). Along these lines, relational embeddedness captures a confirmation bias between the partners to interpret events in either a trustworthy or blaming (Nickerson, 1998). First, I measure *past duration* as the accumulated continuous years the partners participated in the alliance or alliance duration. Partner-specific experience accumulates within the alliance as the alliance partners interact with each other over time (Gulati, et al., 2009). Each year passed between the alliance partners represents a shared history and a deepening of psychological contracts as they interact with each other through the annual breeding and auction seasons. Second, I measure the *strength* of the alliance relationship as the number of horses shared by the alliance partners in a given year. Relationship strength is built upon the frequency of interaction between the alliance partners. The more the alliance partners interact with each other, the more likely the partners are to perceive each other as trustworthy (e.g., Lewicki and Bunker, 1996; Rempel, Holmes and Zanna, 1985; Zand, 1972).

I also control for *performance,* which plays an important role because it may influence the possibility of future collaboration (Schwab and Miner, 2008). Outcome-learning theory suggests that actors will repeat actions which were associated with positive performance, and revise actions that were associated with negative performance (Cyert and March, 1963; March and Olsen, 1976). Conceptually, an alliance whose offspring sold above the expected value prior to termination may be more likely to re-form the alliance as a means to repeat past successes. I control for the alliance's performance by using the alliance's average deviation of the sales relative to median sales price of similarly bred horses across the alliances horses. Finally, I include year controls to capture general trends throughout each year.

The distribution of primary uncertainty, task experience, multiplexity, and termination experience is positively skewed. In order to account for the skewed distribution, I used the log transformation of these variables. However, in instances such as experience, I must keep meaningful zero values that refer to no experience. In order to preserve the zero values in the log distribution, I transformed termination by increasing the values by one, as suggested by Cameron and Trivedi (2009). Thus, the appropriate values of these variables are maintained through the log transformation.

3.4 Econometric Approach

3.4.1 Analyses

The ideal experiment for addressing my research question involves randomly assigning a circumstance by which partners ascertain new information (such as primary

uncertainty or task inexperience) regarding the alliance which causes them to terminate the relationship. The experiment must satisfy the important assumption that the alliance partners were previously well-matched at the time of formation. Moreover, such a change in information should be randomly imposed on the partners. Unfortunately, from 2005 to 2010 an exogenous source allowing for a natural experiment that would cause such a change in motivation of parties to terminate and re-partner was unavailable. My identification strategy therefore relies on singling out the effect of termination conditions and learning net of the alliances' unobserved heterogeneity. The empirical setting I use allows me to control for important factors such as the fit of capabilities for the alliance partners to account for other, often unobserved strategic justifications to re-form the alliance.

I take a reduced-form approach and estimate a random effects logit model. My approach is in contrast to previous studies of alliance termination as an outcome (e.g., Reuer and Zollo, 2005) which employ a Cox regression model (Cox, 1972) to assess the duration-specific risk of the antecedents to termination for each alliance. If I were interested in the stability of an existing alliance or the duration of the re-formed relationship, the Cox regression model, where the hazard rate provides a measure of the stability of the relationship, would be appropriate. However, to be consistent with my theory, I treat the duration as static and focus on the strength of the conditions at the point of termination and its effect on the alliance re-formation.

The alliance-year is the unit of observation in my analysis. I observe alliances

which existed and then were terminated using the first two years of the data. Since the alliance partners need to remain active in the industry following termination, and are present at auction every year, the panel is balanced. The panel allows me to incorporate the conditions surrounding the termination event by including lagged independent variables. Since the alliances are formed around particular horses on annual cycles, I do not observe variation within the alliance-year. However, I account for variation across the alliance-years. Therefore, I use random-effects rather than fixed-effects (Wooldridge, 2001). Random-effects models account for time-constant unobserved heterogeneity. The random-effects model uses both a time-constant error term and a time-varying error term. There is a strict assumption for the random-effects model that the time-constant error term originates from a random distribution. One concern is that the alliance observations may not be independent, as the partnering firms' alliance decisions may be influenced by their other alliances. However, my empirical setting reduces this concern, based on the industry evaluation of the genetic quality of the offspring, provided by the *Auction Edge* data. The alliance partners are limited by the genetic fit of the parents of the offspring, as the horses will have a relatively small set of horses that they can be optimally matched with. Thus, the decision to pursue one alliance is independent from the decision to pursue other alliances.

Formally,

$$\textit{re-formation}_{it} = \beta_0 + \beta_1 \textit{primary uncertainty}_{it\text{-}2} + \beta_2 \textit{task inexperience}_{it\text{-}2} + \beta_3 \textit{complexity}_{it\text{-}2} + \beta_4 \textit{termination experience}_{it\text{-}2} + \beta_5 \textit{reputation}_{it\text{-}2} + \beta_6 \textit{performance}_{it\text{-}2}$$

$$+ \beta_{7\text{-}9}\textit{embeddedness controls} + \beta_7\textit{duration} + \beta_8\textit{strength} + \beta_9\textit{centrality} + \beta_{10}\textit{size}_{it\text{-}2}$$

$$+ \beta_{11}\textit{competitive uncertainty}_{it\text{-}2} + \alpha_i + u_{it}$$

where *re-formation$_{it}$* is the dichotomous re-formation, *Primary Uncertainty$_{it\text{-}2}$* is the alliance's primary uncertainty lagged by two years, *Task Inexperience$_{it\text{-}2}$* is the alliance's task inexperience lagged by two years, *Complexity$_{it\text{-}2}$* is the alliance's overlap between breeder and consignor roles lagged by two years, *Termination Experience$_{it\text{-}1}$* is the alliance's general termination experience lagged by one year, and α_i captures the year control. Further, in order to consider the joint effects that the partnership decisions of termination and re-formation have on the firms and the surrounding network, I include the embeddedness characteristics, such as past duration, relationship strength, and positional embeddedness, in the model. Due to the annual cycles of the industry, I need to capture the independent variables just prior to the alliance termination. Given the one-year absence required to satisfy my measure of alliance termination, I must capture the independent variables a minimum of two years prior to the alliance re-formation.

I calculated one-step transitional probabilities to understand the probability of transitioning from one state, termination, to another, re-formation, in a system. One-step transitional probability is defined as $p_{ij}=Pr\{X_n=j|X_{n\text{-}1}=i\}$ where p_{ij} is the one-step probability of transitioning from alliance termination, *i*, to alliance re-formation, *j,* where *n* is the number of steps, and where *X* is the sequence of random variables with a Markov property (Dodge et al., 2006). One-step transitional probabilities[17] of alliance termination

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[17] I calculated the transitional probabilities using the *xttrans* command in STATA 10.0.

and alliance re-formation suggest performance is not the sole reason for the alliance re-formation. Across the sample, 58%[18] of alliances terminate their relationships. Alliances that experienced losses at the auction had a 64% transitional probability of terminating their relationship, while 59% of the alliances that incurred gains at the auctions terminated. Similarly, using the entire sample, nine percent of alliances subsequently re-form. Alliances with losses at the previous auctions had a seven percent probability of re-forming the relationship. Previously profitable alliances had a nine percent probability of re-forming the relationship. The transitional probabilities illustrate that alliances experiencing losses have a slightly lower probability of re-forming their alliance. However, the difference between terminated alliances incurring losses and terminated alliances experiencing gains is not as large as one might anticipate.

3.4.2 Results

The descriptive statistics and correlations are provided in Tables 2 and 3. The average termination experience which partnering firms bring to alliances is 3.5. The variance inflation factor (VIF) statistics for each of the variables are less than 10, which indicates multicollinearity is not a concern. When multicollinearity is present, it creates a downward bias in the coefficients and reduces statistical significance (Greene, 2003).

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Insert Tables 2 and 3 about here

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[18] The data are consistent with other estimates of alliance termination rates in the literature which range from 50 to 70% (e.g. Slowinski and Sagal, 1993).

The results of the analyses are shown in Table 4A. Model 1 estimates the effects of the controls on alliance re-formation. Models 2 through 5 show the stepwise results of the hypothesis testing for the Hypotheses 1, 2, 3, and 4. Model 6 includes the key explanatory variables, alongside the pseudo-R^2 of 69% which suggests Model 6 has good fit. Table 4B presents the log-odds coefficients.

Insert Table 4A and 4B about here

Results from the control variables in Model 1 highlight important links between alliance termination and alliance re-formation. Competitive uncertainty is negative and significant (*-0.40, p<0.05*), suggesting a detrimental effect to alliance re-formation from strategic opportunism between the partners due to increased competitive overlap. Interestingly, past duration of the relationship is also negative and significant (Model 1: *1.56, p<0.01*), which may be capturing a persistence of problems through the alliance partners' shared history that contributes to their alliance termination. The coefficient for size, too, is negative and significant (*-0.87, p<0.01*), reflecting that particularly large partners that may experiment with alliances are unlikely to re-form. Centrality, reputation, and performance each capture the resources and value the alliance yields for the alliance partners; as anticipated these measures are positive and significant (centrality: *0.53, p<0.01*; reputation: *0.07, p<0.10*; performance: *0.06, p>0.05*). The

positive relationship between these coefficients and alliance re-formation suggest that prior alliances which benefited the former partners are more likely to re-form. Strength captures another dimension of trust emphasizing the frequency of communication between the alliance partners; the sign on strength is positive and significant (*1.04, p<0.01*). This relationship indicates that alliance partners are more likely to re-form if they were more involved with each other during their previous alliance, perhaps quickly clarifying any prior misunderstandings.

The first hypothesis predicted that alliances terminated under conditions of greater primary uncertainty would be more likely to re-form the alliance. The results in Models 2 and 6 in Table 4A statistically support Hypothesis 1 as the effect of *Primary Uncertainty* is positive and significant. The greater the primary uncertainty at the time of termination, the greater the odds the alliance will re-form. Alliance partners that terminate under greater primary uncertainty are 1.19 times (*p<0.01*) more likely to re-form their alliance relationship.

Hypothesis 2 claimed that alliance partners with less task experience would be more likely to re-form their alliance. The results in Models 3 and 6 in Table 4A, provide do not support for the effect of *Task Inexperience* on alliance re-formation. The effect achieves marginal statistical significance as the odds ratio is in the predicted direction (Model 6: 0.548, *p<0.10*). Terminations that occur for alliance partners with greater task experience are 45% less likely to re-form the relationship.

Hypothesis 3 asserted that alliance partners with greater social complexity leading up to termination would be more likely to re-form the alliance. The results in Models 4 and 6 in Table 4A do not support the effect of *Complexity* on alliance re-formation. The effect is non-significant, despite the predicted direction of the odds ratio (Model 6: 1.27, *p>0.10*).

Hypothesis 4 argued that alliances would be more likely to re-form for partners with greater alliance termination experience. The findings in Models 5 and 6 in Table 4A, support the positive effect of *Termination Experience* on alliance re-formation. Alliances with greater termination experience prior to re-formation are 83% more likely to re-form (*p<0.01*).The results highlight the relationship between termination experience and re-formation, supporting my argument that termination experience helps put the prior relationship in a positive light.

Given that the baseline probability of alliance re-formation is nine percent, the results for primary uncertainty, task inexperience and termination experience also achieve economic significance. Using the marginal effect at the mean (shown in Table 5 Model 4), a one standard deviation increase in primary uncertainty leads to a six percent increase beyond the nine percent baseline probability of alliance re-formation, increasing the probability of re-forming by 67%. Task inexperience increases the baseline probability of re-formation by 122%, yielding a 20% probability of re-forming, given a one standard deviation decrease in task experience. Furthermore, a one standard deviation increase in alliance termination experience increases the baseline probability of alliance re-formation

by 289%, leading to a re-formation probability of 35%. Such increases have a profound impact on alliance re-formation.

In Table 5, I replicate my results using several alternate specifications. The results for primary uncertainty and alliance termination experience are consistent with the findings in Table 4. I show regression results for the limited probability model (LPM), and logit models with robust and clustered standard errors in Models 1 to 3. The marginal effects are in Model 4. Model 5 provides results for a fixed effects model. Due to the low number of observations per group, the fixed effects model had insufficient within-group variance to converge. I removed the sample restriction for alliances terminated in the previous period. Further, due to missing data I also had to remove several of the control variables. The results from the fixed effects model are consistent with those in Table 4, with the exception that the level of significance for primary uncertainty and task experience switches (primary uncertainty: *0.132, p<0.10*; task experience: *-1.342, p<0.01*).

Insert Table 5 about here

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In Table 5, Model 6, I present results for the Cox proportional hazard model, modeling the effect of the independent variables on the hazard rate of an alliance re-forming. The results for task experience differ from the previous models. The sign is positive and marginally significant (*0.02, p<0.10*). Similarly, in Model 7, the cross-

sectional logistic regression model, the coefficient is also positive but non-significant (*0.27, p>0.10*). In both models, the coefficient on size appears to strengthen, suggesting that experience gained through selling multiple horses, as opposed to attending multiple auctions, may be more influential (Model 6: *-0.24, p<0.01*; Model 7: *4.76, p<0.01*). Such a large coefficient on size in the cross-sectional model may also suggest that the distribution of size may still be skewed despite the log transformation. I remove extreme values in Table 12.

In Tables 6 through 9, I present robustness tests using alternate measures for the hypothesized independent variables *primary uncertainty*, *task experience*, *complexity*, and *termination experience*. In Table 6, Model 1 presents my final model from Table 4, Model 1. Models 2 and 3 provide my alternate measures for primary uncertainty including the percentage of horses that did not sell at auction—reserve not attained (Model 2) and the year over year change (Model 3). Model 2 looks at the state of uncertainty based on the outcomes of the auction. A horse that does not sell in an auction is given the status of "reserve not attained" (RNA). Sellers submit to the sale office prior to the sale of their horse the minimum bid price needed to sell the horse. Horses that do not sell because the reserve was not attained suggest a discrepancy between sellers and buyers and market uncertainty on valuation. Another concern is that my measure for primary uncertainty may not be fully exogenous. Breeders choose the stallions that they use to breed their offspring, and if the number of offspring did not change from the point at which they made their breeding decision, the number of offspring may not cause

greater uncertainty. In order to address this concern, Model 3 looks at the change in the number of offspring from the previous year, to capture the change in state that may create uncertainty for the alliance partners.

Insert Tables 6 through 9 about here

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The results for the alternate primary uncertainty measure reserve not attained are not significant in Table 6 Model 2 (*0.014, p<0.10*). The coefficients for task experience, complexity and alliance termination experience remain consistent with Model 1. One explanation for the findings for the reserve not attained measure is that the increased market uncertainty due to the financial crisis starting in late 2007 and through 2010, during my fieldwork research, might be captured by the year dummies. In 2010, many buyers and sellers were still challenged with finding an appropriate value for their horses. In Model 2, the coefficients for the year dummies increase in significance (2008: *2.644, p<0.01*). In Model 3, the change in state in the number of offspring from the sire-lines used by the alliance is marginally significant in the predicted direction (*0.001, p<0.01*), while task experience turns non-significant (*-0.525, p>0.10*). One explanation for the changes in coefficients may be the increased significance in competitive uncertainty (*-0.729, p<0.01*). For experienced players, changes in the market may create greater opportunities for alliance partners to exploit product-market overlaps causing behavioral uncertainty and decreasing alliance re-formation. While including these alternate

measures for primary uncertainty provides mixed support, the results for alliance termination experience are robust to these alternate measures.

Task experience is a dyadic measure, and a concern here is that taking the average of the two partner's experiences may mask differences between the two partners. In Table 7, I address these concerns by substituting the partners' minimum (Model 2), maximum (Model 3), and difference (Model 4) of experience. Across the models the coefficients for primary uncertainty and alliance termination experience remain consistent. My theory implied that task inexperience was a rare and uncontrollable attribution. Model 2 speaks to the rarity of task inexperience; partners with lower values of task inexperience may be nascent firms. Model 2 uses the alternate measure of task experience by taking the minimum value of the partner's experiences. The coefficient is in the opposite direction and non-significant (*1.202, p>0.10*). In contrast Models 3 and 4 both provide stronger support for task experience than in the Model 1 (*-0.601, p<0.10*). Model 3 substitutes the primary uncertainty measure with the maximum value of either of the two partner's task experiences *(-0.759, p<0.01*). This measure emphasizes the controllability of the attribution, by suggesting that the larger the value of task experience, the more controllable the circumstances leading to termination. Similarly, Model 3, which captures the difference between the two partner's task experiences, contrasts the rarity of one partner's experience with the controllability of the other partner's experience. The difference is negative and significant, suggesting that the larger the difference in the partner's task experiences the less likely the alliance will re-form (Model 4: *-0.708,*

p<0.01). Taken together, the results suggest that is not the inexperienced partner but the more experienced partner's skills with the task that determine the likelihood of the partners' re-formation. The less experienced partner may be expecting guidance on the task from the more experienced partner and grow frustrated if the experienced party does not manage the circumstances, preventing future re-formation.

A concern for my measure of complexity may be that weighting a transaction based on the proportion of the alliance's horses that share the same seller and consignor could be influenced by the size of the partnering firms. I address these concerns in Table 8. Larger operations tend to be forward integrated into consigning agencies, giving these firms more options in terms of terminating and re-forming alliances. I also measure complexity as a dummy code without the weighting, to avoid the overweighting of observations from alliances formed between larger firms. In Model 2, I use the alternate measure of complexity. The other coefficients for primary uncertainty, task experience, and termination experience remain unchanged. The coefficient for complexity remains non-significant (Model 2: *0.304, p<0.10*). I do not find support using either measure for my third hypothesis suggesting complexity increases alliance re-formation.

Alliance termination experience, like task experience, is also a dyadic measure. Alternate measures for termination experience are used to address two concerns. In Table 9, Models 2 through 4 address concerns that using the simple mean of the two partner's values may dampen any differences between the two partner's alliance termination experiences. Models 5 and 6 deal with the link between formation and termination

experiences—since firms must form alliances in order to terminate the variation might be the same.

In contrast to the findings on task experience, which suggested the differences between the two partners matter, the results for Models 2 through 4 suggest that similarity in experience may be more important (Table 9). Model 2 looks at the minimum value of either partner's termination experiences. The results for the minimum value of termination experience (Model 2: *0.995, p<0.10*) are weaker than the average used in Model 1 (*1.775, p<0.01*) but are in the expected direction. Model 3 substitutes the maximum value of alliance termination experience for the average. The results in Model 3 for the maximum value (*0.876, p<0.05*) are stronger than Model 2, suggesting that greater levels of alliance termination experience increase alliance re-formation. Model 4 addresses the absolute value of the difference of the alliance partner's termination experiences. The difference in the partner's termination experiences is non-significant (*0.187, p>0.10*), suggesting that differences in termination experience may not be influencing the findings for alliance termination experience. Thus, it appears that the more the alliance partners pool their experience, particularly for those with greater alliance termination experiences, the more likely they are to re-form the alliance.

In Table 9, Models 5 and 6, I account for alliance formation experience. The findings of alliance termination experience may be capturing the variance from alliance formation experience. In Model 5, I measure the partner's average alliance termination experiences relative to the partner's average alliance formation experiences. The ratio provides

weaker support in Model 5 (*0.897, p<0.10*) than the partner's average alliance termination experiences in Model 1 (*1.775, p<0.01*), suggesting that the formation experiences are dampening the influence of alliance termination experience. Model 6 separates formation and alliance termination experiences as two separate independent variables. Alliance formation experience turns negative and non-significant (Model 6: -*0.069, p>0.10*) while alliance termination experience is positive and significant (Model 6: *1.729, p<0.01*). Thus, the results for alliance termination experience are robust to including alliance formation experience.

I examine differences between the antecedents of alliance termination and alliance re-formation in Table 10. According to my theory, I would expect hazards to alliance termination such as primary uncertainty (Model 2), task inexperience (Model 3), complexity (Model 4), and alliance termination experience (Model 5) to increase the likelihood of alliance termination. In Model 6, I also include alliance formation experience, which is thought to mitigate alliance termination (e.g. Reuer and Zollo, 2005), to show the different effects of the two types of experience. Consistent with my theory, primary uncertainty and alliance termination experience increase the likelihood of alliance termination (primary uncertainty: Model 2: *0.699, p<0.01*; termination experience: Model 5: *0.459, p<0.01*). Complexity is non-significant in the stepwise model (Model 4: *0.042; p>0.10*) but positive and significant in the expected direction in the saturated model (Model 7: *0.267; p<0.05*). Task experience is significant in the opposite direction than anticipated in Model 3 (*0.597; p<0.01*) but is non-significant in

the saturated model (Model 7: *0.358, p>0.10*). The effects of inexperience may be captured by size as the number of auctions participated in is related to the partners' number of horses produced. The sign on size is negative and significant as expected (Model 7: *-0.219, p<0.10*). Primary uncertainty is also non-significant in the saturated model (Model 7: *0.364, p>0.10*). Formation experience entered in the stepwise model is positive and significant in the opposite direction than expected (Model 6: *0.788, p<0.01*), perhaps capturing the variation from termination experience. In the saturated model, the results for termination experience and formation experience are as expected. Termination experience increases the likelihood of termination (Model 7: *0.498, p<0.05*) while formation experience turns negative and non-significant (Model 7: *-0.096, p>0.10*). The pattern of results for complexity and primary uncertainty may be closely related and are shown similarly in Table 11.

Insert Tables 10 and 11 about here

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In Table 11, I explore the antecedents to alliance formation using my data of existing alliances. Although there are concerns of sample selection bias, the model provides an initial comparison of the re-formation antecedents to formation antecedents. Consistent with my theory I would anticipate primary uncertainty, task experience, complexity, and termination experience to be in the opposite direction of the antecedents to alliance re-formation. Similar to Table 10, I also include alliance formation experience to help tease out the effects of alliance termination experience. The stepwise estimates for primary

uncertainty (Model 2: *-0.699, p<0.01*), complexity (Model 4: *-0.042, p>0.10*), and termination experience (Model 5: *-0.459, p<0.01*) are all in the expected direction. However, the coefficients for task experience and formation experience are in the opposite direction (task experience: Model 3: *-0.597, p<0.01*; formation experience: Model 6: *-0.788, p<0.01*). But both of these estimates turn non-significant in the saturated model (Model 7: task experience: *-0.358, p>0.10*; formation experience: *0.096, p>0.10*). Similar to the results for the antecedents of alliance termination, both complexity and termination experience are significant and reduce the likelihood of alliance formation (Model 7: complexity*: -0.267, p<0.05*; termination experience: *-0.489, p<0.05*). Likewise primary uncertainty is non-significant (Model 7: *-0.364, p<0.10*).

The sample selection bias explains some of the inconsistency, particularly for the formation model. Ideally, I should observe all of the possible combinations of potential alliances in order to understand which alliances form. Instead, I only observe formations for the combinations of existing models. Thus, the formation model mimics a continuation model of a sample of existing alliances. In the saturated model, for both alliance termination and alliance formation, primary uncertainty turns non-significant and complexity becomes significant. This pattern of results may be picking up the increased vertical integration as partnering firms move to control uncertainty in the industry. Forward integrating into consigning agencies would increase social complexity and decrease the alliance partners' commitment to alliances as they internalize more activities. Overall, the stepwise results for the antecedents to formation and termination,

with the exception of task experience, differ as expected from the antecedents to alliance re-formation.

I remove extreme values from my sample in Table 12. In particular, large sale prices, herds, and consistent race success happen for a small group of influential firms in the industry. In Model 1, I remove sale performance values above $200,000. Firms and alliances that average sale performance above $200,000 typically sell their horses through select days of the sale, when sellers pay a premium to nominate their horses and then have the horses inspected for selection by the sale company. In many of these cases, activities are undertaken for symbolic status reasons and the outcomes may not be as consequential for them. In Model 2, I remove partnering firms that breed more than 15 horses per year, because as firms increase their production they often become increasingly vertically integrated and therefore may not rely on alliances as an important strategy. In Model 3, I remove alliances that have extreme values of quality over 50%. Good quality breeding stock may average winning percentages of 10% to 20%, suggesting that values over 50% may be extreme values due to exceptional quality or small number of observations in offspring.

Insert Table 12 about here

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All of the first three models in Table 12 support my results in Table 4, Model 6. In Table 12, Model 1, where the sample is restricted based upon sale performance, the

results are very close to those in Table 4. The importance of primary uncertainty decreases slightly to *0.17 (p<0.10),* while task experience and termination experience increase in importance (task experience: *-0.660, p<0.10*; termination experience: *-1.807, p<0.01*). These slight shifts suggest that managing expectations through prior experience may be more salient for alliances whose investments in offspring may not have such large yields at auction. In Model 2, the sample size is restricted to firms that produce fewer than 15 offspring each year. The results for primary uncertainty and termination experience are slightly weaker here than in Table 4, Model 6 (primary uncertainty: *0.153, p<0.01* termination experience: *1.492, p<0.01*). Task experience slightly increases in importance to *0.648 (p<0.10).* Complexity becomes marginally significant (*0.309, p<0.10*). The pattern of results suggests that smaller firms must weigh their resource constraints against different experiences; larger firms may be expected to manage social complexity better than smaller firms, making task inexperience and complexity slightly more important attributions when smaller firms consider re-forming an alliance. Model 3 shows slightly more importance given to task inexperience (*-0.678, p<0.10*), complexity (*0.328, p<0.10*), and termination experience (*1.903, p<0.01*). The coefficient for primary uncertainty weakened (*0.139, p<0.05*). This pattern of results may suggest some middle status conformity where these alliances tended to avoid riskier bloodlines. Concerns over complexity and expectations at the point of termination may play more of a role in their re-formation decision.

In Tables 12 (Models 4 and 5) and 13 (Models 1 through 6), I run sub-sample analyses including performance split based on median and expected values, high and low fit in terms quality, and alliances that may have terminated due to competitive uncertainty. Intuitively, one would expect alliances that perform better and fit well to be more likely to re-form, and alliances that terminate under poor performance and fit to be less likely to re-form. While my theory does not distinguish between different types of alliance terminations it implies that terminations are difficult to recover from. As such, strong support for my theory might suggest that attributions can "heal old wounds," and that the coefficients would be larger for alliances that terminate from prior problems.

In Table 12, Models 4 and 5, I split the sample based on the fit of the breeders in terms of combining bloodlines known for producing winners of horse races versus those that had not yet produced winners. Splitting the sample also accounts for concerns related to mutual selection—alliance partners able to combine highly compatible resources have better fit and are more likely to be attractive alliance partners. The results in model 4 strengthen, as I would expect (e.g. primary uncertainty: Table 12 Model 4: *0.318, p<0.01*; Table 4A Model 6: *0.175, p<0.01*). The results also provide weak support for my third hypothesis which suggested that increased complexity from multiple social roles would increase alliance re-formation (Table 12 Model 4: *0.353, p<0.10*). In contrast, the results in model 5 for alliances using unproven genetics generally weaken (e.g. primary uncertainty: Table 12 Model 5: *0.259, p<0.10*; Table 4A Model 6: *0.175, p<0.01*), except for alliance termination experience which becomes stronger (Table 12 Model 5: *1.801,*

p<0.01; Table 4A Model 6: *1.775, p<0.01*). This pattern of results may suggest that alliance partners with greater termination experience under conditions of unproven genetics may be experimenting in their alliances, using their alliances to share risk rather than committing valuable resources.

In Table 13, I delve more into particular types of termination as a robustness check for instances where the termination may be more difficult to re-form. Models 1 and 2 split the sample based the alliance's performance relative to the median sale price of $50,000. Models 3 and 4 look at the alliance's performance relative to the expected value at the point of their breeding decision. Models 5 and 6 look at termination under competitive uncertainty driven by market overlap (Model 5) and circumstances where the alliance's horses did not clear the auction (Model 6). Models 1 through 4 deal with performance dissatisfaction. Model 5 addresses concerns over opportunism, due to increased competitive overlap in the market. Model 6 investigates a situation of unnatural termination, where the relationship may have been forced to continue despite the completion of a contract. The partners remain bound together because they were unable to sell their horses by shared ownership.

Insert Table 13 about here

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Models 1 through 4, looking at the alliance's performance, support my theory concerning primary uncertainty. Termination circumstances in which the alliance achieved less than $50,000, or less than their expected value at auction, have a stronger

likelihood of re-forming than those who met or exceeded median or expected values when the partners terminated under greater primary uncertainty (e.g. Table 13 Model 1: *0.222, p<0.05*; Table 13 Model 2: *0.150, p<0.05*). Thus, my findings are stronger for primary uncertainty on terminations related to more difficult performance circumstances. Similarly, the results also strengthen for alliance termination experience in Models 1 and 2 (Table 13 Model 1: *1.672, p<0.01*; Table 13 Model 2: *1.607, p<0.01*). In contrast, task experience receives mixed results. In Models 1 and 2 where the data are split based on performing relative to the median, task experience has a stronger influence on reformation for alliances that performed below the median than for alliances that performed better than the median, consistent with my theory (Table 13 Model 1: *-0.757, p<0.10*; Table 13 Model 2: *-0.681, p<0.10*). In contrast, where the data are split based on the alliance partner's performance expectations (Models 3 and 4), an opposite pattern is suggested. Task inexperience is non-significant for those who perform below their expectations and becomes stronger for alliances that terminated where their expectations were met (Table 13 Model 3: *-0.204, p>0.10*; Table 13 Model 4: *-0.907, p<0.10*). These results may reflect the link between experience and expectations, as alliance termination experience also weakens for alliances that did not meet their expectations (Table 13 Model 3: *1.447, p<0.01*; Table 13 Model 4: *1.728, p<0.01*). My qualitative case example of task inexperience provides a similar explanation. Efforts were made by the partners to attribute the termination to lack of task experience, but the partners were clouded by unrealistic expectations and became too discouraged to re-form the alliance.

Models 5 and 6 investigate instances where the alliance may have terminated due to competitive uncertainty or unnaturally. In both instances, the results provide strong support for my theory. The coefficients strengthen in both models, although less so in the case of unnatural termination (e.g. primary uncertainty: Table 13 Model 5: *0.364, p<0.01*; Table 13 Model 6: *0.228, p<0.10)*. Terminating under greater primary uncertainty, task inexperience, or termination experience appears to help alleviate the negative effects of competitive uncertainty through increased product-market overlap; and unnatural terminations where partners were unable to sell their horses due to miscalculating the market. Thus, the results support my theory that primary uncertainty, task inexperience and termination can be fruitful for alliance re-formation even in situations where the partners may have terminated on poor terms.

The findings of my dissertation are robust to several alternate explanations, particularly for alliance termination experience. I replicate earlier findings of alliance formation and find alliance termination experience does not operate in the same way as alliance formation experience. Importantly, using the same data, results for the alliance formation are generally consistent with prior literature (e.g., Gulati, 1999), as shown in Table 11. Further, alliance formation experience may even detract from alliance re-formation, although these results are mixed. In addition, I address limitations in capturing termination and alliance failures by splitting the sample based on alliance performance outcomes and competitive uncertainty at the point of termination shown in Table 13. I also investigated the compatibility of the alliance partners in terms of the fit of the

partners' resources, ensuring that termination re-formation is not simply a function of repeated exploitation of one partner by another, as shown in Table 12.

4.0 DISCUSSION, CONTRIBUTIONS, LIMITATIONS AND FUTURE RESEARCH

4.1 Discussion

In this dissertation, I examine attributions and general experience surrounding alliance termination in order to explain the relationship between alliance termination and alliance re-formation. My findings support the claim that alliance termination conditions and termination experience have a positive impact on alliance re-formation between the same prior alliance partners. Counterintuitively, factors typically understood as hazards for alliances are positive for alliance re-formation, controlling for detrimental factors for a relationship such as competitive uncertainty. Alliance re-formation appears as an interesting and important phenomenon distinct from alliance formation. The antecedents to re-formation differ from the antecedents for alliance formation. I will first discuss the results related to the conditions surrounding termination, and then those results which address the connection between trust and experience.

Counterintuitive antecedents. The findings are counterintuitive in the sense that at first glance, the same set of antecedents appears to increase alliance termination, impede alliance formation, and also increase alliance re-formation. However, these antecedents are different at each stage of the relationship. Consistent with my theory, which is based on attributions and experience, I find the antecedents are positive for alliance re-formation, accounting for adverse factors such as competitive uncertainty. In particular, antecedents such as primary uncertainty provide attributions for the termination that may avoid blame of the alliance partners.

The results for the relationship between primary uncertainty and alliance re-formation support my hypothesis. I argue that partners are more likely to re-form their alliance under greater uncertainty exogenous to the relationship. Partners are less likely to blame each other for the termination, because they are directing their attention to the primary uncertainty (an external attribution) at the time of termination. I find alliance partners are more likely to re-form their alliance relationship when the market is uncertain. The mechanism underlying primary uncertainty as an antecedent to re-formation differs from primary uncertainty as an antecedent to alliance termination. Alliance partners terminate relationships under greater uncertainty in order to adapt to changes in market preferences (e.g., Pfeffer and Nowak, 1976). In contrast, in terms of alliance re-formation, the presence of such uncertainty offers the former alliance partners an external attribution. The rationale for alliance may still exist, and the former partners can attribute their prior decision to terminate the relationship to the uncertain market environment, something external, rare, and beyond the partners' control.

The relationship between task inexperience and alliance re-formation is not supported. In contrast to primary uncertainty (an external attribution), I propose that task inexperience (an internal attribution) provides a condition for termination which enables alliance re-formation. Inexperience is associated with the liability of newness, which makes it difficult for firms to form relationships (e.g., Gulati and Gargiulo, 1999) and maintain relationships (e.g., Reuer and Zollo, 2005). However, in consideration of re-formation, I find marginal support for task inexperience as positive for the alliance

partners, as the attribution for the termination is not damaging to the partners' reputations because task inexperience is rare and uncontrollable. For example, firms may use an alliance to explore a new market segment but lack the necessary skills to foresee regulatory hurdles. A failure of temporary incompetence may be viewed as an innocent failure, rather than a strategic sabotage of the alliance. Such a view of alliance termination related to task inexperience as positive for the former partners is consistent with emerging literature in entrepreneurship which suggests that nascent firms can leverage their alliance terminations to enhance their market presence (e.g., Santos and Eisenhardt, 2009).

Instead, I find stronger support for the partners' differing in their task experiences. A partner with greater task experience may be more likely to shoulder the blame for the termination. Alliances with greater differences in their task experience are less likely to re-form, which may draw on the controllability of aspect of task experience. Partners with greater task experience may be expected to control the causes of the alliance termination.

Social complexity surrounding the alliance termination creates an instance where multiple attributions are present. My results do not support my suggestion that alliances terminating under social complexity are more likely to re-form. The coefficient is in the predicted direction, which may suggest greater social complexity could create causal ambiguity regarding the termination for the former alliance partners. However, the annual time cycles of the industry setting may prevent the former partners from investing in

lengthy search processes that would enable them to re-form. In industries involving transportation or telecommunication infrastructure, for example, the complex integration of activities may take several years to unwind, giving the alliance partners ample time to invest in deep search surrounding the alliance termination. Firms involved in breeding Thoroughbreds, by contrast, must participate in each activity in a certain window of time, giving the firms comparatively less time to pause and analyze.

Experience and Trust. The finding that accumulated general termination experience increases alliance re-formation is also counterintuitive. One might anticipate that accumulation of alliance terminations would damage a partner's reputation beyond repair, preventing alliance re-formation. However, I argue that alliance termination experience represents potential adjustment of expectations developed from terminations involving other partners, which aids the former partners' ability to re-form the alliance. Previous empirical work on alliance routines focused on alliance experience gained through alliance formation and maintenance, such as general and partner-specific alliance experience (e.g., Reuer and Zollo, 2005), and through a dedicated alliance function (Kale Dyer and Singh, 2002). My findings contribute to the literature on alliance routines by arguing that termination experience positively impacts alliance re-formation. I build on prior work on alliance experience (e.g., Kale, et al, 2002; Zollo, Reuer and Singhl, 2002; Gulati et al, 2009) by identifying general alliance termination experience as an important and distinct antecedent of alliance re-formation. Alliance termination experience rather than alliance formation experience enables alliance re-formation. Moreover, my findings

also relate to prior literature on learning from alliance terminations (e.g., Arino and de la Torre, 1998; Faems et al, 2008), which emphasize partner-specific alliance learning. My results also suggest a role for general alliance experience, particularly in termination experience, which implies a spillover of expectations from other alliance terminations to the focal dyad. Rather than causing a "leper effect," in which past partners opt to avoid each other, the firms are more likely to re-form their relationship with greater termination experience. The findings support an important link between general experience and the re-creation of trust.

4.2 Contributions

My dissertation makes several contributions to the literature on strategic alliances, trust, and social networks. In this section, I discuss the theoretical, empirical, and practical implications of my dissertation. First, it contributes to the alliance literature by showing that alliance re-formation is a distinct outcome from alliance formation, and that alliance termination experience, moreover, is distinct from alliance formation experience. Second, the dissertation contributes to the literature on trust and relationship repair by building on the idea that formation of trust and reinstatement of trust are distinct. Along these lines, I link both attribution and experience approaches, typically treated in isolation, to trust. Third, the dissertation has important implications for broader work on social networks, which has considered tie decay but largely ignored lapses in relationships punctuated by a termination. Fourth, I contribute to the empirical work on alliances, by finding a longitudinal setting of terminations and re-formations in which

both alliance experience and alliance performance can be measured directly. Last, the findings of the dissertation should benefit management practice by drawing managers' attention to the conditions surrounding termination and encouraging managers to adjust their expectations about alliances when terminating a relationship so that another relationship with the same partner is possible in the future.

4.2.1 Contributions to the Alliance Literature

Re-formation. Emerging work on alliances has focused on explaining the antecedents to alliance termination and identifying the different types of alliance termination (e.g., Polidoro et al., 2011; Reuer and Zollo, 2005). Alliance re-formation has been largely ignored because alliance partners are implicitly assumed to start anew with each alliance, or to renew a previous alliance with little disruption (e.g., Gulati, 1995; Gulati and Gargiulo, 1999). Supported by my fieldwork and empirical investigation, I argue that the partners do not begin with a fresh start. Instead, the prior alliance history matters, particularly at termination. Former alliance partners face the decision of whether or not to revisit a prior alliance partner, and weigh the past experiences by forming attributions about the termination to determine their willingness to re-form the alliance.

Scholars building on the process perspective of alliance termination have argued that both the alliance partners and the nature of the alliance change as the alliance partners interact over time (Ring and Van de Ven, 1994; Doz, 1996). Nevertheless, the models stop short at the point of the alliance termination, implying that the process is disrupted by termination. In contrast, my dissertation finds that alliance termination is a

vital part of the process. Alliance terminations may, in fact, provide an important occasion for organizational change. Psychological contracts and informal roles may be disrupted, resulting in internal re-structuring and departures of key alliance representatives (e.g., Faems et al., 2008). For this reason, I move beyond looking at processes within the existing alliance to create a link between the prior alliance termination and the re-formed alliance. By taking into account alliance re-formation, I am able to shed light on how the psychological contracts might be maintained after the alliance has ended. For instance, Ring and Van de Ven (1994) propose that alliances are more likely to terminate if there is an imbalance in the negotiations between the alliance partners. The proposition implicitly suggests that alliance partners will be unwilling to negotiate, or even re-form in the future, due to frustrations in the prior alliance. I extend Ring and Van de Ven (1994) by identifying circumstances surrounding the termination in which imbalance may be more easily overcome, allowing for re-formation. Furthermore, at the point of re-formation, an alliance partner may seek additional compensation or approach the negotiations more positively based on how the termination was framed.

Termination Experience. The literature on alliances emphasizes the importance of alliance experiences and learning from failure (e.g., Dyer and Singh, 1998; Arino and de la Torre, 1998). However, it is not clear under what general circumstances the experience benefits the alliance partners. For instance, Gulati et al. (2009) point to mixed findings in empirical work, using general alliance experience as an antecedent to alliance formation and performance. Instead, they suggest that partner-specific experience accrued within

the dyad may have greater value in executing an existing alliance than general alliance formation experience. My dissertation suggests general termination experience may be more informative than general alliance formation experience. Alliance terminations are more likely to spur the former partners into a period of interpretation across the set of prior alliances than formation and maintenance of an existing alliance. At termination, the firms will either analyze what went wrong or adjust to the loss of the activity, similar to the "endowment effect," in which an actor places a greater value on an item *ex post* than the item's value *ex ante* (e.g., Kahneman, Knetsch and Thaler, 1990). Taken together, the above arguments point out that the type of alliance experience matters for different alliance outcomes, such as alliance formation, termination and re-formation. Partner-specific experience may be particularly valuable in the midst of a relationship but may not lead to the comparing and contrasting of termination experiences needed at re-formation. Theorizing on alliance experience must not only distinguish between general and partner-specific experience, but also between experiences at different stages of the relationship.

The emerging literature on learning from failure (e.g., Arino and de la Torre, 1998; Haunschild and Sullivan, 2002) points out that termination experience is different from formation experience. However, the literature to date has emphasized the experience that occurs from frictions during the relationship rather than after and across relationships. Arino and de la Torre (1998) find, qualitatively, that alliance partners can learn to manage relationship failures while in the middle of executing an alliance.

Similarly, Faems et al. (2008), in a single case study, find the termination experience with the same alliance partner was beneficial for the re-formed alliance. The termination forced the partners to reflect on mistakes and use the subsequent alliance as an opportunity to approach the relationship differently. However, the partners continue to have other experiences after the alliance execution. Firms compare and contrast alliance termination experiences, so there is potential for learning and adjusting expectations after an alliance has ended. Rather than focusing on past mistakes, the interpretation after a termination can bring the former partners back together. Such learning across termination experiences might be overlooked if the partners are only focused on learning during alliance execution.

Alliance terminations are a unique instance with the potential to be perceived as failure but need not be presented as such. By focusing on re-formation, the findings from my dissertation suggest general alliance termination experiences may help the alliance partners adjust expectations, thereby alleviating the emphasis on past failure.

4.2.2 Contributions to the Trust Literature

By theorizing and testing the relationship between general alliance termination experience and alliance re-formation, my dissertation makes an important contribution by linking general experiences to trust. Recent advances in the literature on the subject stress that trust creation is not the same as trust re-creation (Dirks, Lewicki and Zaheer, 2009). First, I use the relationship repair literature on attributions (Tomlinson and Mayer, 2009) to gain traction as to why the antecedents to termination change when I theorize about

alliance re-formation. Second, little attention so far has been directed at the role of general experiences in relation to trust. By including both perspectives, I am able to theorize about how both circumstances and other experiences influence the relationship between termination and re-formation.

The attribution perspective of relationship repair has brought attention to the influence of circumstances at the point of a transgression (Ferrin and Dirks, 2003). Context affects the actors' trust assessments. Yet, alliance relationships may not necessarily involve a breach in trust alongside the alliance termination (Reuer and Zollo, 2005). Alliances can terminate for a variety of reasons and, at the same time, alliance partners have the opportunity to frame the termination in a beneficial manner. The attribution perspective of relationship repair provides traction as to why, despite a transgression, partners may be able to re-create trust (Tomlinson and Mayer, 2009). By using the attribution perspective, I am able to explain why alliance terminations may avoid long-term trust implications using external and internal causes that avoid blame, thus paving the way for alliance re-formation.

My dissertation makes an important contribution by directly relating general experience to the trust literature. Literature on trust (e.g., Gulati, 1995) emphasizes the positive role of experience within a given relationship, particularly for formation and maintenance of ties. At the same time, I argue partners also require experience with other partners in order to interpret alliance terminations. Recent work on trust and relationship repair suggests partners can use appropriate social rituals (Ren and Gray, 2009) and

structures (Gillespie and Dietz, 2009) to restore trust in a relationship. However, by considering only partner-specific experience, it is also possible that firms may develop competency traps if experience only accrues within a relationship (March, 1991; Levinthal and March, 1993; Simon, 1993).

For alliance terminations, accumulating experience within a relationship may not be as informative as accumulating termination experience across relationships. For example, termination experience within a relationship might inform the partners what to avoid when terminating a relationship with each other in the future. Over time, trust develops through repeated positive interactions that instill a sense of positive effect and good will (Mayer, Davis and Schoorman, 1995). However, if the partners experience the same problems with each other repeatedly, trust will decline. The source of the friction between the partners may be rooted in a competency trap. Despite the partners' efforts to resolve the problems, the partners may employ inappropriate tactics, particularly in the midst of termination. For instance, the partners may treat the underlying reason for termination as one of control, using a structural remedy incorrectly for an integrity problem which may require a social ritual, such as a public apology (e.g. Ren and Gray, 2009; Zaheer and Fudge Kamal, 2011). Partners with more diverse alliance termination experience, gained through terminations with other partners, may be more effective at identifying the reason and subsequent repair approach for the alliance termination.

Further, my argument brings the attribution and experience perspectives to relationship repair. Alliance partners may be more or less effective at applying such

attributions to adjust their expectations of the terminated relationship based on prior alliance termination experiences. Alliance partners develop and enhance trust in their relationships by learning through experience (e.g. Inkpen and Currall , 2004; Dyer and Chu, 2000). Yet, alliances are also enhanced when the full range of possible attributions are captured. In the literature on other outcomes, such as strategic reorientation (Lant, Milliken, and Batra, 1992) and accident recovery (Haunschild and Sullivan, 1992), the link between attributions and diverse experiences is complementary when firms reflect on incidents and invest in developing skills to learn from prior events.

4.2.3 Contributions to the Networks Literature

Alliance relationships are embedded in a larger set of relationships which enable and constrain the partnering firms' strategic actions (Gulati, Nohria and Zaheer, 2000). Recent literature on network dynamics highlights the content and nature of ties change over time (Polidoro et al, 2011; Greve et al, 2010). Antecedents to formation, and now re-formation, are not simply the opposite of those of termination, nor are the antecedents to formation the same as re-formation. There are two important contributions to the networks literature, based upon the findings of my dissertation, in terms of the stability of ties as duration, and the complexity of the ties as social pluralism.

Duration of Ties. In networks of alliance relationships, the two partnering firms represent the nodes in the network which are linked together by the alliance tie. In alliance terminations, the nodes continue to exist despite the termination of the alliance tie. Re-formation brings attention back to the nodes which survive well after the tie has

ended. The learning from past ties, and influence of former ties on future ties, when nodes continue but ties are dissolved, suggests an imprinting of the prior ties on future ties (e.g., Gulati and Gargiulo, 1999; Soda, Usai, and Zaheer, 2004). At the same time, these models have focused largely on the network structures at the point of formation, rather than termination.

The structure of networks at the point of termination may be particularly potent in the next stages of tie creation and tie re-formation. Alliances, which often involve a large commitment of resources, tend to end definitively. In contrast, other relationships, such as advice arrangements or friendships, may fade as time passes. As a result, the former alliance partners are more likely to invest in sensemaking following a termination. Deeply embedded ties which terminate may also invoke a restructuring of the network in order to adapt to losses of resources following the termination (e.g., Greve et al., 2010; Ebaugh, 1988). Literature on network cohesion suggests that third-party ties can help resolve conflict and enforce appropriate behaviors in the midst of a relationship (e.g., Walker, Kogut and Shan, 1997; Rowley, Behrens, and Krackhardt, 2000). However, Greve et al. (2010) find that cohesive networks have an increased rate of termination involving multiple alliances. Through further investigation, Greve et al. (2010) also find that the multiple alliance terminations are heavily influenced by the position of the firms, suggesting that these firms at termination are jockeying to maintain or enhance their resources. Thus, the former alliance partners are particularly attuned to the actions of third-party ties at the point of termination, in order to take stock of resource opportunities

and constraints as the network shifts. Taken together with my findings that general alliance termination experience increases the likelihood of alliance re-formation, the former partners may place greater emphasis rather than less emphasis on alliance terminations, as tie decay might suggest, by understanding the network at the point of termination.

4.2.4 Empirical Approach

The empirical approach afforded by the novel data source make several contributions. One of the challenges of studying alliance terminations and re-formation is locating a setting to track these relationship events over time. My dissertation provides in-depth, project-level detail to build and expand on theory, which thus far has only been approached in a single case study setting (e.g., Arino and de la Torre, 1998; Faems et al, 2008). Such project level detail allows me to address several identification issues faced in quantitative alliance research.

Alliances are at a minimum a dyadic phenomenon, in the sense that at least two parties commit a significant collaboration to combine and share resources (Gulati and Gargiulo, 1999). It follows that firms may participate in multiple alliances simultaneously, and so the empirical observations may not be independent. The non-independence of observations presents a significant econometric challenge, as estimates may be biased. The bias occurs when alliance partners participate in multiple alliances and these observations are treated as independent. Moreover, when re-formation does occur, the decision is influenced by both parties' desire to re-form. Thus, empirical

approaches at the dyad level of analysis must also account for both the potential alliance relationships as well as the realized alliance relationships (e.g., Dushnitsky and Shaver, 2009).

Challenges of non-independence of observations and mutual selection are exacerbated by data limitations. In many cases, data aggregated from the firm level to the alliance level are unable to separate the performance and resource benefits of the alliance from the individual partnering firms. Alliance performance is typically measured as stock market reactions following the alliance announcement (Park and Mezias, 2005), managerial perceptions (Kale, et al, 2002) and task completion (Hoang and Rothaermel, 2009). In a similar vein, at a dyadic level it is also challenging to evaluate the quality and the fit of an alliance's resources. Empirical work in the alliance literature often uses patents and the patents' proximity to other technology classes to measure the extent of fit among resources brought together by alliance partners (e.g., Stuart, 2000; Sampson, 2007). Hall, Jaffe, and Trajtenberg (2001) note that the challenge in the aggregation of patent classes to the alliance level raised concerns of the adequacy or appropriateness of the measure.

In contrast, the detailed project level data available in the horse industry allows me to distinctly observe firm-level activities and alliance-level performance and experiences. Alliance performance is cleanly observed by the sale price achieved by the alliance's horses at auction. The data also provide information on the stud fee, a major variable cost incurred by the alliance partners. Building on Hoang and Rothaermel

(2005), I observe the completion of the task and the extent of the alliance's success or failure in monetary terms. Furthermore, the Thoroughbred horse industry setting is particularly useful in assessing the fit of the alliance partners at the outset. The genetics of the horse industry may appear to evolve similarly to high technology industries. However, the horse industry provides additional empirical benefits which differ from patent-based measures (Hall et al., 2001). The primary purpose of Thoroughbred horses as racehorses narrows the risk of potential noise in assessing the quality of a particular genetic path. Genetic streams are highly rated for their ability to yield race winners consistently through each generation. Industry efforts have focused solely on the identification of these successful genetic combinations for the purpose of racing. This is in contrast to high technology industries in which an entirely new technological frontier may be discovered that will dramatically alter the fit of previous patents and knowledge streams. Furthermore, my selection of yearling auctions also ensures that the alliance products are all at the same stage of commercialization—in contrast to high technology settings where firms are in a learning race (Hamel, 1991)—which allows for a cleaner setting to observe the alliance partners' efforts. Such clean measures of performance and resource fit resolve the empirical challenges of non-independence and mutual selection faced by the alliance literature.

4.2.5 Contributions to Management Practice

My dissertation makes several important contributions to management practice. One of the tenets of strategic management is that by selecting one strategic position a

firm creates barriers to pursuing other strategic positions. At the same time, firms engaged in alliances may face barriers to pursuing other alliance partners (e.g., Faems, et al, 2008). In such instances, re-formation is particularly attractive. Even when the partners face certain termination, former alliance partners should remain open to an alliance with the same partners in the future. Moreover, the partners should use the causal attributions from the termination and termination experiences from other terminated alliance relationships to improve upon prior mistakes in re-formed alliances.

Termination is not the end. Practitioners often face uncertainty over the decision to terminate an alliance relationship. The decision to terminate an alliance is in many cases clear and appropriate. However, it is in the best interest of both former partners to keep as many potential strategic alternatives as possible open in the future. My results show that practitioners who terminate an alliance relationship when there is greater market uncertainty, may have greater options in the future of forming an alliance with the same partner. The attribution of the termination both publicly and privately may alleviate concerns of strategic wrongdoing by either party. Moreover, the moment of termination may also be an important time to reinforce a sense of trust in the relationship. Alliance representatives may use their prior alliance experiences to develop a shared view of the termination and counsel each other on future opportunities in order to show sincere interest in the well-being of the respective other party.

Context matters. Practitioners' ability to form attributions of the alliance termination assumes that the partnering firms will invest dedicated resources to

interpreting the alliance termination. Organizations in alliance intensive industries with greater alliance experience are more likely to also have dedicated departments responsible for forming and managing alliance relationships (Kale et al, 2002). The findings of my dissertation also suggest there may be a similar relationship between alliance termination experience and dedicated alliance capabilities. At a minimum, firms should dedicate resources to developing causal attributions for alliance terminations. Alliance partners that use the alliance termination experiences are also more likely to re-form alliances. These findings add to prior work which emphasizes the importance of exit clauses in alliance contracts, to suggest that the alliance termination experiences may also limit damaged relationships by re-creating a sense of trust—despite potential breaches in trust—between the alliance partners.

4.3 Limitations

This dissertation is not without limitations. The external validity of these findings to industries other than the horse industry is an important question. The firms involved in my study are typically smaller organizations of approximately 20 employees and the industry experiences high uncertainty due to chance genetic variation. The cyclical nature of horse industry activities provides clear entry and exit points that may not be available for airline or telecommunications alliances. However, I argue that the results should be valid to all alliance intensive industries in which firms can carry a portfolio of alliances and partners share many of the tasks in the alliance project. Moreover, the relatively small size of these organizations may provide a more accurate setting to test my theory,

which partly relies on literature, at an interpersonal level. Inter-organizational trust is developed through the collective action of individuals (e.g., Zaheer, McEvily and Perrone, 1998; Ring and Van de Ven, 1994). In smaller organizations, it is more likely that the individuals play an important role in the alliance relationship on behalf of the entire organization. Thus, the findings may provide more meaningful support for using attributions and trust as the foundation for my theoretical framework, which explains how conditions surrounding termination and learning can enhance alliance re-formation.

The centrality measure used in my analysis assumes the network components are fully connected. Measures such as Bonacich centrality, which capture nodal centrality, include weighted measures based on the connectedness of the node's alters. In order to calculate the distance between the node and its alters, the network needs to be connected; otherwise the measures of centrality will vary (Wasserman and Faust, 1994). For instance, a network with disconnected components has at least "two nodes that belong to different components [that] do not have a finite distance between them" (p. 3, Opsahl, Agneessens, and Skorvetz, 2010). As a result, I use the centrality values for the network before the termination occurs, as the termination could create disconnected components. I also control for the quality of the horses. When quality is difficult for actors to observe, centrality may become more salient (Podolny, 1994). By incorporating both centrality and quality I am able capture the alliance's direct and indirect access to resources.

The matching between the past alliance partners is an important empirical consideration. In estimating the relationship that involves two firms jointly committing to

a common outcome (re-formation) there is a risk that ordinary least squares regression estimates may be biased (Greene, 2003). A key implication is that a firm forming alliances with all possible partners may inherently have a higher probability of re-formation by default because the firm's only option is to re-form with a prior partner. The firm's choices to form and re-form alliances are not independent. Furthermore, the dyadic level model of tie re-formation may be affected by the mutual selection required to re-form an alliance as relationship choices are not made independent of other possible partnership decisions (Dushnitsky and Shaver, 2009).

While structural models for many-to-many matching are available (e.g. Fox, 2010), my theory suggests a dynamic matching model is required. Unfortunately, such a model is not currently available. I control for matching between partners by including the control for reputation, which measures their access to similar levels of quality genetics. Alliance partners will seek access to race winning genetic lines that increase the willingness-to-pay of potential buyers. I provide a similar control for firm size. Such an approach allows me to account for factors that can be challenging to observe between the former partners prior to alliance re-formation. However, the results are robust to limiting the sample to alliances of similar quality and size. The results may also be biased due to the right censoring of the alliance duration as alliances may have produced horses for auction in years prior to 2005. I follow prior alliance work to assume that the window moves in three-year periods (e.g., Gulati and Gargiulo, 1999; Zaheer and Soda, 2009), which is a typical alliance duration. For example, an alliance observed in 2005 began in

2002 to breed and rear the offspring.

4.4 Future Directions

Taking the stance that termination is not simply the end but can be an enlightened beginning for alliances. Further research in this area opens a variety of future directions for fruitful work. Four future directions build directly on my dissertation research by looking at: the performance implications of alliance re-formation; the matching of re-formed alliances; the types of alliances pursued in re-formed alliances; and the link between vicarious learning and alliance re-formation. Other future directions extend from the findings of my dissertation to investigate the role of time and the effectiveness of verbal accounts to frame the termination.

Performance Implications of Alliance Re-formation. Alliance re-formation is assumed in my theorizing to be a positive outcome for the alliance partners. One future direction for this research is to assess the relationship between alliance re-formation and performance. The two primary challenges in estimating alliance performance models are the lack of clearly defined alliance level performance data (Arino, 2002), and the self-selection of strategic decisions made to improve performance (Shaver, 1998). My dissertation data allow me to address both estimation issues.

The detailed project-level data provide a clean setting to observe alliance performance. By separating the alliance's horses from the partners' own individually owned horses, I am able to distinguish between the alliance's and firms' performance. The price paid for the alliance's horses at auction are the product of the alliance's efforts.

The alliance's horses are clearly marked using the breeder item in the *Blood-Horse Auction Edge* data. The performance is captured using the auction results data. Thus, the setting cleanly separates the alliance's activities from the partners' individual firm activities and performance.

Firms select strategies in order to improve performance, so strategic choices such as alliance re-formation are endogenous to performance. In future research, I propose to use an instrument as the variation in the horses' fertility used by the alliance. Greater variance[19] in the horses' fertility will cause the alliance partners' to reassess their willingness to commit to a relationship. Mares (the female horses) have a range of fertility issues ranging from the inability to conceive (barren) to reabsorbing an embryo or aborting a fetus (slipped) and producing an offspring which dies (dead foal). Industry estimates of fertility rates show that nearly 90% of mares conceive (Cassidy, 2007). Inconsistent reproductive histories may signal a mare is reaching the end of her reproductive career.[20]

Importantly, fertility history is not related to the alliance's performance. Offspring are valued based on their racing potential rather than their reproductive abilities. Indeed,

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19 Fertility may also cause a mechanical termination for alliances that only produce one horse. If the mare does not conceive, the alliance would not be able to produce a horse for that particular year; this change could confound termination and re-formation. Thus, I use the variance in fertility across the mare's reproductive history to capture the alliance partner's willingness to breed horses that may be vulnerable to fertility issues.

20 Mares with fertility problems three years in a row lose their value entirely. However, mares that have produced a race winner but have fertility problems provide an opportunity for a firm with lesser resources to take a risk to produce offspring with higher quality genetics than would be ordinarily available to the firm.

despite the industry's high conception rate, the horses have developed reproductive weaknesses due to their genetic selection on physiological characteristics favorable to racing ability[21] (Cassidy, 2007). Thus, fertility serves as an appropriate instrument for the relationship between alliance re-formation and alliance performance.

Matching. The theory in my dissertation assumes that alliance partners make the decision to re-form in a dynamic setting based on their learning from termination. However, the role of alliance terminations on alliance choices might also be interesting to consider as a static single-shot game. Early data analysis suggests firms with greater termination experience have fewer quality resources. Yet, my data find the same termination experience has a positive relationship with performance. The data imply that firms accumulating terminations do more with less. Two possible explanations exist for this pattern of results. Firms may use the alliances as a vehicle of control to exploit their existing positional advantages over disadvantaged firms, operating in a mode of asymmetric control (Inkpen and Beamish, 1997). Alternatively, the firms may be operating in a stewardship approach and, through accumulated terminations over time, choose less attractive genetic paths that may promote the long-term health of the genetic pool for the industry. By including both the firm and alliance characteristics, I am able to build a structural two-sided, many-to-many matching model (Fox, 2010) to investigate these alliance selection choices.

21Mares are bred to have more muscular hindquarters which changes the angle of the vagina so that it is more susceptible to contamination. Veterinary intervention sutures the vulva, called the *Casilick* operation, preventing contamination.

Another future direction is to tease out the probability for terminated alliances to re-form. My theory has assumed a universe of antecedents to re-formation from terminated alliances. I am only able to observe alliance re-formations for terminated alliances rather than all possible alliances. This selection bias becomes a concern when I compare alliance formation antecedents to alliance re-formation antecedents. Ideally, I need to observe alliance re-formations that came from both a hypothetical universe of all possible alliances and from a universe where the alliances terminated. A possible approach for this problem is to use an instrument for alliance termination that predicts alliance termination but is unrelated to alliance re-formation. One possibility draws on the 2008 financial crisis. In Figure 5A, alliance terminations increase in 2009 as a reaction to the 2008 financial crisis, while the tendency for alliance formation and re-formation remain constant. The figure suggests that a year dummy for 2009 captures the variance in alliance termination but is unrelated to alliance re-formation. I could complete this analysis using a logit two-stage selection model based on my existing data (e.g. Dubin and McFadden, 1984; Dubin and Rivers, 1989).

Network Measures. My dissertation treated network measures as controls addressing the social context in which the terminating alliance was embedded. Network measures may also be considered as important predictors of alliance re-formation. For instance, terminations which include multi-party defections may provide more stability in terms of forming an attribution for termination which will aid alliance re-formation even though the network has experienced greater instability (e.g. Greve et al, 2010). Several

parties sharing the same structure may make the reasoning for termination abundantly clear. The clique of alliances may be more likely re-form because the partners can reach an appropriate remedy for termination. Thus, network density might also reveal a counterintuitive result when considering alliance re-formation.

Re-formation and its network antecedents might also shed light on network evolution (Ahuja, Soda and Zaheer, 2012). For instance, network characteristics preceding alliance termination might reveal how firms trade off past relationships for future opportunities. Structural holes may remain open because prior alliance terminations were so severe that alliance partners will avoid their former partners at all costs.

Re-structuring Relationships. Another area for further research would be to investigate the alternate relationships past partners pursue if they do not re-form. Recent research on alliance terminations by Greve et al. (2010) finds that alliance terminations can have a ripple effect through the network by causing multi-party defections. At the same time, Gulati and Gargiulo (1999) find that newly formed alliances will mimic the structures of previous alliances. Taken together, it is not clear whether, after termination, firms are able to partner with similarly positioned firms as their previous partners. Rather, firms may find they have to take on partners with entirely different characteristics and approach. In order to test this relationship, I will use the dissertation data to understand whether firms opt for one-sided control-based relationships or mutual relationships. In my setting, one-sided alliances form in a foal-sharing agreement, where a mare owner

allows the stallion owner to dictate the terms for a breeding and the stallion owner and mare owner share the ownership of the offspring. Mare owners enter into these agreements to secure a breeding to a stallion that may be of higher quality than the mare. However, the mare owner is at the mercy of the stallion owner, who largely controls the placement of the offspring at auction. In foal sharing agreements, one of the breeders is listed as the stallion syndicate rather than the stud farm. In contrast, mare-sharing alliances allow for mutual participation of both parties through the breeding and raising decisions of the offspring. Following alliance terminations, one could expect that in a logic of control, a firm would choose to set expectations *ex ante* and pursue foal-sharing agreements. On the other hand, a logic of learning and cooperation suggests that firms will continue to pursue mare-sharing and use the prior alliance learning to improve with other partners.

Along these lines, a number of possible contingencies may provide interesting results. For instance, building directly from my dissertation, one might intuitively anticipate that following termination caused by increased alliance complexity, firms would subsequently opt for alliances narrow in scope, such as foal-sharing arrangements. However, I would argue that firms are more likely to opt for mare-sharing arrangements when prior alliances were terminated under increased complexity. Based on the findings from my dissertation, and drawing on the idea that increased complexity facilitates learning (Haunschild and Sullivan, 2002), firms will be more open to cooperative arrangements by maintaining a willingness to trust. Moreover, firms are more likely to

operate in a logic of control and pursue foal-sharing arrangements if the termination has clear causes, such as competitive or behavioral uncertainty.

Vicarious Learning and Alliance Re-formation. Thus far, I assume that alliance termination experience is positive in relation to learning for the alliance termination partners. Kale et al. (2002) suggest that alliance experience and alliance capabilities are related but distinct constructs. My finding for the relationship between general alliance termination experiences and alliance re-formation suggests that partners may accrue benefits by looking across relationships. Pushing learning spillovers further, there may also be a distinct role for experiential and vicarious learning processes in terms of alliance re-formation. For instance, alliance partners may also learn vicariously from other alliance terminations in the industry. Baum, Li, and Usher (2000) find that firms who learn vicariously tend to imitate the actions of other firms. Building from my dissertation, treating termination as a relatively rare event, partners may re-form by imitating similar attributions used for terminations by other alliance partners. For example, if terminating partners observe other terminating alliances using an external attribution, that may give further credibility to the attribution. However, in the case of experiential learning, which treats termination as a repeated event, firms may attempt to replicate their prior successes after terminations based on their own experience in other similar tasks. Thus, in terms of alliance re-formation, partners may replicate causal attributions that appeared to work for other re-formed alliances between other partners if the focal dyad lacks successful termination experience.

Two other future directions of study, building from my dissertation, that may require additional data sources involve investigations into the role of time and of framing. The former addresses the time it takes for the reputational disadvantages of termination to expire. The latter investigates the consistency of understanding, or framing, between the alliance partners.

Does time heal all wounds? The length of time taken to re-form may also be interesting in contexts with different periodicity. My dissertation has purposely avoided empirical investigation on the duration of time between the alliance termination and re-formation. I employ a common assumption in the horse industry that a year is a sufficient lapse between relationships. In other settings (e.g. Faems et al., 2008), very little time passes between the termination and re-formation. At the same time, research in other strategic settings investigating the role of time has proved very fruitful. One example is overcoming the liability of foreignness (Zaheer, 1995). A study using a longer panel of alliance data might uncover the length of time at which the reputational disadvantages from termination due to behavioral uncertainty might fade.

Other research might pursue the use of verbal accounts to test the effectiveness of re-framing past terminations. "Framing" refers to the meaning that actors ascribe to events using words and messages (e.g. Bateson, 2000). My dissertation has assumed that both alliance partners share the same sources of information and similar interpretations of the alliance termination event. However, in dyadic relationships each side may have viewed this same information differently (McEvily, Zaheer, and Fudge Kamal, 2012).

The framing of the alliance termination may evolve through dialectics, a partisan conflict of opposing views which lead to a new equilibrium (Hargrave and Van de Ven, 2006). The two alliance partners may emphasize different attributions and diverge on the causes of the termination. When the former partners communicate their divergent views in verbal accounts, the partners may continue their partisan views or reconcile their frames through mutual adjustment. Qualitative research can uncover the verbal frames used to develop shared interpretations of the alliance termination.

4.5 Conclusion

In summary, the findings in this dissertation have considerable relevance to the literature on inter-organizational relationships. In many cases the need for alliances continues despite the partnering firms' decision to terminate, particularly in alliance-intensive industries such as airlines, pharmaceuticals, telecommunications, and biotechnology. Further, the partnering firms may have compelling economic incentives based on their resources and capabilities to maintain a good position following a termination to re-form the alliance. By drawing on the uncertainty related to the alliance termination, firms may be able to re-form their alliance. Given that many firms leave alliance contracts under-specified, particularly in the formulation of exit clauses, alliance partners can pre-empt costly exits by focusing their attention on experience from past terminations. Moreover, alliance partners should pay attention to primary uncertainty as the rationale for the termination. Useful reflection across alliance terminations, gained through termination experience, can enable former partners to re-form successfully.

TABLES

TABLE 1
Description of Measures

Measure	Level	Description
Dependent Variable:		
Alliance Re-formation	Alliance	1,0 code if the alliance is present in the year following termination
Independent Variables:		
Primary Uncertainty	Alliance	Average number of offspring produced by stallions used by the focal alliance to produce alliance's offspring in a given year: $$\sum x_i/n$$ Where x_i is the number of offspring for stallion i used to horse k for alliance j n is the number of horses produced by alliance j
Task Inexperience	Firm	Average of firm$_i$ and firm$_j$'s number of sales participated in each year: $$x_i+x_j/2$$ Where x_{ik} is the number of sales participated in each year by firm i and x_{jk} is the number of sales participated in by firm j
Complexity	Alliance	Number of alliance offspring where either member firm$_i$ or firm$_j$ act as

			consignor.
	Termination Experience	Firm	Average of firm$_i$ and firm$_j$'s accumulated number of general alliance terminations in each year: $(x_{tik} + x_{t-1ik}) + (x_{tjk} + x_{t-1jk})/2$ Where x_{tik} is the number of general alliance terminations incurred by firm i in year t participating in alliance k and x_{tjk} is the number of general alliance terminations incurred by firm j in year t participating in alliance k

Measure		Level	Description
Controls:			
	Competitive Uncertainty	Alliance	Sum of horses in sale$_k$ which match the same genetics as alliance$_i$'s horse in the same sale in a given year
	Past Duration	Alliance	Accumulated consecutive number of years for alliance$_k$
	Strength	Alliance	Number of horses sold in a given year by alliance$_i$
	Reputation	Alliance	Alliance average percentage of races won by offspring sharing the same *sire x dam-sire* genetics $$\sum x_j/n_j$$ Where x_i is the percentage of races won by offspring sharing the same sire x dam-sire combination for a horse bred by alliance j n is the number of horses produced by alliance j
	Performance	Alliance	Average sale price achieved at auction for horses bred and sold by the alliance in each year $$\sum x_j/n_j$$ Where x_i is the sale price for a horse sold at auction by alliance j n is the number of horses sold by alliance j

	Size	Firm	Average of firm$_i$ and firm$_j$'s number of horses offered at auction in each year $x_i+x_j/2$ Where x_i is the number of horses offered at auction by firm i and x_j is the number of horses offered at auction by firm j
	Centrality	Firm	Joint Bonacich (1987) eigenvector centrality of firm$_i$ and firm$_j$ $$c(\alpha,\beta) = \alpha \sum_{k=0}^{\infty} \beta^k R^{k+1} \mathbf{1},$$ Where α is a scaling factor, β is a weighting factor. R is a relational matrix, which is 0 along the main diagonal and in which cell r$_{ij}$ summarizes the relative superiority of I with respect to j, and 1 is a column vector of 1's (Podolny, 1994, p.466)

TABLE 2
Descriptive Statistics

		mean	s.d.	min	max
	Alliance[a]	0.24	0.43	0.00	1.00
	Termination[a]	0.15	0.36	0.00	1.00
1.	Re-formation[a]	0.01	0.10	0.00	1.00
2.	Primary Uncertainty[b]	25.03	60.36	2.00	1532.00
3.	Task Experience	2.46	0.70	1.50	7.00
4.	Complexity	0.27	1.05	0.00	42.00
5.	Termination Experience	3.33	4.36	1.00	43.00
6.	Competitive Uncertainty	1.03	0.17	1.00	5.00
7.	Size	4.46	4.55	2.00	86.00
8.	Strength	1.20	0.82	1.00	22.00
9.	Past Duration	3.44	1.02	3.00	7.00
10.	Centrality	14.05	129.65	2.00	9317.00
11.	Reputation(%)	49.22	30.83	0.00	100.00
12.	Sale Performance ($)	43968.50	123332.30	-27500.00	2600000.00

[a]Descriptive statistics are provided for the entire sample.
[b]Lagged descriptive statistics are provided for the sample of terminated alliances.

TABLE 3

Correlations

		1	2	3	4	5	6	7	8	9	10	11	12
1.	Re-formation	1											
2.	Primary Uncertainty	0.029	1										
3.	Task Experience	0.005	0.158***	1									
4.	Complexity	0.014	0.229***	0.172***	1								
5.	Termination Experience	0.0493*	0.022	0.399***	0.0846***	1							
6.	Competitive Uncertainty	-0.024	0.249***	0.234***	0.209***	0.0491*	1						
7.	Size	-0.021	0.276***	0.641***	0.249***	0.542***	0.179***	1					
8.	Strength	-0.005	0.564***	0.335***	0.419***	0.0571**	0.410***	0.457***	1				
9.	Past Duration	0.023	0.211***	0.116***	0.035	-0.00807	0.138***	0.0919***	0.229***	1			
10.	Centrality	-0.006	0.579***	0.177***	0.424***	0.101***	0.372***	0.391***	0.708***	0.124***	1		
11.	Reputation(%)	0.001	-0.015	-0.010	0.024	0.004	-0.004	-0.0094	-0.0069	-0.0004	-0.0004	1	
12.	Sale Performance ($)	-0.014	0.036	0.0381*	0.023	0.0984***	-0.017	0.0594**	-0.0185	0.019	-0.0004	0.002	1

$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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TABLE 4A

Random-Effects Logistic Regression Results

Stepwise random effects logistic regression results for the dependent variable alliance re-formation. Model 1 introduces the control variables only. Models 2 through 5 introduce the independent variables separately for hypotheses 1 to 4 respectively. Model 6 presents the saturated model including all of the controls and independent variables.

VARIABLES	(1) Controls	(2) H1 Primary Uncertainty	(3) H2 Task Experience	(4) H3 Complexity	(5) H4 Termination Experience	(6) Saturated
Competitive Uncertainty $_{i,t-2}$	-0.397**	-0.484**	-0.349*	-0.398**	-0.475**	-0.517**
	(0.202)	(0.205)	(0.202)	(0.201)	(0.206)	(0.208)
Past Duration $_{i,t-2}$	-1.560***	-1.633***	-1.565***	-1.565***	-1.586***	-1.652***
	(0.179)	(0.183)	(0.179)	(0.179)	(0.180)	(0.184)
Strength $_{i,t-2}$	1.020***	0.818***	1.071***	0.995***	0.550***	0.367*
	(0.201)	(0.208)	(0.202)	(0.202)	(0.208)	(0.219)
Centrality $_{i,t-2}$	0.528***	0.525***	0.529***	0.524***	0.635***	0.629***
	(0.0466)	(0.0465)	(0.0465)	(0.0467)	(0.0494)	(0.0496)
Size $_{i,t-2}$	-0.863***	-0.860***	-0.655***	-0.870***	0.219	0.378*
	(0.147)	(0.148)	(0.183)	(0.148)	(0.187)	(0.219)
Reputation $_{i,t-2}$	0.0708*	0.0150	0.0700*	0.0718*	0.0664*	0.0118
	(0.0371)	(0.0410)	(0.0371)	(0.0371)	(0.0380)	(0.0420)
Sale Performance $_{i,t-2}$	0.0600**	0.0542**	0.0566**	0.0590**	0.0662**	0.0568**
	(0.0258)	(0.0260)	(0.0258)	(0.0259)	(0.0259)	(0.0264)
Primary Uncertainty $_{i,t-2}$		0.175***				0.175***
		(0.0484)				(0.0499)
Task Experience $_{i,t-2}$			-0.732*			-0.601*
			(0.394)			(0.408)

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Complexity $_{i,t-2}$					0.214	0.239
					(0.155)	(0.160)
Termination Experience $_{i,t-1}$					1.781***	1.775***
					(0.231)	(0.232)
2008.year	2.483***	2.380***	2.482***	2.485***	2.660***	2.546***
	(0.230)	(0.232)	(0.230)	(0.230)	(0.239)	(0.241)
2009.year	3.845***	3.795***	3.830***	3.836***	4.393***	4.304***
	(0.341)	(0.344)	(0.340)	(0.341)	(0.356)	(0.359)
2010.year	1.380***	1.190***	1.382***	1.357***	2.612***	2.393***
	(0.317)	(0.325)	(0.318)	(0.318)	(0.356)	(0.365)
Constant	5.494***	5.498***	5.883***	5.477***	6.572***	6.826***
	(0.652)	(0.658)	(0.687)	(0.653)	(0.678)	(0.716)
Observations	2,313	2,313	2,313	2,313	2,313	2,313
Groups	2,256	2,256	2,256	2,256	2,256	2,256
N	2313	2313	2313	2313	2313	2313
Degrees of freedom	10	11	11	11	11	14
Log-likelihood	-806.0	-799.5	-804.3	-805.1	-775.3	-766.9

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

TABLE 4B

Random-Effects Logistic Regression Results

Stepwise random effects logistic regression results for the dependent variable alliance re-formation. Coefficients are presented as Log-Odds, values less than 1 indicate a negative relationship and values more than 1 indicate a positive relationship. Model 1 introduces the control variables only. Models 2 through 5 introduce the independent variables separately for hypotheses 1 to 4 respectively. Model 6 presents the saturated model including all of the controls and independent variables.

VARIABLES	(1) Controls	(2) Primary Uncertainty	(3) Task Experience	(4) Complexity	(5) Termination Experience	(6) Saturated
Competitive Uncertainty $_{i,t-2}$	0.673**	0.616**	0.705*	0.671**	0.622**	0.597**
	(-1.966)	(-2.369)	(-1.732)	(-1.978)	(-2.309)	(-2.486)
Past Duration $_{i,t-2}$	0.210***	0.195***	0.209***	0.209***	0.205***	0.192***
	(-8.709)	(-8.934)	(-8.757)	(-8.721)	(-8.795)	(-8.981)
Strength $_{i,t-2}$	2.775***	2.265***	2.919***	2.706***	1.734***	1.444*
	(5.085)	(3.922)	(5.293)	(4.926)	(2.648)	(1.675)
Centrality $_{i,t-2}$	1.696***	1.690***	1.697***	1.689***	1.887***	1.876***
	(11.35)	(11.27)	(11.37)	(11.23)	(12.86)	(12.68)
Size $_{i,t-2}$	0.422***	0.423***	0.520***	0.419***	1.245	1.459*
	(-5.851)	(-5.812)	(-3.573)	(-5.889)	(1.173)	(1.724)
Reputation $_{i,t-2}$	1.073*	1.015	1.073*	1.074*	1.069*	1.012
	(1.907)	(0.367)	(1.885)	(1.935)	(1.746)	(0.282)
Sale Performance $_{i,t-2}$	1.062**	1.056**	1.058**	1.061**	1.068**	1.058**
	(2.328)	(2.088)	(2.193)	(2.280)	(2.558)	(2.150)
Primary Uncertainty $_{i,t-2}$		1.191***				1.191***
		(3.611)				(3.512)
Task Experience $_{i,t-2}$			0.481*			0.548*

				(-1.856)		(-1.861)
Complexity $_{i,t-2}$				1.239		1.270
				(1.384)		(1.499)
Termination Experience $_{i,t-1}$					1.832***	1.831***
					(7.702)	(7.641)
2008	11.97***	10.80***	11.96***	12.00***	14.30***	12.76***
	(10.79)	(10.27)	(10.79)	(10.80)	(11.11)	(10.54)
2009	46.74***	44.49***	46.08***	46.35***	80.92***	73.99***
	(11.29)	(11.05)	(11.27)	(11.25)	(12.34)	(12.00)
2010	3.973***	3.287***	3.981***	3.883***	13.62***	10.95***
	(4.352)	(3.664)	(4.346)	(4.270)	(7.334)	(6.552)
Constant	243.2***	244.3***	359.0***	239.0***	714.8***	921.6***
	(8.425)	(8.353)	(8.558)	(8.390)	(9.696)	(9.528)
Observations	2,313	2,313	2,313	2,313	2,313	2,313
Groups	2,256	2,256	2,256	2,256	2,256	2,256
Log-likelihood	-806.0	-799.5	-804.3	-805.1	-775.3	-766.9

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

TABLE 5

Robustness of Estimation Results

The dependent variable is alliance re-formation. Regression models showing the robustness of the estimation approach. Models 1 through 4 use the panel structure and lagged independent and control variables. Model 1 presents the results for the linear probability model. Models 2 and 3 show logistic regression results using robust and clustered standard errors. Model 4 yields the marginal effects. Model 5 provides results from fixed effects regression. Model 6 uses a Cox hazard model incorporating the years of risk to re-forming an alliance. Model 7 uses cross-sectional, regressing re-formation on the antecedents selected at the point of termination.

VARIABLES	(1) Linear Probability Model (Robust)	(2) Logistic Regression (Robust)	(3) Logistic Regression (Clustered)	(4) Marginal Effects	(5) Fixed Effects	(6) Cox Proportional Hazards	(7) Cross-section (Robust)
Competitive Uncertainty	-0.0479***	-0.517***	-0.517***	-0.050***	-0.883**	-0.123	-2.064
	(0.0180)	(0.190)	(0.190)	(0.019)	(0.393)	(0.181)	(1.364)
Past Duration	-0.182***	-1.652***	-1.652***	-0.161***			-0.199*
	(0.0169)	(0.311)	(0.312)	(0.025)			(0.105)
Strength	0.0585**	0.367*	0.367*	0.0359*	-0.239	-0.353*	0.0811
	(0.0258)	(0.213)	(0.214)	(0.0210)	(0.202)	(0.182)	(0.409)
Centrality	0.105***	0.629***	0.629***	0.062***		-0.765***	-0.641***
	(0.00750)	(0.0510)	(0.0510)	(0.006)		(0.184)	(0.241)
Size	0.0442*	0.378	0.378	0.0369		-0.241***	4.758***
	(0.0261)	(0.231)	(0.236)	(0.023)		(0.0662)	(0.904)
Reputation	0.00451	0.0118	0.0118	0.001		-0.330***	-0.104*
	(0.00411)	(0.0430)	(0.0429)	(0.004)		(0.0536)	(0.0581)

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sale Performance	0.00809	0.0568*	0.0568*	0.006*		0.0102	0.0362
	(0.00544)	(0.0312)	(0.0312)	(0.003)		(0.0573)	(0.0500)
Primary Uncertainty	0.0150***	0.175***	0.175***	0.017***	0.132*	0.103***	0.332***
	(0.00564)	(0.0496)	(0.0495)	(0.005)	(0.0772)	(0.0385)	(0.0667)
Task Experience	-0.0703*	-0.601*	-0.601*	-0.059*	-1.342***	0.0223*	0.277
	(0.0403)	(0.407)	(0.407)	(0.040)	(0.402)	(0.340)	(0.545)
Complexity	0.0260	0.239	0.239	0.023	0.166	0.0170	0.0335
	(0.0194)	(0.157)	(0.157)	(0.015)	(0.499)	(0.0444)	(0.212)
Termination Experience$_t$	0.259***	1.775***	1.775***	0.173***	6.480***	1.078***	0.360***
	(0.0274)	(0.237)	(0.238)	(0.025)	(0.711)	(0.107)	(0.0815)
2007				-0.308	7.737***		
				(0.074)	(0.804)		
2008	0.325***	2.546***	2.546***	0.016***	5.976***		2.165***
	(0.0253)	(0.294)	(0.293)	(0.062)	(0.574)		(0.343)
2009	0.545***	4.304***	4.304***	0.303***	1.845***		2.663***
	(0.0377)	(0.504)	(0.503)	(0.158)	(0.367)		(0.315)
2010	0.480***	2.393***	2.393***				
	(0.0476)	(0.422)	(0.421)				
Constant	1.334***	6.826***	6.826***				-4.874***
	(0.0718)	(1.025)	(1.025)				(0.624)
Observations	2,313	2,313	2,313	2313	886	3,588	2,764
R-squared	0.253						
N	2313	2313	2313	2313	886	3588	2764

Log-Likelihood	-643.6	-766.9	-766.9	-766.9	-152.7	-1570	-475.5
Groups					356		

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE 6

Robustness of Primary Uncertainty Measure

Random-effects logistic regression results testing robustness of primary uncertainty measures. Dependent variable is alliance re-formation. Model 1 shows the number of offspring measure used in Table 4. Model 2 measures primary uncertainty as a ratio of the number of horses that did not sell (Reserve not attained – RNA) at auction to the number of horses that the alliance was unable to sell, which captures a relative measure of the controllability of the partner's actions. Model 3 uses the change in the number of a sire's offspring to capture a transition from the partner's expected state. The years of 2008, 2009, and 2010 also experienced market uncertainty due to the financial crisis.

VARIABLES	(1) Number of Offspring	(2) RNA	(3) Δ Offspring
Competitive Uncertainty $_{i,t-2}$	-0.517**	-0.428**	-0.739**
	(0.208)	(0.206)	(0.341)
Past Duration $_{i,t-2}$	-1.652***	1.582***	-1.464***
	(0.184)	(0.180)	(0.181)
Strength $_{i,t-2}$	0.367*	0.569***	0.226
	(0.219)	(0.210)	(0.334)
Centrality $_{i,t-2}$	0.629***	0.634***	1.086***
	(0.0496)	(0.0496)	(0.105)
Size $_{i,t-2}$	0.378*	0.413*	0.430
	(0.219)	(0.219)	(0.369)
Reputation $_{i,t-2}$	0.0118	0.0676*	0.196***
	(0.0420)	(0.0381)	(0.0732)
Sale Performance $_{i,t-2}$	0.0568**	0.0650**	0.196***
	(0.0264)	(0.0261)	(0.0689)
Primary Uncertainty (#Offspring) $_{i,t-2}$	0.175***		
	(0.0499)		
Primary Uncertainty (RNA) $_{i,t-2}$		0.0138	
		(0.0135)	
Primary Uncertainty (Δ Offspring) $i,t-2$			0.000900*
			(0.000498)
Task Experience $_{i,t-2}$	-0.601*	-0.711*	-0.525
	(0.408)	(0.411)	(0.662)
Complexity $_{i,t-2}$	0.239	0.219	-0.150
	(0.160)	(0.159)	(0.268)
Termination Experience $_{i,t-1}$	1.775***	1.763***	2.040***
	(0.232)	(0.232)	(0.363)
2008	2.546***	2.644***	
	(0.241)	(0.239)	

2009	4.304***	4.357***	2.004***
	(0.359)	(0.355)	(0.290)
2010	2.393***	2.511***	0.709*
	(0.365)	(0.366)	(0.427)
Constant	6.826***	6.528***	10.74***
	(0.716)	(0.781)	(1.101)
Observations	2,313	2,313	860
R-squared	2,256	2,256	809
N	2313	2313	860
Log-Likelihood	14	14	13
Groups	-766.9	-772.5	-276.4

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE 7

Robustness of Task Experience Measure

Random-effects logistic regression results showing the robustness of task experience. The dependent variable is alliance re-formation. Model 1 shows task experience measured as the average of the two partner's sale experience, which is the same measure used in Table 4. Model 2 uses the minimum value of the two partner's sale experience. Model 3 measures the maximum value of the two partner's sale experience. Model 4 takes the difference of the two firm's sale experience.

VARIABLES	(1) Average	(2) Minimum	(3) Maximum	(4) Difference
Competitive Uncertainty $_{i,t-2}$	-0.517**	-1.146**	-0.502**	-0.533***
	(0.208)	(0.471)	(0.207)	(0.206)
Past Duration $_{i,t-2}$	-1.652***		-1.648***	-1.642***
	(0.184)		(0.183)	(0.183)
Strength $_{i,t-2}$	0.367*	0.430	0.325	0.149
	(0.219)	(0.488)	(0.217)	(0.222)
Centrality $_{i,t-2}$	0.629***	1.479***	0.633***	0.643***
	(0.0496)	(0.287)	(0.0497)	(0.0500)
Size $_{i,t-2}$	0.378*	-0.219	0.481**	0.421**
	(0.219)	(0.415)	(0.218)	(0.194)
Reputation $_{i,t-2}$	0.0118	0.226**	0.0115	0.00782
	(0.0420)	(0.0903)	(0.0421)	(0.0423)
Sale Performance $_{i,t-2}$	0.0568**	0.154**	0.0559**	0.0579**
	(0.0264)	(0.0644)	(0.0264)	(0.0264)
Primary Uncertainty $_{i,t-2}$	0.175***	0.257**	0.174***	0.177***
	(0.0499)	(0.112)	(0.0500)	(0.0501)
Task Experience (Avg) $_{i,t-2}$	-0.601*			
	(0.408)			
Task Experience (Min) $_{i,t-2}$		1.202		
		(0.821)		
Task Experience (Max) $_{i,t-2}$			-0.759**	
			(0.317)	
Task Experience (Diff) $_{i,t-2}$				-0.708***
				(0.200)
Complexity $_{i,t-2}$	0.239	0.556	0.239	0.262
	(0.160)	(0.353)	(0.159)	(0.160)
Termination Experience $_{i,t-1}$	1.775***	3.383***	1.741***	1.639***
	(0.232)	(0.764)	(0.232)	(0.234)

2008	2.546***	2.832***	2.539***	2.518***
	(0.241)	(0.649)	(0.242)	(0.243)
2009	4.304***	3.860***	4.270***	4.198***
	(0.359)	(0.797)	(0.358)	(0.357)
2010	2.393***	1.761**	2.374***	2.288***
	(0.365)	(0.691)	(0.365)	(0.367)
Constant	6.826***	2.831***	6.862***	6.361***
	(0.716)	(1.061)	(0.699)	(0.678)
Observations	2,313	2,313	2,313	2,313
Groups	2,256	2,256	2,256	2,256
Log-Likelihood	-766.9	-830.8	-765.1	-761.5

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE 8

Robustness of Complexity Measure

Random-effects logistic regression results testing the robustness of complexity. The dependent variable is alliance re-formation. Model 1 measures complexity as the percentage of the alliance's horses offered at auction where either partner acts as both seller and consignor, the same measure is used in Table 4. In model 2 complexity is dummy coded where 1 indicates a seller and consignor are the same on at least one horse, and 0 the seller and consignor of the alliance's horses differ.

VARIABLES	(1) % of horses offered	(2) dummy coded
Competitive Uncertainty $_{i,t-2}$	-0.517**	-0.519**
	(0.208)	(0.208)
Past Duration $_{i,t-2}$	-1.652***	-1.652***
	(0.184)	(0.184)
Strength $_{i,t-2}$	0.367*	0.392*
	(0.219)	(0.219)
Centrality $_{i,t-2}$	0.629***	0.629***
	(0.0496)	(0.0496)
Size $_{i,t-2}$	0.378*	0.377*
	(0.219)	(0.219)
Reputation $_{i,t-2}$	0.0118	0.0115
	(0.0420)	(0.0420)
Sale Performance $_{i,t-2}$	0.0568**	0.0567**
	(0.0264)	(0.0264)
Primary Uncertainty (#Offspring) $_{i,t-2}$	0.175***	0.175***
	(0.0499)	(0.0499)
Task Experience (Avg) $_{i,t-2}$	-0.601*	-0.612*
	(0.408)	(0.408)
Complexity (%) $_{i,t-2}$	0.239	
	(0.160)	
Complexity (dummy) $_{i,t-2}$		0.304
		(0.194)
Termination Experience $_{i,t-1}$	1.775***	1.769***
	(0.232)	(0.232)

2008	2.546***	2.544***
	(0.241)	(0.241)
2009	4.304***	4.301***
	(0.359)	(0.358)
2010	2.393***	2.387***
	(0.365)	(0.365)
Constant	6.826***	6.824***
	(0.716)	(0.716)
Observations	2,313	2,313
Groups	2,256	2,256
Log-Likelihood	-766.9	-766.8

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE 9

Robustness of Alliance Termination Experience

Random-effects logistics regression results showing the robustness of alliance termination experience. The dependent variable is alliance re-formation. Model 1 uses the average of the two partners' general termination experience, the same measure shown in Table 4. Model 2 considers the minimum value between the two partner's general termination experiences. Model 3 takes the maximum value of the two partner's general termination experiences. In Model 4, the two partner's general termination experiences are differenced and measures the absolute value of the difference. Models 5 and 6 account for the influence of alliance formations on alliance terminations, Model 5 uses a ratio of the partners' average termination experience to the partner's average formation experience and Model 6 includes the partner's average formation experience as a control variable.

VARIABLES	(1) Average	(2) Minimum	(3) Maximum	(4) Difference	(5) Ratio	(6) Formation Control
Competitive Uncertainty $_{i,t-2}$	-0.517**	-0.461**	-0.446**	-0.440**	-0.450**	-0.517**
	(0.208)	(0.205)	(0.205)	(0.205)	(0.205)	(0.208)
Past Duration $_{i,t-2}$	1.652***	1.674***	-1.637***	-1.630***	1.632***	-1.652***
	(0.184)	(0.184)	(0.182)	(0.183)	(0.183)	(0.184)
Strength $_{i,t-2}$	0.367*	0.872***	0.822***	0.818***	0.870***	0.357
	(0.219)	(0.213)	(0.212)	(0.214)	(0.213)	(0.235)
Centrality $_{i,t-2}$	0.629***	0.522***	0.523***	0.522***	0.518***	0.630***
	(0.0496)	(0.0465)	(0.0466)	(0.0466)	(0.0466)	(0.0498)
Size $_{i,t-2}$	0.378*	0.649***	-0.625***	-0.676***	0.765***	0.401
	(0.219)	(0.186)	(0.187)	(0.186)	(0.191)	(0.294)
Reputation $_{i,t-2}$	0.0118	0.0138	0.0163	0.0168	0.0158	0.0119
	(0.0420)	(0.0410)	(0.0411)	(0.0411)	(0.0410)	(0.0420)
Sale Performance $_{i,t-2}$	0.0568**	0.0487*	0.0489*	0.0503*	0.0494*	0.0568**
	(0.0264)	(0.0262)	(0.0262)	(0.0261)	(0.0263)	(0.0264)

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	(1)	(2)	(3)	(4)	(5)	(6)
Primary Uncertainty $_{i,t-2}$	0.175***	0.174***	0.174***	0.174***	0.175***	0.175***
	(0.0499)	(0.0488)	(0.0487)	(0.0487)	(0.0487)	(0.0499)
Task Experience (Avg) $_{i,t-2}$	-0.601*	-0.673*	-0.662*	-0.641*	-0.640*	-0.600*
	(0.408)	(0.399)	(0.399)	(0.398)	(0.399)	(0.408)
Complexity $_{i,t-2}$	0.239	0.219	0.248	0.231	0.196	0.241
	(0.160)	(0.156)	(0.156)	(0.156)	(0.156)	(0.160)
Termination Experience (Avg) $_{i,t-1}$	1.775***					1.729***
	(0.232)					(0.466)
Termination Experience (Min) $_{i,t-1}$		0.958*				
		(0.550)				
Termination Experience (Max) $_{i,t-1}$			0.876**			
			(0.433)			
Termination Experience (Dif) $_{i,t-1}$				0.187		
				(0.263)		
Termination Experience (Ratio) $_{i,t-1}$					0.897*	
					(0.524)	
Formation Experience $_{i,t-2}$						-0.0688
						(0.595)
2008	2.546***	2.459***	2.561***	2.420***	2.376***	2.550***
	(0.241)	(0.238)	(0.250)	(0.239)	(0.232)	(0.243)
2009	4.304***	3.978***	4.088***	3.822***	3.791***	4.310***
	(0.359)	(0.367)	(0.381)	(0.351)	(0.344)	(0.362)
2010	2.393***	1.642***	1.759***	1.244***	1.211***	2.404***
	(0.365)	(0.423)	(0.436)	(0.343)	(0.328)	(0.378)
Constant	6.826***	6.566***	6.353***	5.774***	6.405***	6.829***
	(0.716)	(0.830)	(0.753)	(0.696)	(0.775)	(0.717)
Observations	2,313	2,313	2,313	2,313	2,313	2,313
Groups	2,256	2,256	2,256	2,256	2,256	2,256
Log-Likelihood	-766.9	-795.5	-795.1	-796.9	-795.7	-766.9

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE 10
Antecedents of Alliance Termination

Random-effects logistics regression results showing the antecedents of alliance termination. The dependent variable is alliance termination. Model 1 only includes the control variables. Models 2 through 6 introduce hypothesized antecedents as well as alliance formation experience in a series of stepwise models. Alliance formation experience is included in Model 6 to show the contrasting findings for alliance termination experience. Model 7 provides the results for the saturated model including all independent variables and controls.

VARIABLES	(1) Controls	(2) Primary Uncertainty	(3) Task Experience	(4) Complexity	(5) Termination Experience	(6) Formation Experience	(7) Saturated
Competitive Uncertainty $_{i,t-1}$	0.0355	0.0471	0.00383	0.0352	0.190	0.0398	0.178
	(0.0973)	(0.0974)	(0.0977)	(0.0973)	(0.131)	(0.0974)	(0.132)
Past Duration $_{i,t-1}$	0.299***	0.303***	0.306***	0.300***	0.291***	0.307***	0.299***
	(0.0437)	(0.0438)	(0.0438)	(0.0437)	(0.0454)	(0.0439)	(0.0456)
Strength $_{i,t-1}$	-1.335***	-1.369***	-1.370***	-1.339***	-0.901***	-1.070***	-0.984***
	(0.0887)	(0.0897)	(0.0902)	(0.0891)	(0.117)	(0.0983)	(0.140)
Centrality $_{i,t-1}$	0.226***	0.252***	0.0550	0.225***	-0.256**	-0.362***	-0.299
	(0.0732)	(0.0737)	(0.0915)	(0.0732)	(0.115)	(0.120)	(0.207)
Size $_{i,t-1}$	-0.180***	-0.175***	-0.178***	-0.181***	-0.220***	-0.221***	0.219***
	(0.0257)	(0.0258)	(0.0257)	(0.0257)	(0.0378)	(0.0265)	(0.0382)
Reputation $_{i,t-1}$	-0.0561***	-0.0555***	-0.0548***	-0.0560***	-0.0515	-0.0497**	-0.0521
	(0.0199)	(0.0199)	(0.0199)	(0.0199)	(0.0322)	(0.0200)	(0.0323)
Sale Performance $_{i,t-1}$	-0.0443**	-0.0369**	-0.0418**	-0.0444**	-0.0806**	-0.0450***	-0.0736**
	(0.0173)	(0.0168)	(0.0171)	(0.0173)	(0.0359)	(0.0174)	(0.0364)

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Primary Uncertainty $_{i,t-1}$	0.699***						0.364
	(0.214)						(0.308)
Task Experience $_{i,t-1}$		0.597***					0.358
		(0.193)					(0.255)
Complexity $_{i,t-1}$			0.0415				0.267**
			(0.0812)				(0.107)
Termination Experience $_{i,t-1}$					0.459***		0.498**
					(0.0929)		(0.212)
Formation Experience $_{i,t-1}$						0.788***	-0.0958
						(0.129)	(0.336)
2007	-0.990***	-1.017***	-0.991***	-0.989***		-1.069***	
	(0.103)	(0.104)	(0.104)	(0.103)		(0.105)	
2008	-1.143***	-1.150***	-1.142***	-1.143***	-0.319**	-1.371***	-0.308**
	(0.122)	(0.123)	(0.122)	(0.122)	(0.130)	(0.129)	(0.131)
2009	-1.855***	-1.982***	-1.865***	-1.855***	-1.158***	-2.213***	-1.207***
	(0.138)	(0.144)	(0.138)	(0.138)	(0.152)	(0.152)	(0.159)
2010	-3.174***	-3.296***	-3.171***	-3.177***	-2.607***	-3.668***	-2.654***
	(0.166)	(0.171)	(0.166)	(0.166)	(0.188)	(0.189)	(0.194)
Constant	-0.672***	-2.961***	-0.983***	-0.680***	-1.453***	-1.016***	-2.854***
	(0.227)	(0.736)	(0.249)	(0.228)	(0.284)	(0.235)	(1.065)
Observations	4,435	4,435	4,435	4,435	2,339	4,435	2,339
Groups	2,879	2,879	2,879	2,879	1,452	2,879	1,452
Log-Likelihood	-2539	-2534	-2535	-2539	-1338	-2521	-1333

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE 11

Antecedents of Alliance Formation

Random-effects logistics regression results showing the antecedents of alliance formation. The dependent variable is alliance formation. Model 1 only includes the control variables. Models 2 through 6 introduce hypothesized antecedents as well as alliance formation experience in a series of stepwise models. Alliance formation experience is included in Model 6 to show the contrasting findings for alliance termination experience. Model 7 provides the results for the saturated model including all independent variables and controls.

VARIABLES	(1) Controls	(2) Primary Uncertainty	(3) Task Experience	(4) Complexity	(5) Termination Experience	(6) Formation Experience	(7) Saturated
Competitive Uncertainty $_{i,t-1}$	-0.0355	-0.0471	-0.00383	-0.0352	-0.190	-0.0398	-0.178
	(0.0973)	(0.0974)	(0.0977)	(0.0973)	(0.131)	(0.0974)	(0.132)
Past Duration $_{i,t-1}$	-0.299***	-0.303***	-0.306***	-0.300***	-0.291***	-0.307***	-0.299***
	(0.0437)	(0.0438)	(0.0438)	(0.0437)	(0.0454)	(0.0439)	(0.0456)
Strength $_{i,t-1}$	1.335***	1.369***	1.370***	1.339***	0.901***	1.070***	0.984***
	(0.0887)	(0.0897)	(0.0902)	(0.0891)	(0.117)	(0.0983)	(0.140)
Centrality $_{i,t-1}$	0.180***	0.175***	0.178***	0.181***	0.220***	0.221***	0.219***
	(0.0257)	(0.0258)	(0.0257)	(0.0257)	(0.0378)	(0.0265)	(0.0382)
Size $_{i,t-1}$	-0.226***	-0.252***	-0.0550	-0.225***	0.256**	0.362***	0.299
	(0.0732)	(0.0737)	(0.0915)	(0.0732)	(0.115)	(0.120)	(0.207)
Reputation $_{i,t-1}$	0.0561***	0.0555***	0.0548***	0.0560***	0.0515	0.0497**	0.0521
	(0.0199)	(0.0199)	(0.0199)	(0.0199)	(0.0322)	(0.0200)	(0.0323)
Sale Performance $_{i,t-1}$	0.0443**	0.0369**	0.0418**	0.0444**	0.0806**	0.0450***	0.0736**
	(0.0173)	(0.0168)	(0.0171)	(0.0173)	(0.0359)	(0.0174)	(0.0364)
Primary Uncertainty $_{i,t-1}$		-0.699***					-0.364
		(0.214)					(0.308)

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Task Experience $_{i,t-1}$			-0.597***				-0.358
			(0.193)				(0.255)
Complexity $_{i,t-1}$				-0.0415			-0.267**
				(0.0812)			(0.107)
Termination Experience $_{i,t-1}$					-0.459***		-0.498**
					(0.0929)		(0.212)
Formation Experience $_{i,t-1}$						-0.788***	0.0958
						(0.129)	(0.336)
2007	0.990***	1.017***	0.991***	0.989***		1.069***	
	(0.103)	(0.104)	(0.104)	(0.103)		(0.105)	
2008	1.143***	1.150***	1.142***	1.143***	0.319**	1.371***	0.308**
	(0.122)	(0.123)	(0.122)	(0.122)	(0.130)	(0.129)	(0.131)
2009	1.855***	1.982***	1.865***	1.855***	1.158***	2.213***	1.207***
	(0.138)	(0.144)	(0.138)	(0.138)	(0.152)	(0.152)	(0.159)
2010	3.174***	3.296***	3.171***	3.177***	2.607***	3.668***	2.654***
	(0.166)	(0.171)	(0.166)	(0.166)	(0.188)	(0.189)	(0.194)
Constant	0.672***	2.961***	0.983***	0.680***	1.453***	1.016***	2.854***
	(0.227)	(0.736)	(0.249)	(0.228)	(0.284)	(0.235)	(1.065)
Observations	4,435	4,435	4,435	4,435	2,339	4,435	2,339
Groups	2,879	2,879	2,879	2,879	1,452	2,879	1,452
Log-Likelihood	-2539	-2534	-2535	-2539	-1338	-2521	-1333

Standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE 12
Robustness Omitting Extreme Values

Random-effects logistics regression results showing the robustness of alliance re-formation omitting extreme values. The dependent variable is alliance re-formation. Model 1 omits the extreme values of alliance sale performance over $200,000. Model 2 removes partnering firms that produce more than 10 horses annually. Model 3 removes observations where the alliance's breeding stock has a winning percentage less than 50%. In Model 4, the two partner's fit is considered through their breeding stock producing proven winners. Model 5 provides a contrast to Model 4, where the alliance partners have assumed the risk of breeding stock with no history of producing winning offspring.

VARIABLES	(1) Sale Performance	(2) Size	(3) Quality <=50	(4) Winners	(5) No Winners
Competitive Uncertainty $_{i,t-2}$	-0.567**	-0.628***	-0.536**	-0.366	-1.252**
	(0.235)	(0.231)	(0.239)	(0.234)	(0.512)
Past Duration $_{i,t-2}$	-1.649***	-1.568***	-1.466***	-1.112***	-2.398***
	(0.196)	(0.184)	(0.184)	(0.203)	(0.395)
Strength $_{i,t-2}$	0.370	0.634**	0.420*	0.210	0.900*
	(0.227)	(0.263)	(0.243)	(0.254)	(0.464)
Centrality $_{i,t-2}$	0.649***	0.676***	0.718***	0.602***	0.662***
	(0.0523)	(0.0540)	(0.0586)	(0.0634)	(0.0840)
Size $_{i,t-2}$	0.388*	0.188	0.269	0.454*	0.101
	(0.230)	(0.286)	(0.251)	(0.273)	(0.390)
Reputation $_{i,t-2}$	0.0115	0.0128	0.00678	0.271***	
	(0.0437)	(0.0440)	(0.0564)	(0.0713)	
Sale Performance $_{i,t-2}$	0.337***	0.0766***	0.0829***	0.0714**	0.0168
	(0.119)	(0.0286)	(0.0277)	(0.0291)	(0.0643)
Primary Uncertainty $_{i,t-2}$	0.170***	0.153***	0.139**	0.318***	0.259*
	(0.0520)	(0.0521)	(0.0579)	(0.0716)	(0.140)
Task Experience $_{i,t-2}$	-0.660*	-0.648*	-0.678*	-0.607*	-0.155
	(0.434)	(0.436)	(0.463)	(0.502)	(0.734)
Complexity $_{i,t-2}$	0.187	0.309*	0.328*	0.353*	0.104
	(0.171)	(0.175)	(0.178)	(0.191)	(0.305)
Termination Experience $_{i,t-1}$	1.807***	1.492***	1.903***	1.772***	1.801***
	(0.244)	(0.279)	(0.261)	(0.284)	(0.415)
2008	2.471***	2.413***	2.356***	2.788***	3.064***
	(0.256)	(0.250)	(0.261)	(0.305)	(0.480)
2009	4.229***	4.115***	3.992***	4.107***	5.375***
	(0.384)	(0.360)	(0.373)	(0.409)	(0.774)
2010	2.251***	2.241***	2.531***	2.927***	2.495***

	(0.391)	(0.382)	(0.382)	(0.482)	(0.585)
Constant	6.977***	6.770***	7.006***	3.410***	9.349***
	(0.758)	(0.735)	(0.762)	(0.985)	(1.431)
Observations	2,183	2,144	1,834	1,394	919
Groups	2,132	2,093	1,787	1,373	914
Log-likelihood	-709.5	-703.1	-595.5	-485.1	-267.5

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE 13

Robustness of Alliance Termination Severity

Random-effects logistics regression results showing the robustness of alliance re-formation on subsamples related to the termination's severity. Model 1 samples alliance terminations where alliance partners achieved less than the median sale price of $50,000. Model 2 samples alliance terminations where the alliance partners achieve the median sale price or better. Models 3 and 4 compare subsamples of alliance termination where the alliance partners sold the horses for less than the expected value (Model 3) and met or exceeded the expected value (Model 4). Model 5 subsamples alliance termination under competitive uncertainty. Model 6 looks at terminations where relationships did not terminate naturally at the auction because the partners were unable to sell the horses, the reserve price was not attained (RNA) at auction.

VARIABLES	(1) Median <$50000	(2) Median >=$50000	(3) <0 Loss	(4) >=0 Met or Exceeded	(5) Overlap	(6) RNA
Competitive Uncertainty $_{i,t-2}$	-1.084**	-0.395*	-0.976**	-0.415*	-1.588**	-1.290***
	(0.504)	(0.237)	(0.456)	(0.240)	(0.689)	(0.483)
Past Duration $_{i,t-2}$	-1.917***	-1.582***	-1.398***	-1.632***	-1.689***	-1.470***
	(0.420)	(0.210)	(0.426)	(0.208)	(0.396)	(0.374)
Strength $_{i,t-2}$	0.908**	0.114	0.987**	0.173	-0.258	-0.333
	(0.386)	(0.279)	(0.413)	(0.267)	(0.528)	(0.645)
Centrality $_{i,t-2}$	0.462***	0.660***	0.551***	0.652***	0.905***	0.720***
	(0.101)	(0.0602)	(0.102)	(0.0585)	(0.141)	(0.129)
Size $_{i,t-2}$	0.536	0.377	0.0648	0.545**	0.477	0.459
	(0.419)	(0.266)	(0.466)	(0.253)	(0.471)	(0.516)
Reputation $_{i,t-2}$	-0.0611	0.0318	-0.0303	0.00487	0.0948	0.00687
	(0.0754)	(0.0539)	(0.0835)	(0.0504)	(0.119)	(0.109)
Sale Performance $_{i,t-2}$	1.964***	-0.00740	0.398***	0.0180	0.0881	-0.00975
	(0.433)	(0.0329)	(0.152)	(0.0304)	(0.0549)	(0.117)
Primary Uncertainty $_{i,t-2}$	0.222**	0.150**	0.312***	0.137**	0.364***	0.228*
	(0.0963)	(0.0607)	(0.107)	(0.0572)	(0.131)	(0.118)
Task Experience $_{i,t-2}$	-0.757*	-0.681*	-0.204	-0.907*	-0.846*	-0.613*
	(0.735)	(0.520)	(0.779)	(0.498)	(1.048)	(0.683)
Complexity $_{i,t-2}$	0.482*	0.174	0.438	0.171	0.0430	0.406
	(0.272)	(0.210)	(0.303)	(0.196)	(0.430)	(0.278)
Termination Experience $_{i,t-1}$	1.672***	1.607***	1.447***	1.728***	2.560***	2.006***
	(0.470)	(0.279)	(0.487)	(0.272)	(0.590)	(0.542)

2008	3.413***	1.824***	3.007***	2.097***	2.436***	1.546***
	(0.512)	(0.290)	(0.520)	(0.280)	(0.596)	(0.569)
2009	5.381***	3.498***	4.788***	3.843***	4.585***	3.579***
	(0.785)	(0.418)	(0.763)	(0.412)	(0.754)	(0.799)
2010	3.186***	1.395***	3.182***	1.805***	2.415**	2.391**
	(0.653)	(0.473)	(0.766)	(0.433)	(1.076)	(0.931)
Constant	6.280***	7.329***	4.692***	7.374***	9.311***	7.777***
	(1.442)	(0.858)	(1.484)	(0.839)	(1.948)	(1.744)
Observations	1,090	1,223	860	1,453	455	344
Groups	1,090	1,193	860	1,418	453	341
Log-likelihood	-255.4	-473.3	-211.5	-535.0	-122.6	-129.0

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

FIGURES

FIGURE 1
Termination and Re-formation Instances

	t-2	t-1	t

Firm A

Firm B

No Alliance

Alliance

Alliance Continues

Alliance Continues

Alliance Terminates

Alliance Terminates

Terminated Alliance
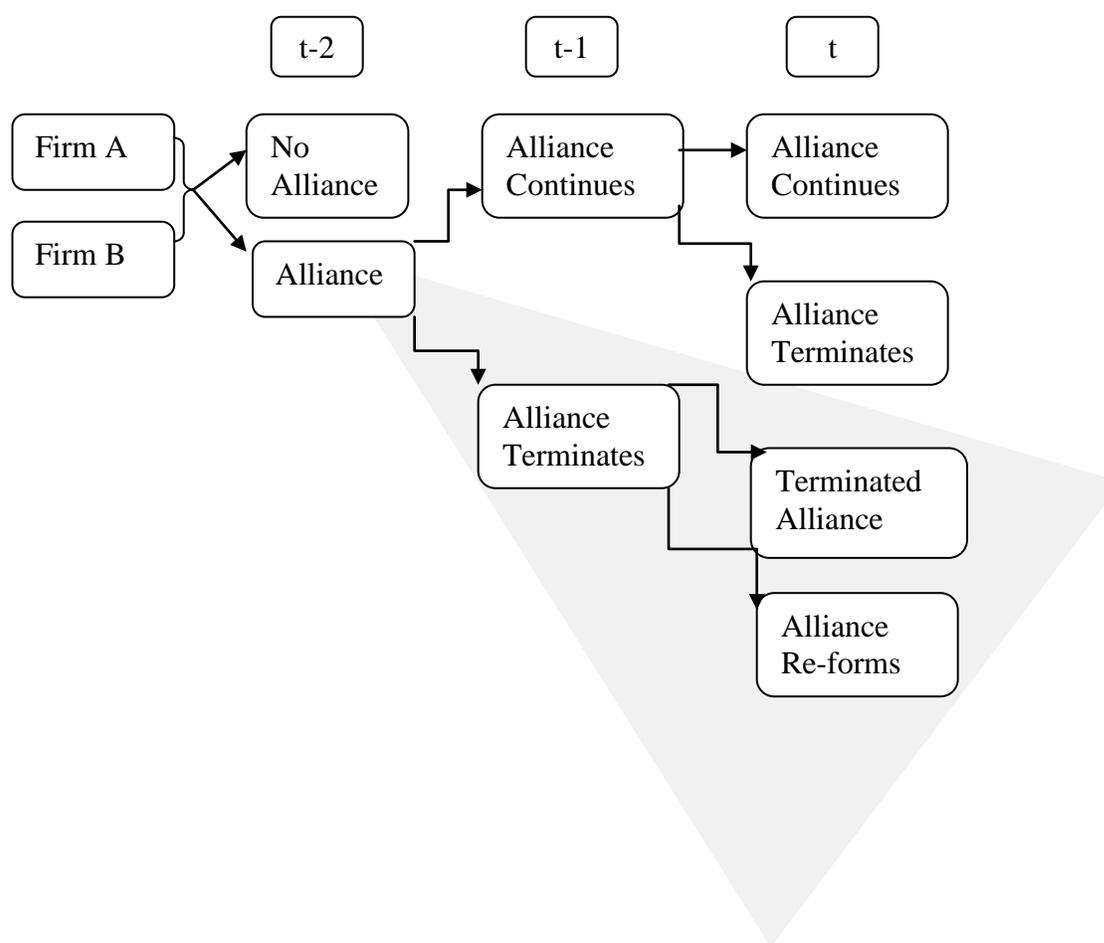
Alliance Re-forms

FIGURE 2

Termination Antecedents to Re-formation

Termination Characteristics

H1: Primary Uncertainty

H2: Task Specific

H4: Alliance Complexity

(+)

(+)

(+)

Tie Re-formation

Termination Experience:

H3: Termination Experience

(+)
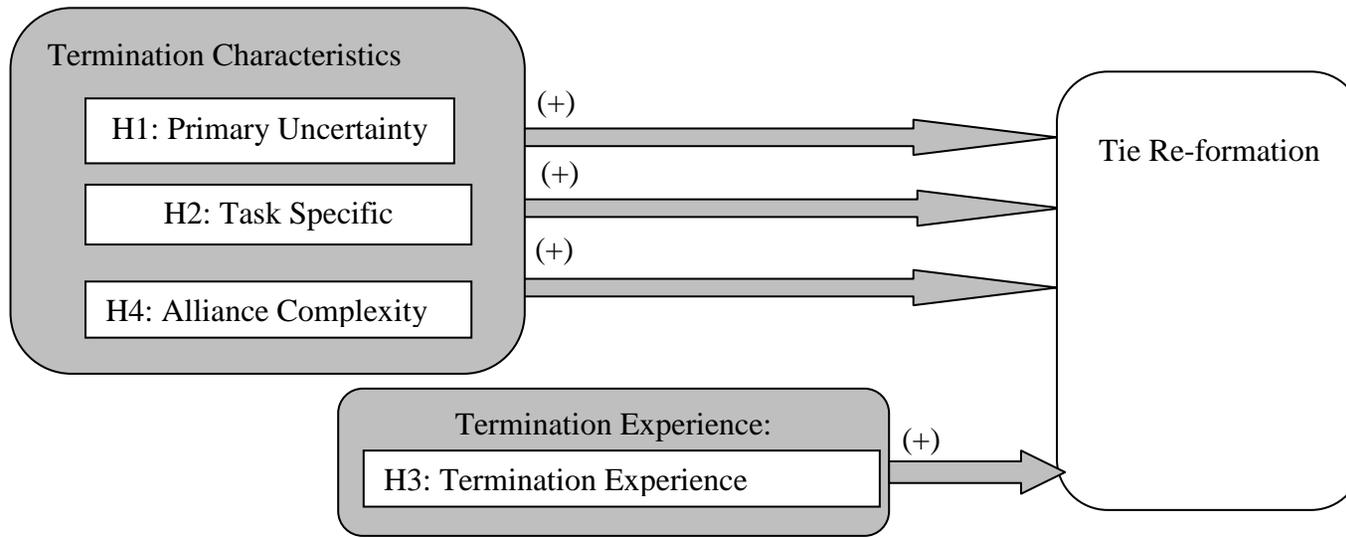
FIGURE 3
Spot Transaction vs. Alliance

Spot Transaction:
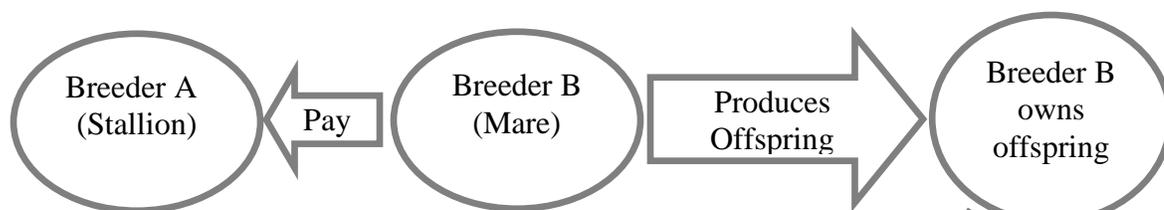
Alliance[22]

---
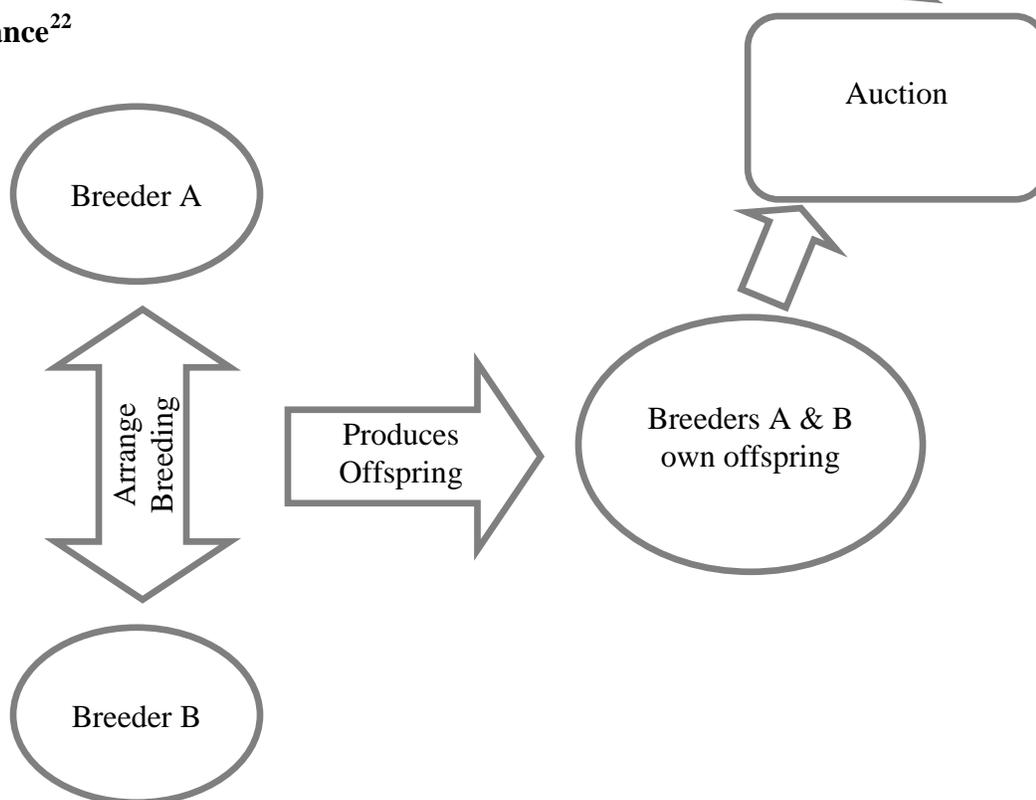
[22] The breeding arrangement for the alliance may involve any source of access to a stallion or mare. Importantly, the alliance occurs through the co-ownership of offspring.

FIGURE 4

Shared Alliance Activities in the Thoroughbred Horse Industry[23]

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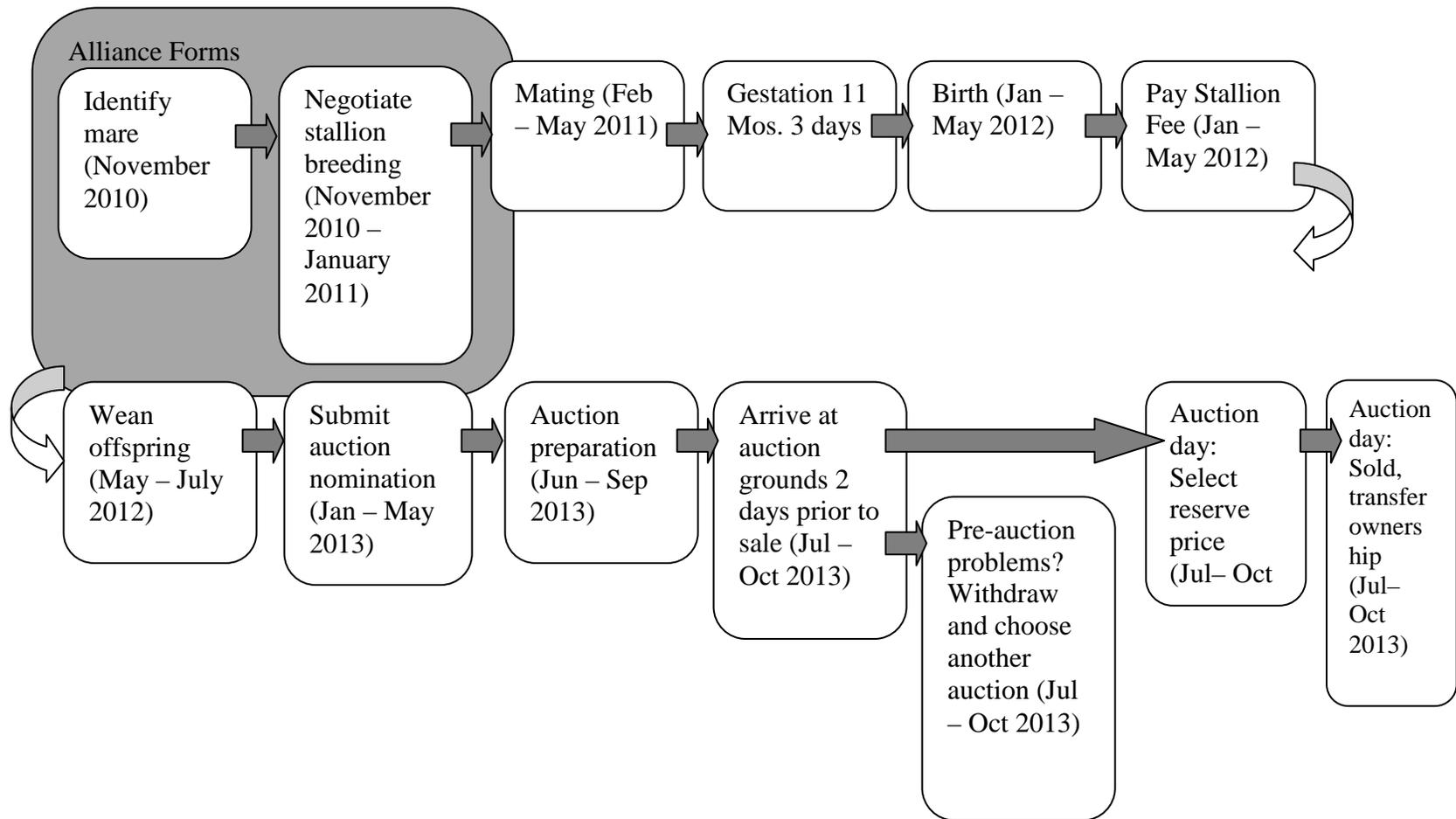
[23] Events repeat on an annual basis. For an alliance to produce one horse the duration is three years.

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FIGURE 5A
Alliances, Terminations and Re-formations By Year
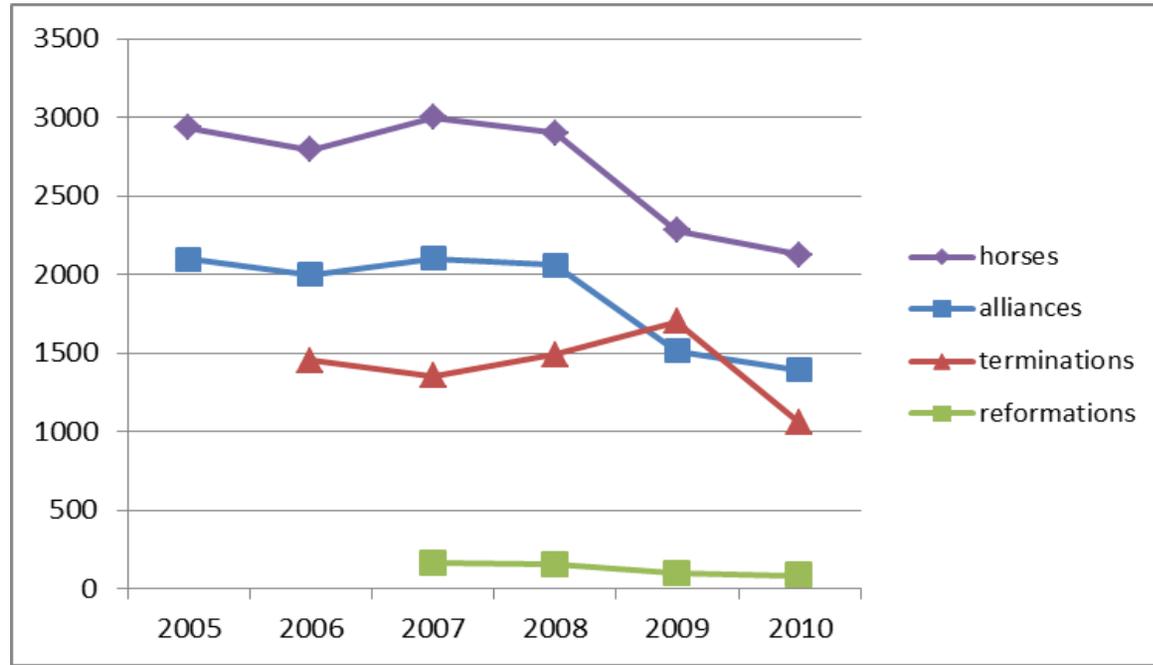
FIGURE 5B

Continuations, Terminations and Re-formations for Alliances from 2005
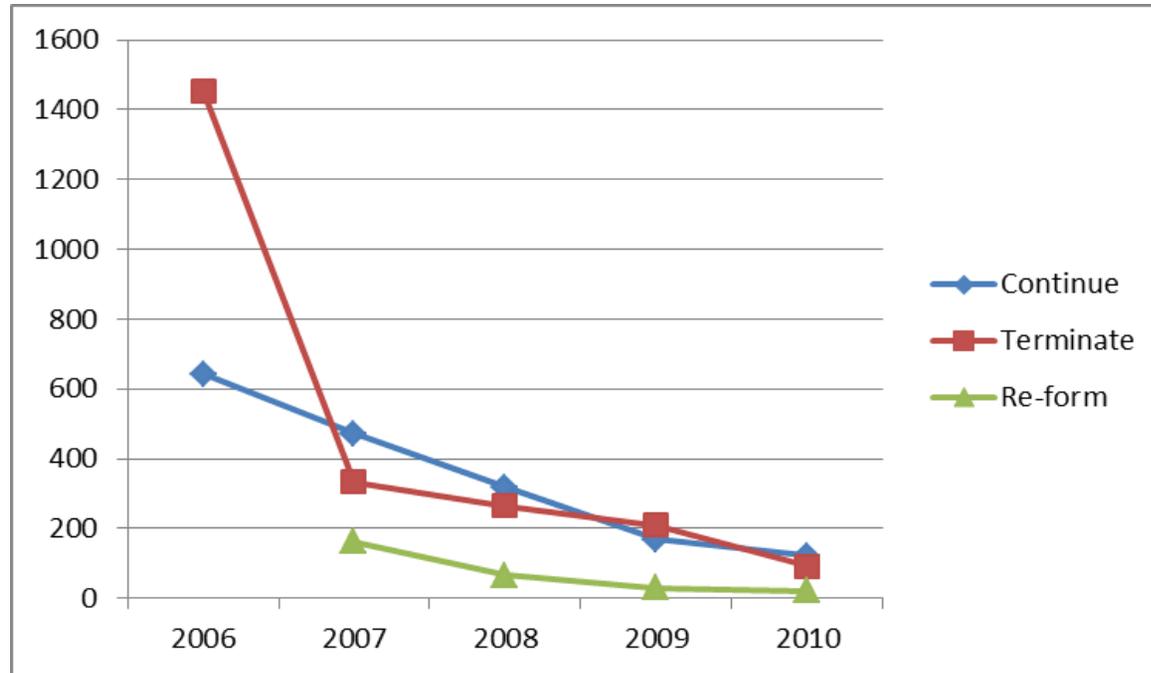
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APPENDICES

EXPLANATION PAGE

Hip number is followed by mare's name, pedigree line and breeder. Below is listed the covering sire if mare is in foal. Covering sire's current-year stud fee is listed.

Family information gives number of starts, wins and earnings for mares and foals and also shows previous sales. For mares and first dams, previous consignors are also listed.

Last claiming price of mares and foals reflecting year, track, amount and new owner.

When applicable, the Nicking line gives number of foals, strs, wnrs, 2yo wnrs, stakes winners and the best grade or group race that a horse has won (e.g., gr. I, Eng-II, Fr-III, etc.).

For in-foal mares, nicking pertains to her unborn foal.

The *TrueNicks* ratings in Auction Edge can be found for each subject horse (weanlings, yearlings, and 2-year-olds). For broodmares, a rating is provided for the mare's offspring and her in utero foal if she is carrying one.

For more information see pages 9-10 or go to: http://TrueNicks.com

Best win, purse and track where won.

Mare and foal's **BEST BRIS® SPEED FIGURE** is shown, in addition to the best win, value of race, type of race and track where he/she won (in the case of graded races, no dollar amount is given). A glossary of tracks, both domestic and foreign appear in this book.

EXCLUSIVE BRIS® SPEED RATINGS!

The Class Performance Index (CPI) shows how a horse's earnings compare with other horses of the same sex and age. See page 10 for a detailed description.

(D), (T) or (D, T) indicates if a horse won on dirt, turf, or both.

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180 • Example Mare (not real data) (98, m), by Holy Bull—Horse by Affirmed. Breeder Mr. & Mrs. Mr. and Owner (Ky.) [A]

Covering Sire: **Awesome Again; 2004 Stud Fee: $75,000** Dosage: (4-0-8-0-0) • DI: 2.00 • CD: 0.67
2004 Yrlg. Avg: $54,667 (25 offered, 21 sold) $30,000 median, $200,000 high, $3,500 low
2003 Wnlg. Avg: $81,500 (3 offered, 2 sold) $81,500 median, $115,000 high, $48,000 low

Family	Timeform	Best BRIS
Eden, 12 sts, 1 win (D), $48,773 [0.13 CPI], 42k msw/CD/8.5f	n/a	79

   99KEEJUL $170,000—Consignor: John Williams, agent; Buyer: Stewart L. Armstrong

Family	Timeform	Best BRIS
Affirmatively, 22 sts, 2 wins (D,T), $68,195 [0.13 CPI], 26k alw/SA/8.5f	n/a	

03—ch. f., by Siphon (BRZ) [A]
02—General Thomas, c., by Old Trieste. 14 sts, 2 wins, $49,883 [1.00 CPI], n/a . . . . n/a 45
08—*Garros*, g., by Grand Slam. 13 sts, 3 wins (T), $51,638 [1.60 CPI], 33k alw/BM/8f. . . . . 97 p . . . 89
   01KEESEP $25,000—Buyer: Mark Johnston
95—Crazy for You, f., by Pleasant Tap. 8 sts, 1 win (D), $5,019 [0.00 CPI], 3k al/GVA/9.5f . . . . n/a . . . . . . n/a
   96KEESEP $60,000—Buyer: Anderson Inc., agent
94—Forever Young, f., by Shadeed. 6 sts, 0 wins, $2,508 [0.20 CPI], n/a . . . . n/a 61
   00FTKNOA $43,000—Buyer: Ralph T. Rose; {Alphabet Soup} • **95KEESEP $145,000**—Buyer: Frank Stronach
93—Action, c., by Blushing John. 35 sts, 4 wins (D), $152,272 [2.50 CPI], 39k alw/SAR/9f . . . . n/a 101
   97CLAIM (AQU) $70,000—For: John Rotella

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520 • Yrlg. f, by Winston Churchill—Waywayanda by Belong to Me. Breeder Questroyal Stables (N.Y.)

First Foals: 2000; 2002 Stud Fee: $5,000; 1999 Stud Fee: n/a Dosage: (10-4-16-2-0) • DI: 2.20 • CD: 0.69
2001 Yrlg. Avg: $5,650 (4 offered, 2 sold) $5,650 median, $8,000 high, $3,800 low
2001 2YO. Avg: $2,350 (5 offered, 4 sold) $2,450 median, $3,000 high, $1,500 low

Family	Timeform	Best BRIS
Waywayanda, 5 sts, 1 win (D), $26,750 [2.50 CPI], 24k msw/DEL	n/a	71

95FTKNOV $63,000—Consignor: Chance Farm, agent; Buyer: Dan Vines
01—b. f., by Gold Token.
00—b. c., by Gold Token.
Nicking: Sons of Mr. Prospector/Belong to Me mares: 1 foal, 0 strs
   Sons of Mr. Prospector/Danzig mares: 332 foals, 246 strs, 172 wnrs (52%), 52 2yo wnrs (16%), 22 SWs (7%), 9 GSWs (3%): **ECTON PARK** (gr. I), **HULA ANGEL** (Ire-I), **VOODOO DANCER** (gr. I); **DISTORTED HUMOR** (gr. II), **PROSPECT BAY** (gr. II), **SUPREMO** (gr. II); **MORNING PRIDE (IRE)** (Fr-III), **MYTHICAL GIRL** (Eng-III), **STUCK** (It-III).

AUCTION EDGE ■ *BloodHorse.com 7*

EXPLANATION PAGE 2

Hip number is followed by sex of weanling, pedigree line and breeder.

Tells when the first foals of weanling sires hit the ground. Following is the current-year stud fee of the sire and the stud fee that corresponds to the selling horse.

Italicized horses indicate those that broke their maiden at two.

NEW Second dam information is provided when a sale horse's first dam has had no more than four foals.

Asterisks indicate exported horses. Death dates are also given when available.

425 • Wnlg. c, by Awesome Again—Ahead by a Century by Slew City Slew. Breeder Windways Farm Limited (Ont.)

First Foals: 2000; 2004 Stud Fee: $75,000; 2003 Stud Fee: $50,000   Dosage: (6-0-6-0-0) • DI: 3.00 • CD: 1.00
2004 Yrlg. Avg: $54,667 (25 offered, 21 sold) $30,000 median, $200,000 high, $3,500 low
2003 Wnlg. Avg: $81,500 (3 offered, 2 sold) $81,500 median, $115,000 high, $48,000 low

1st Dam   Timeform   Best BRIS
AHEAD BY A CENTURY, 37 sts, 5 wins (D,T), $369,862, 65k stk/WO/6.5f . . . . n/a. 93
  01KEENOV $182,000-Consignor: Hill 'n' Dale Sales Agency, agent; Buyer: Windways Farm • 97KEESEP
      $22,000-Consignor: Romancaks Farm/Holtsinger; Buyer: Robert Tiller

2nd Dam   Timeform   Best BRIS
Aromalight, 15 sts, 0 wins, $6,070, n/a . . . . 105 . . . . . . n/a
  95KEENOV $29,000-Consignor: Tom Hinkle, agent; Buyer: Bill Tite; {Slew City Slew}
04–dkb/br. f., by Include.
03–dkb/br. c., by Slew City Slew.
  04KEESEP $9,000—Buyer: Oxbow Racing
99–00*A Real Good (example), f., by Personal Flag. Unraced. Sent to Austr
97–De Nata Persona, g., by Personal Flag. 13 sts, 0 wins, $2,589 . . . . . .
  98KEESEP $10,000—Buyer: Salt Creek Farm
94–Tom B, g., by Dixieland Brass. Unraced
92–*A GOODLOOKIN BROAD*, f., by Broad Brush. 30 sts, 4 wins (D), $113,141, 52k stk/HAW/8.5f . . . . . n/a. 86
91–Acid Power, g., by Wolf Power (SAF). 47 sts, 2 wins (D), $48,08, 19k msw/AP/6.5f. . . . . n/a. 77
90–Cozzen Fifi, f., by Cozzene. 3 sts, 0 wins, $1,440, n/a. . . . . n/a. 35
  92FTFFEB $30,000—Buyer: Michael Berry
89–Wolfaroma, c., by Wolf Power (SAF). 30 sts, 3 wins (D), $30,827, 8k mcl/AP/8f . . . . n/a. 70
  90KEESEP $75,000—Buyer: G. F. Baiely • 93CLAIM (AP) $9,000—For: Diane M Miner & Mike Dini
(02—No Report. 01—No Report. 00—No Report. 98—No Report. 95—No Report. 93—No Report.)
Nicking: Sons of Deputy Minister/Slew City Slew mares: 5 foals, 2 strs, 1 wnr (20%), 1 2yo wnr (20%), 0 SWs
          Sons of Deputy Minister/Seattle Slew mares: 46 foals, 33 strs, 22 wnrs (48%), 7 2yo wnrs (15%), 5 SWs (11%), 3
          GSWs (7%): AWESOME TIME (gr. III), FRENCH RIVIERA (gr. III), KENTUCKY KAPER (gr. III)
96–*TIME BANDIT*, c., by Time for a Change. 13 sts, 3 wins (D), $210,188, (gr.III)/SAR/6f. 111 89
  98BARMAR ($100,000) RNA • 97KEESEP $85,000—Buyer: Peter Pugh

Dosage, a technique for classifying Thoroughbred pedigrees by type. Please go to **http://chef-de-race. com/dosage/ review. htm** for a complete description.

If an in-foal mare is subject horse, the dosage pertains to her unborn foals

Previous and current-year sales information of the sire of the weanling.

Mare and foal's **BEST TIMEFORM® RATING** is given when applicable. Please refer to page 10 for a complete explanation.

Expanded auction information reflects in-foal sales of female siblings under first dam, in addition to weanling, yearling and 2-year-old sales data.

Abbreviated non-productive year produce line.

TIMEFORM® RATINGS

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APPENDIX B
Auction Edge Keeneland September Yearling Sale 2010 Example

Competitive Uncertainty: Genetics Information, Sire – Dam by Dam Sire

Alliance: List owners of the offspring at the time of breeding

Fertility: Mare production history and reasons given for missed years

Environmental Uncertainty: Number of offspring sharing the same genetic pattern

Reputation: Percentage of races won by the same genetic combination

Valuation: Median value of offspring sharing the same sire

83 • Yrlg. c, by El Prado (IRE)—Pour La Paix by Cozzene, Breeder Haras Santa Maria de Araras S.A. and Adena (KY) [C]

s: 1994; 2010 Stud Fee: $75,000; 2008 Stud Fee: $75,000   Dosage: (3-7-14-4-0) • DI: 1.55 • CD: 0.32
. Avg: $69,679 (29 offered, 23 sold) $40,000 median, $260,000 high, $5,000 low
Avg: $68,934 (6 offered, 5 sold) $75,000 median, $135,000 high, $25,000 low

Timeform Best BRIS
ix, 2 sts, 0 wins, $2,670 .... n/a 78
c., by Bernstein
c., by Dynaformer, Unraced
EESEP $75,000; Buyer: MAB Agency
-vision d'Amour, c., by Saarland, 4 sts, 0 wins, $4,368 [0.33CPI] .... n/a 82
08OBSAUG ($27,000) (RNA)

Timeform Best BRIS
20 sts, 3 wins (D), $124,988 [4.97CPI], 33k alw/SA/6.5f .... n/a 99
., by Broken Vow, Unraced
e, g., by Put It Back, 6 sts, 1 win (D), $11,487 [0.58CPI], 14k mcl/TAM/8.5f .... n/a 78
lle, f., by Montbrook, Unraced
UDIT, h., by Elusive Quality, 15 sts, 4 wins (D), $196,377 [4.35CPI], 77k stk/AQU/6f .... - ? 101
Francaise, m., by Quiet American, Unraced
ake, h., by Saint Ballado, 1 st, 0 wins, $0 .... n/a 74
9TEXDEC $3,000; Buyer: Amador Toca • 02FTSAUG ($140,000) (RNA)
TE, m., by Broad Brush, 22 sts, 7 wins (T), $485,104 [9.35CPI], 150k gr.III/AP/9.5f .... n/a 98
eville, m., by Saint Ballado, 22 sts, 4 wins (D), $280,223 [5.12CPI], 68k alw/WO/5f. .... n/a 100
nse, m., by Wild Again, 6 sts, 1 win (D), $71,715 [4.44CPI], 50k msw/WO/7f .... n/a 82
SWIN $32,000; Buyer: Jody Huckabay; {Master Command}
Relaunch, 21 sts, 0 wins, $15,104 [0.33CPI]. .... n/a 76
Fete, m., by A.P. Indy, 14 sts, 3 wins (D), $87,022 [2.68CPI], 35k alw/WO/8.5f. .... n/a 92
n, m., by Kris S., 10 sts, 2 wins (D), $53,522 [2.56CPI], 25k alw/MTH/8.5f .... n/a 92
.)
L PRADO (IRE) w/COZZENE mares: 5 foals, 2 strs, 2 wnrs (40%), 0 2yo wnrs, 0 SW
ns of Sadler's Wells/Cozzene mares: 16 foals, 10 strs, 3 wnrs (19%), 1 2yo wnr (6%), 0 SW
ns of Sadler's Wells/Caro (IRE) mares: 12 foals, 8 strs, 5 wnrs (42%), 2 2yo wnrs (17%), 1 SW (8%), 0 C

84 • Yrlg. c, by A.P. Indy—Plenty of Light by Colony Light, Breeder Arindel (KY) [A

: 1994; 2010 Stud Fee: $150,000; 2008 Stud Fee: $300,000   Dosage: (8-15-19-0-0) • DI: 3.42 • CD:
Avg: $342,143 (23 offered, 14 sold) $235,000 median, $1,000,000 high, $65,000 low
Avg: $97,500 (3 offered, 2 sold) $97,500 median, $170,000 high, $25,000 low

Timeform Best
F LIGHT, 7 sts, 5 wins (D), $510,420 [28.79CPI], 544k gr.I/KEE/9f 120 108
ENOV $110,000-Consignor: Sweezey & Partners, agents, agent for Arindel Farm; Buyer: WinStar; {Elusive
Quality} • 06KEENOV ($475,000)-Consignor: Taylor Made Sales Agency, agent, agent for Aaron & Marie Jones
(RNA); {Seeking the Gold} • 990BSAPR ($52,000)-Consignor: Rising Hill Farms, agent, agent for JD Farms
(RNA)
r Elusive Quality
d the Clock, c., by Bernardini, Unraced
09KEESEP $320,000; Buyer: A. Perrett
llennium, c., by Seeking the Gold, 3 sts, 0 wins, $3,080 [0.27CPI] .... n/a 80
FFEB $150,000; Buyer: Sagamore Farm • 08KEESEP ($385,000) (RNA)
ightning, h., by Forestry, 8 sts, 1 win (D), $27,015 [1.05CPI], 15k mcl/FL/6f .... n/a 79
SMAY $50,000; Buyer: Scott M. Schwartz • 06KEESEP ($220,000) (RNA)
nperial, h., by Gone West, 19 sts, 1 win (D), $100,644 [0.49CPI], 81k msw/HSN/6f .... n/a ...... n/a

Snapshot of Raw Data for Alliances 1 through 15 Highlighting Re-formations for Alliances 2, 57, 68, and 82

The first table shows the data for alliances, termination, re-formation in addition to the control variables. The second table provides the data for the main independent variables.

ptrid	year	exists	termination	reformation	competitive uncertainty	duration	strength	size	centrality	reputation	performance
1	2005	1			0	3	4	6	0.282	50	26625
1	2006	1	0		0	4	1	4	0.277	0	-675
1	2007	1	0	0	0	5	1	1	0.0135	0	115000
1	2008	1	0	0	0	6	4	7	0.0075	0	38900
1	2009	0	1	0	0			2	0.008	0	0
1	2010	0	0	0	0			0	0.008	0	0
2	2005	1			1	3	1	6	0.282	0	-1000
2	2006	1	0		0	4	1	4	0.277	20	5000
2	2007	0	1	0	0			1	0.0135	0	0
2	2008	1	0	1	0.3333	3	3	7	0.0075	0	24333
2	2009	0	1	0	0			2	0	0	0
2	2010	0	0	0	0			0	0	0	0
3	2005	0			0			0	0	0	0
3	2006	1	0		0	3	1	1	0		70000
3	2007	0	1	0	0			0	0.006	0	0
3	2008	0	0	0	0			0	0.006	0	0
3	2009	0	0	0	0			0	0	0	0
3	2010	0	0	0	0			0	0	0	0
4	2005	0			0			1	0	0	0
4	2006	1	0		0	3	1	3	0	56	6500
4	2007	0	1	0	0			2	0.1675	0	0
4	2008	0	0	0	0			0	0.7835	0	0
4	2009	0	0	0	0			1	0	0	0

4	2010	0	0	0	0			0	0	0	0
5	2005	0			0			1	0.27	0	0
5	2006	0	0		0			0	0.27	0	0
5	2007	1	0	0	0	3	1	3	0	40	150000
5	2008	1	0	0	0	6	1	3	0	0	-2500
5	2009	0	1	0	0			0	0.017	0	0
5	2010	0	0	0	0			0	0.01	0	0
6	2005	0			0			14	0	0	0
6	2006	0	0		0			14	0		0
6	2007	1	0	0	2	3	1	25	0	0	400000
6	2008	0	1	0	0			13	0	0	0
6	2009	0	0	0	0			15	0.008	0	0
6	2010	0	0	0	0			0	0.008	0	0
8	2005	0			0			0	0.27	0	0
8	2006	0	0		0			0	0.27		0
8	2007	0	0	0	0			0	0	0	0
8	2008	1	0	0	0	3	1	1	0	0	0
8	2009	0	1	0	0			0	0	0	0
8	2010	0	0	0	0			0	0	0	0
9	2005	0			0			0	0.27	0	0
9	2006	0	0		0			0	0.27		0
9	2007	0	0	0	0			0	0	0	0
9	2008	1	0	0	0	3	1	1	0	0	0
9	2009	0	1	0	0			0	0	0	0
9	2010	0	0	0	0			0	0	0	0
10	2005	0			0			0	0	0	0
10	2006	1	0		0	3	1	2	0	50	2500
10	2007	0	1	0	0			0	0.012	0	0
10	2008	0	0	0	0			0	0.007	0	0
10	2009	0	0	0	0			0	0	0	0
10	2010	0	0	0	0			0	0	0	0
11	2005	0			0			1	0.27	0	0
11	2006	0	0		0			1	0.27	0	0

11	2007	0	0	0	0			0	0	0	0
11	2008	1	0	0	0	3	1	1	0	40	-1700
11	2009	0	1	0	0			0	0	0	0
11	2010	0	0	0	0			0	0	0	0
14	2005	1			0	3	1	1	0.0055	67	55000
14	2006	0	1		0			1	0.0055	0	0
14	2007	0	0	0	0			0	0	0	0
14	2008	0	0	0	0			1	0	0	0
14	2009	0	0	0	0			0	0	0	0
14	2010	0	0	0	0			0	0	0	0
15	2005	1			0	3	1	1	0.0055	0	3000
15	2006	0	1		0			0	0.0055	0	0
15	2007	0	0	0	0			0	0	0	0
15	2008	0	0	0	0			0	0	0	0
15	2009	0	0	0	0			0	0	0	0
15	2010	0	0	0	0			0	0	0	0
57	2005	1			0	3	1	2	0.277	0	-10750
57	2006	0	1		0			1	0.282	0	0
57	2007	1	0	1	1	3	1	2	0	11	130000
57	2008	1	0	0	0	6	1	1	0	0	825000
57	2009	0	1	0	0			0	0.0125	0	0
57	2010	0	0	0	0			0	0.0275	0	0
68	2005	1			0	3	2	4	0.283	0	260000
68	2006	0	1		0			3	0.284	0	0
68	2007	1	0	1	0.5	3	2	3	0	0	370750
68	2008	1	0	0	0	6	2	2	0	0	173125
68	2009	0	1	0	0			1	0.008	0	0
68	2010	0	0	0	0			0	0.008	0	0
82	2005	1			0	3	1	11	0.5455	42	25000
82	2006	0	1		0			5	0.281	0	0
82	2007	1	0	1	1	3	1	8	0	0	50000
82	2008	1	0	0	0	6	1	3	0	0	25000
82	2009	0	1	0	0			3	0.008	0	0

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ptrid	year	exists	termination	reformation	primary uncertainty	task experience	multiplexity	termination experience	formation experience
82	2010	0	0	0	0	0	0.008	0	0

ptrid	year	exists	termination	reformation	primary uncertainty	task experience	multiplexity	termination experience	formation experience
1	2005	1			36	2	0		2.5
1	2006	1	0		12	2	0	0	3
1	2007	1	0	0	0	1	0	2	3
1	2008	1	0	0	144	4	0	2	4
1	2009	0	1	0	0	1	0	4	6
1	2010	0	0	0	0	2	0	5	6
2	2005	1			4	2	2		2.5
2	2006	1	0		20	2	2	0	3
2	2007	0	1	0	0	1	0	2	3
2	2008	1	0	1	444	4	6	2	4
2	2009	0	1	0	0	1	0	4	6
2	2010	0	0	0	0	2	0	5	6
3	2005	0			0	0	0		0
3	2006	1	0		2	1	0	0	1
3	2007	0	1	0	0	0	0	1	1
3	2008	0	0	0	0	0	0	1	1
3	2009	0	0	0	0	0	0	1	1
3	2010	0	0	0	0	0	0	1	1
4	2005	0			0	0.5	0		0.5
4	2006	1	0		18	2	0	0	2
4	2007	0	1	0	0	1	0	2	2
4	2008	0	0	0	0	0	0	2	2
4	2009	0	0	0	0	1	0	2	2.5
4	2010	0	0	0	0	0	0	3	2.5
5	2005	0			0	1	0		1
5	2006	0	0		0	0	0	1	1

5	2007	1	0	0	20	2	0	1	3.5
5	2008	1	0	0	24	3	0	2	3.5
5	2009	0	1	0	0	0	0	4	3.5
5	2010	0	0	0	0	0	0	4	3.5
6	2005	0			0	2	0		2
6	2006	0	0		0	2	0	1	2
6	2007	1	0	0	2	2	0	1	3
6	2008	0	1	0	0	1	0	2	3
6	2009	0	0	0	0	2	0	2	3
6	2010	0	0	0	0	2	0	2	3
8	2005	0			0	0	0		0
8	2006	0	0		0	0	0	0	0
8	2007	0	0	0	0	0	0	0	0
8	2008	1	0	0	0	1	0	0	1
8	2009	0	1	0	0	0	0	1	1
8	2010	0	0	0	0	0	0	1	1
9	2005	0			0	0	0		0
9	2006	0	0		0	0	0	0	0
9	2007	0	0	0	0	0	0	0	0
9	2008	1	0	0	0	1	0	0	1
9	2009	0	1	0	0	0	0	1	1
9	2010	0	0	0	0	0	0	1	1
10	2005	0			0	0	0		0
10	2006	1	0		4	1	0	0	1.5
10	2007	0	1	0	0	0	0	2	1.5
10	2008	0	0	0	0	0	0	2	1.5
10	2009	0	0	0	0	0	0	2	1.5
10	2010	0	0	0	0	0	0	2	1.5
11	2005	0			0	0.5	0		0.5
11	2006	0	0		0	0.5	0	1	1.5
11	2007	0	0	0	0	0	0	2	1.5
11	2008	1	0	0	10	1	0	2	2.5
11	2009	0	1	0	0	0	0	3	2.5

11	2010	0	0	0	0	0	0	3	2.5
14	2005	1			6	1	0		1
14	2006	0	1		0	0.5	0	1	2
14	2007	0	0	0	0	0	0	2	2
14	2008	0	0	0	0	0.5	0	2	2.5
14	2009	0	0	0	0	0	0	3	2.5
14	2010	0	0	0	0	0	0	3	2.5
15	2005	1			0	1	0		1
15	2006	0	1		0	0	0	1	1
15	2007	0	0	0	0	0	0	1	1
15	2008	0	0	0	0	0	0	1	1
15	2009	0	0	0	0	0	0	1	1
15	2010	0	0	0	0	0	0	1	1
57	2005	1			8	1.5	0		1.5
57	2006	0	1		0	1	0	1	2
57	2007	1	0	1	36	2	0	2	3.5
57	2008	1	0	0	32	1	0	3	3.5
57	2009	0	1	0	0	0	0	4	3.5
57	2010	0	0	0	0	0	0	4	3.5
68	2005	1			18	1	2		3
68	2006	0	1		0	2	0	2	3
68	2007	1	0	1	30	2	2	2	4
68	2008	1	0	0	24	1	4	3	4
68	2009	0	1	0	0	1	0	4	5
68	2010	0	0	0	0	0.5	0	5	5.5
82	2005	1			72	4	0		4
82	2006	0	1		0	4	0	1	4
82	2007	1	0	1	18	2	0	1	5
82	2008	1	0	0	18	1	0	4	6.5
82	2009	0	1	0	0	1	0	7	8.5
82	2010	0	0	0	0	1	0	7	8.5