TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 Relevance of Research Topic and Research Questions

To grow and prosper, firms are challenged to find new resource combinations that enable the creation of novel and value creating business opportunities (Penrose, 1959; Schumpeter, 1934). However, as competition and environmental changes frequently erode firms' resources, no one firm can possess all the strategically critical resources to ensure long-term success, growth, and survival (Penrose, 1959; Rumelt, 1984). Thus, firms often reach beyond their boundaries to access, exchange, or internalize valuable resources through strategic alliances (Ahuja, 2000; Chung, Singh, & Lee, 2000; Das & Teng, 2000; Eisenhardt & Schoonhoven, 1996). Strategic alliances can be defined as arrangements between firms regarding the joint coordination of skills and resources as part of a project or business operation (Dussauge, Garrette, & Mitchell, 2000).

The engagement of firms in a wide array of strategic alliances has indeed become a ubiquitous phenomenon in today's business landscape (Contractor & Lorange, 1988, 2002). In many key industries such as computer hard and software, telecommunications, electronics, pharmaceuticals, or air transportation, strategic alliances have become an important strategic device and an essential part of firm strategy. Consequently, most firms today are engaged in multiple simultaneous strategic alliances with different partners, i.e. are multilaterally connected, and are facing the challenge to manage an entire alliance portfolio (Anand & Khanna, 2000; Doz & Hamel, 1998; Gulati, 1998; Hoffmann, 2005; Lavie, 2006; Parise & Casher, 2003). These alliance portfolios emerge over time through the formation of individual

alliances, which each serve a singular purpose but often fail to cohere into a consistent portfolio (Bamford & Ernst, 2002; Doz & Hamel, 1998; George, Zahra, Wheatley, & Khan, 2001).

While the extant empirical literature supports the view that single strategic alliances create value for their parent firms (Chan, Kensinger, Keown, & Martin, 1997; Hagedoorn & Schakenraad, 1994), little is known about value creation from the perspective of a firm's alliance portfolio. Various alliance researchers have indeed pointed out that the alliance portfolio is an interesting unit of analysis that raises a number of new and important theoretical and empirical issues that merit further scholarly research (George et al., 2001; Gulati, 1998; Khanna, 1998; Lavie, 2006). More recently researchers have started to address the need to closer examine alliance portfolios. Those studies that take alliance portfolios into account have mainly focused on the link between overall alliance portfolio structural characteristics and their performance impact (Bae & Gargiulo, 2004; Baum, Calabrese, & Silverman, 2000; George, Zahra, Wheatley, & Kahn, 2001; Rowley, Behrens, & Krackhardt, 2000; Stuart, 2000). However, these existing studies have theoretically and empirically neglected an important alliance portfolio relevant issue: interdependencies, such as synergies and conflict, that can occur between individual alliances in a firm's alliance portfolio. A notable exception that raises some of these issues peripherally is Parise and Casher's (2003) conceptual and more managerially relevant framework on how to design and manage alliance portfolios. Furthermore, since alliances are means to obtain preferential access to strategically critical resources (Das & Teng, 2000; Eisenhardt & Schoonhoven, 1996), the issue of interdependencies between the resources accessed through multiple simultaneous alliances with different partners

gains also theoretical relevance from a resource-based perspective (Barney, 1991; Peteraf, 1993; Rumelt, 1984; Wernerfelt, 1984). However, the recent theoretical contributions that extend traditional resource-based logic to interfirm alliances fall short of addressing this issue (Dyer & Singh, 1998; Lavie, 2006). Thus, from both a theoretical and empirical perspective, it would be useful to further clarify the present understanding of (i) how value is created on the alliance portfolio level and (ii) what role interdependencies between alliances play in determining the value that firms derive from their alliance portfolios. Yet, we find that the extant literature is quite silent on this topic.

The objective of this dissertation is therefore to address this gap in the literature by developing new theory and providing empirical evidence on value creation in alliance portfolios. More specifically, this study combines insights from the resource-based view of the firm (Barney, 1991; Peteraf, 1993; Rumelt, 1984; Wernerfelt, 1984) and the strategic behavior and competitive dynamics literature (Chen & Hambrick, 1995; Chen & MacMillan, 1992; Chen & Miller, 1994; Chen, Smith, & Grimm, 1992; Kogut, 1988) to shed further light on the synergies and conflicts that can occur in alliance portfolios. This dissertation seeks to address two specific research questions.

The first research question is mainly theoretically motivated and aims to fill the existing gap in the resource-based literature on resource interdependencies in a multilaterally connected firm's resource system. The first research question goes as follows:

Research Question 1: *How do resources accessed through multiple simultaneous alliances with different partners affect value creation and appropriation?*

The second research question raised in this dissertation is more phenomenon-driven and addresses the issue of alliance portfolio reconfiguration. More specifically it focuses on the very specific situation when a firm enters into a new strategic alliance to expand its existing alliance portfolio incrementally. This research question is framed in a marginal perspective in order to isolate the interaction between a newly formed alliance and the alliance portfolio to which this new alliance is added. The second research question goes as follows:

Research Question 2: *Do alliance portfolios affect the value that firms derive from entering into new strategic alliances?*

While the answer to the first research question is constituted in a purely theoretical model, the theory developed to address the second research question is also tested empirically. More specifically, the theoretical arguments developed to answer the second research question are tested using event study methodology and data from the global airline industry on codeshare alliances formed between 1994 and 1998. The global airline industry, the empirical context of this study, is a good example of an environment in which strategic alliances are important strategic devices for industry players to obtain preferential access to new critical resources such as new routes. Moreover, firms in that industry do not only maintain entire alliance portfolios, i.e. multiple alliances with different partners, in order to compete on a global basis but also frequently add new alliances to their portfolios. This industry is therefore well suited for addressing the second research question empirically.

Finally, the theoretical and empirical contributions of this dissertation are not just limited to the stream of alliance literature in the strategy field. Indeed, they also aim to inform a more fundamental question occupying the attention of strategy researchers in the line of the resource-based view of the firm: what resource characteristics determine the value that a resource creates in a firm's resource system? The theoretical and empirical analysis in this dissertation provides useful insights on how resources and their value creating potential can be evaluated in the context of multilaterally connected firms' resource systems.

1.2 Dissertation Structure

The remainder of this dissertation is organized as follows. Chapter 2 provides a review and critique of the relevant background literature on (i) the resource-based view of the firm and its recent extensions to interconnected firms, (ii) alliance portfolios, and (iii) strategic alliances and their impact on firm value. Chapter 3 contains two distinct pieces of theory development on how value is created in alliance portfolios. The first theory building part aims to address the first research question while the second part addresses the second research question. Chapter 4 describes the adopted research setting, methodology, and measures. Chapter 5 presents the data analysis and results. Chapter 6 discusses the findings and their theoretical as well as managerial implications. Furthermore, it outlines the limitations of this study and highlights avenues for future research. Chapter 7 concludes with a summary of the key contributions of this dissertation.

2 LITERATURE REVIEW

In this chapter, I review the extant literature on (i) the resource-based view of the firm and its recent extensions to interconnected firms as well as the literature on (ii) alliance portfolios and (iii) strategic alliances and their impact on firm value. I shall also highlight the gaps in the current literature and discuss how this study seeks to address them.

2.1 The Resource-Based View of the Firm and its Theoretical Extensions to Interconnected Firms

2.1.1 The Traditional Resource-Based View of the Firm

The idea of resource heterogeneity amongst firms as source for Ricardian rents dates back to the work of Penrose (1959). Following Penrose's work, an important stream in the strategic management field evolved in the 1980s. This stream, commonly known as the resource-based view of the firm (henceforth RBV), conceptualizes firms as heterogeneous bundles of resources and aims at explaining under what conditions these resources enable firms to achieve and sustain competitive advantage (Amit & Shoemaker, 1993; Barney, 1991; Peteraf, 1993; Rumelt, 1984; Wernerfelt, 1984). From the perspective of the RBV, firms can have a sustainable competitive advantage and achieve superior performance when they possess a stock of valuable, rare, imperfectly imitable, and non-substitutable resources (Barney, 1991). It has also been argued that such strategically relevant firm resources cannot be acquired in strategic factor markets as they are generally non-tradeable. Instead they can only be

accumulated internally by choosing appropriate paths of resource flows over a period of time (Dierickx & Cool, 1989) or accessed through non-traditional market mechanisms such as strategic alliances (Das & Teng, 2000; Eisenhardt & Schoonhoven, 1996).

The traditional RBV literature provides a broad range of definitions and classifications for firm resources. In his seminal article, Wernerfelt (1984) defines a resource as anything that could be thought of as a strength or weakness of a given firm, i.e. tangible and intangible assets, which are tied semi-permanently to the firm. Barney (1991) and Grant (1991) offer more specific resource categorizations: Barney (1991) groups resources into physical capital, human capital, and organizational capital resources and Grant (1991) lists six resource types: financial, physical, human, technological, reputational, and organizational resources. In the empirical literature, more functional resource categorizations prevail: Capron, Dussauge, and Mitchell (1998) for instance group resources into R&D, manufacturing, marketing, managerial, and financial resources. Additional resource typologies are offered by Black and Boal (1994) who distinguish between contained and system resources and Miller and Shamsie (1996) who distinguish between property-based and knowledge-based resources.

Moreover, Penrose (1959) suggested that it is in fact not the resource itself but rather the services that a resource renders that create value for a firm. From that perspective, a resource represents a set of potential services with a certain rent generating capacity. Consequently, how a firm capitalizes on a resource's potential services and rent generating capacity depends mainly on the uses to which it deploys

the resource. However, single resources are rarely rent generating on their own (Grant, 1991): it usually requires entire combinations or bundles[1] of complementary resources to capitalize on particular services and to pursue rent generating business opportunities (Amit & Shoemaker, 1993; Eisenhardt & Martin, 2000; Grant 1991; Teece, Pisano, & Shuen, 1997).

The notion of complementarity between resources has indeed caught the interest of both strategy scholars and economists. The extant strategy and economics literature provides a number of conceptualizations and definitions for resource complementarity. In his seminal article, Wernerfelt broadly defines complementary resources as resources "[…] which combine effectively with those you already have" (1984: 175). In the context of innovating firms, Teece (1986: 288) refers to complementary assets or capabilities as those that are to "[…] be utilized in conjunction with other capabilities or assets" needed to make an innovation successful. In a more economics-based perspective, a number of researchers posit that two resources are complementary when having more of one resource raises the value of the other resource and when a combination of these resources together is worth more than the sum of the individual values of having each resource separately (Amit & Schoemaker, 1993; Arora & Gambardella, 1990; Milgrom & Roberts, 1990). The empirical literature shows that firms often engage in interfirm relationships to gain access to such complementary resources in order to create synergistic and rent generating resource combinations through the joint deployment of complementary resources that would not otherwise be available to them (Arora & Gambardella, 1990;

[1] The terms combination and bundles essentially refer to the same concept. In the remainder of the study I will use the term combination.

Chung et al., 2000; Eisenhardt & Schoonhoven, 1996; Gulati, 1995; Rothaermel, 2001).

2.1.2 Extensions of the Resource-Based View to Interconnected Firms

As stated earlier, strategically critical resources can be accessed through external exchange mechanisms such as strategic alliances (Das & Teng, 2000; Eisenhardt & Schoonhoven, 1996). While the traditional RBV has mainly focused on resources that reside within firm boundaries and are owned and controlled by a focal firm (Barney, 1991; Penrose, 1959; Rumelt, 1984; Wernerfelt, 1984), recent theoretical extensions of the RBV to interconnected firms, i.e. firms that participate in interfirm relationships, relax this condition and include resources that firms access through interfirm alliances into the equation (Dyer & Singh, 1998; Lavie, 2006).

In their seminal paper, Dyer and Singh (1998) introduce the idea of the relational view of the firm and argue that inter-organizational relationships can be the source of a firm's competitive advantage and so-called relational rents. They posit that critical firm resources may reside beyond firm boundaries and be embedded in inter-organizational relationships. Sustained competitive advantage and the generation of relational rents through superior relational capital depend on the protection of these resources from imitation and substitution. Relational rents can be preserved though the following isolating mechanisms: (i) causal ambiguity, (ii) time compression diseconomies, (iii) inter-organizational asset inter-connectedness, i.e. competitors cannot imitate practices or investments because of asset stock inter-connectedness, (iv) partner scarcity, i.e. competitors cannot find a partner with the required

complementary strategic resources or relational capability, (v) resource indivisibility, i.e. competitors cannot access the capabilities of a potential partner because these capabilities are indivisible, perhaps have co-evolved with another firm, and (vi) socially complex institutional environment, i.e. competitors cannot replicate a the necessary formal rules (legal controls) or informal rules (social controls) that control opportunities and encourage cooperative behavior (Dyer & Singh, 1998). Furthermore, Dyer and Singh (1998) identify four conditions on the alliance level of analysis that are necessary to create so-called relational rents: (i) investment in relationship specific assets, (ii) investment in knowledge-sharing routines, (iii) the existence of complementary resources and capabilities between partners, and (iv) effective governance of the interfirm relationship.

In a more recent paper, Lavie (2006: 644) argues that "[…] the resource-based competitive advantage of a focal firm participating in an alliance can be partitioned into four elements corresponding to four different types of rents: (1) internal rent, (2) appropriated relational rent, (3) inbound spillover rent, and (4) outbound spillover rent". Internal rents are essentially a combination of Ricardian rents and quasi-rents that a firm can earn with its own resources depending on the complementarities with the resources of its alliance partner (Lavie, 2006). Appropriated relational rent refers to the share of relational rent that a focal firm can appropriate depending on the relative absorptive capacity, relative scale and scope of the resources, contractual agreement, relative opportunistic partner behavior, and relative bargaining power (Lavie, 2006). Internal spillover rent refers to the unintended gains by a focal firm in an interfirm relationship through internalizing a skill or resources from the partner. Lastly,

outbound spillover rent refers to a focal firm's loss of rent due to leakage and spillover (Lavie, 2006).

2.1.3 Research Gap

The review of the extant RBV literature reveals that both the traditional RBV as well as the recent extensions of the RBV to interconnected firms that address critical topics such as rent creation and appropriation in interfirm relationships neglect an important issue: resources that are accessed through multiple simultaneous alliances with different partners may be interdependent. The relational view does not problematize the issue of multiple simultaneous interfirm relationships with different partners and the therewith related resource interdependencies because it focuses on the single alliance as the unit of analysis (Dyer & Singh, 1998). Moreover, Lavie's (2006) theoretical extension of the RBV applies both an alliance as well as firm level analysis but its extension to the alliance portfolio level, however, does not incorporate such resource interdependencies.

To summarize, the existing theoretical extensions of the RBV to interconnected firms essentially develop theory on the single alliance level of analysis and, when extending these frameworks to the alliance portfolio level of analysis, implicitly assume that the extrapolation from the single alliance to the alliance portfolio level is additive in nature (Dyer & Singh, 1998; Lavie, 2006). In other words, the competitive advantage created through multiple alliances equals the sum of the competitive advantages of all individual alliances. However, when taking an alliance portfolio perspective such an additive approach assumes away the interdependencies between

the resources in a multilaterally connected firm's resource system. In other words, the value that interconnected firms derive from their alliance portfolios may be either greater or even less than the sum of the values they derive from all their alliances individually. Thus, to advance the understanding of the role of resources accessed through multiple alliances with different partners in creating value, new theory needs to be developed that better defines the types of interdependencies that can arise between these resources and sheds light on how these interdependencies affect the value that interconnected firms derive from their alliance portfolios. This dissertation takes an important step in filling this theoretical gap in the literature.

2.2 Research on Alliance Portfolios

Today, many firms are engaged in multiple simultaneous strategic alliances with different partners and are therefore facing the challenge to manage an entire alliance portfolio (Anand & Khanna, 2000; Gulati, 1998; Hoffmann, 2005; Parise & Casher, 2003). While existing alliance research has predominantly focused on single alliances, various alliance researchers have pointed out that the alliance portfolio as the unit of analysis raises indeed a number of new and important issues that merit further scholarly research (George et al., 2001; Gulati, 1998; Khanna, 1998; Lavie, 2006). The fact that alliance researchers from various disciplines have recently started to address the need for studying the alliance portfolio phenomenon, resulted in a diverse number of alliance portfolio conceptualizations. Table 1 summarizes these existing alliance portfolio conceptualizations.

Study	Alliance portfolio conceptualization
Baum et al. (2000) Rowley et al. (2000)	A focal firm's egocentric alliance network, i.e. all direct ties with partner firms (social network perspective)
Doz & Hamel (1998)	The set of bilateral alliances maintained by a focal firm
George et al. (2001)	A firm's portfolio of strategic agreements or relationships
Hoffmann (2005)	All alliances of a focal firm
Parise & Casher (2003)	A firm's network of business-partner relationships
Reuer et al. (2002)	A firm's accumulated international joint venture experience (learning perspective)
Reuer & Ragozzino (2006)	All international joint ventures of a focal firm

Table 1: Existing Conceptualizations of Alliance Portfolios

Besides these different conceptualizations, additional confusion is created by the fact that some of the existing terminology is used to describe different alliance related concepts. For example, while social network theorists (Baum et al., 2000; Rowley et al., 2000) use the term alliance network to refer to a focal firm's direct ties with different partners, i.e. its alliance portfolio, some authors use the identical term to refer to multi-party alliances, i.e. one alliance with many partners (Doz & Hamel, 1998; Koza & Lewin, 1999). Gomes-Casseres (1994), however, refers to such multi-party alliances as alliance groups or constellations. Furthermore, Doz and Hamel (1998: 223) coined the term "alliance web", which they clearly distinguish from an alliance portfolio, by defining it as "[…] a set of alliances that are more interdependent than a portfolio but less uniform than a network." Lorenzoni and Baden-Fuller (1995) use a similar term, namely "web of alliances", to refer to an alliance network with strategic guidance by a center organization.

Although the majority of the alliance literature still remains on the dyadic level, literature on the alliance portfolio level of analysis has started to accumulate. The

extant conceptual and empirical alliance literature that addresses the alliance portfolio phenomenon can be organized around the following four main research issues: (i) the formation of alliance portfolios, (ii) the composition and dimensions of alliance portfolios, (iii) synergies and conflicts in alliance portfolios, (iv) alliance portfolios and alliance capability, and (v) alliance portfolios and performance issues. The extant literature on each of these five research issue is now reviewed.

2.2.1 The Formation of Alliance Portfolios

Existing research on the formation of alliances portfolios addresses two distinct but inter-related issues: (i) the underlying rationales and motivations of firms to pursue a multiple alliance strategy, i.e. to form an alliance portfolio and (ii) the strategies pursued by firms to create and use such a portfolio.

Alliance researchers report a number of rationales for building an alliance portfolio. These rationales include creating a substantial experience base (Anand & Khanna, 2000), pursuing multiple simultaneous goals to achieve greater alliance benefits (George et al., 2001), overcoming uncertainty and optimizing risk through different types of alliances in different situations (George et al., 2001), or obtaining new and exploiting existing resources in new contexts (Hoffmann, 2001). In the special case of startup firms, Baum et al. (2000) show that an important motive is the creation of relationships and resources typical of a more established firm. Moreover, in the case of supply alliances, Lorenzoni and Lipparini (1999) show in a longitudinal study of three leading Italian automatic packaging machine manufacturers, how firms build and use their portfolio of supplier alliances as a mechanism to co-evolve with

their environment and shape the nature of competition. Reuer and Ragozzino (2006) take a different perspective by drawing on agency theory and argue that alliance portfolio formation can also be the result of the maximization of managers' own utility function.

While researchers have addressed the issue of motives and rationales, very few studies focus on the strategies pursued by firms when they form an alliance portfolio. One notable exception that addresses this issue is Hoffmann's (2001, 2006) case-based analysis of major European firms, in which he observes that alliance strategy follows business strategy and that both determine the design of alliance portfolios. Moreover, he found that depending on the level of strategic uncertainty and the opportunity to influence their environment, firms use different resource exploration and exploitation strategies in their alliance portfolios. Depending on the strategy pursued, alliance portfolios can vary in their characteristics such as the number of alliances, number of partners, alliance durations, scope, tie strength, and overlap.

2.2.2 The Composition of Alliance Portfolios

A second area of alliance portfolio research focuses on what can be referred to as alliance portfolio composition. An alliance portfolio's composition can be described by the portfolio's structure, i.e. the breadth, overlap, and redundancy of the alliances and partners as well as its size, i.e. the number of alliances and partners (Hoffmann, 2006).

A number of studies grounded in the social network literature focus on the structural dimensions of alliance portfolios and the implications of network structure on firms' performance and alliance behavior (Bae & Gargiulo, 2004; Baum et al., 2000; Gimeno, 2004; Rowley et al., 2000). In these studies, an alliance portfolio is essentially viewed as a firm's ego-network of alliances assuming that a firm's network ties influence the firm's collaborative behavior and performance (Barley, Freeman, & Hybels, 1992; Burt, 1992; Granovetter, 1985; Gulati, 1998; Gulati, Nohria, & Zaheer, 2000). More specifically, these studies identified explanatory factors including the number of particular alliance types and tie diversity (Powell, Koput, Smith-Doerr, 1996), the amount of network resources available to the focal firm (Gulati, 1999), network size related to resource dependence (Casciaro, 1999), the strength of ties in relation to network density (Rowley et al., 2000), the number of direct and indirect ties as well as the degree of connectivity of the focal firm's partners (Ahuja, 2000b), partner diversity (Stuart, 2000), as well as size and efficiency of the network and characteristics of partner firms that are potential rivals (Baum et al., 2000).

From such a structural perspective, alliances within an alliance portfolio are considered as redundant or overlapping when they provide access to the same information (Burt, 1992) or same complementary capabilities (Gomes-Casseres, 1994). Building on that view, Baum et al. (2000: 270) compare firms with redundant alliance networks to conglomerates and state: "[…] in the same way that markets look unfavorably on conglomerates, firms with extensive, inefficient webs of alliances comprised of multiple, duplicate partners risk criticism from analysts, investors, and capital markets." Furthermore, Stuart (2000) who defines alliances as access relationships to resources and know-how refers to Burt's (1992) structural hole theory

and argues that the addition of a non-redundant strategic partner, because it grants access to new information, is likely to be more valuable than a partner that is similar to the existing ones. Moreover, Hoffmann (2001, 2006) suggests that an efficient structure of the alliance portfolio is characterized by a small overlap of individual alliances and a high degree of structural autonomy. He found that the higher the number of alliances and the content overlap of alliances, the higher the total coordination requirements for the alliance portfolio. On the issue of diversity, Baum et al. (2000) demonstrate how partner diversity impacts redundancy and therefore also configuration efficiency. According to them, a small set of alliances with diverse partner may yield more diverse information and capabilities for less cost than a large set of alliances with similar partners.

In a more recent study, Gimeno (2004) examines the composition of firms' alliance networks related to the composition of their competitors' networks and concludes that network composition is the result of competitive dynamics. Furthermore, Bae and Gargiulo (2004) jointly consider the resources of a firm's alliance partners and the network structure in which those resources are exchanged in order to shed light on how the firm can leverage the structure of its alliance network to mitigate the costs that might result from associating with resource-rich and hence powerful partners.

On the issue of alliance portfolios size, previous authors have drawn on the economics literature and reported a curvilinear relationship between a firm's number of strategic alliances and the firm's technological performance such as new product development (Deeds & Hill, 1996; Rothaermel, 2001). Although findings on the

optimal number of alliances remain inconclusive and are likely to be firm specific, previous authors posit that it is impossible to determine the optimal alliance portfolio size ex-ante, as managers can only know the optimal number of alliances ex-post (Deeds & Hill, 1996). Moreover, Gulati (1999) argued that it is not the sheer number of alliances that matters for the breadth of a firm's alliance portfolio but the degree how widespread the direct and indirect connections through alliances are. In other words, a firm may have numerous alliances with only a few firms, which are hardly connected to other firms or numerous alliances with numerous unconnected and isolated firms. In both cases, such a connected firm has a large alliance portfolio in terms of the number of alliances but its breadth of ties is limited. In contrast, a firm may have few alliances but with well-connected firms and here, a smaller alliance portfolio offers a higher breadth. Along the same line of thought, Stuart (2000) also showed that the advantage of an alliance portfolio is in fact not so much determined by the portfolio's size, but by the characteristics of the partners that the focal firm is connected to.

2.2.3 Synergies and Conflicts within Alliance Portfolios

Various authors posit that interconnected firms can achieve a range of synergies across their multiple alliances. Such synergies include inter-alliance knowledge transfer (Powell et al., 1996), economies of scale and scope (Doz & Hamel, 1998), additional rents and cost savings (Hoffmann, 2001), and the development and institutionalization of firm-level alliance capability (Kale, Dyer, & Singh, 2002). Furthermore, some authors distinguish between different types of synergies that can occur in alliance portfolios. Hoffmann (2001) proposes that synergies in an alliance

portfolio can occur between (i) multiple dyads within one alliance, (ii) multiple alliances within one business unit, and (iii) multiple alliances between multiple business units. Moreover, Nielsen and Mahnke (2004) systematize synergies (i) between alliances with the same partner, (ii) among the same alliance type, (iii) across a subset of alliance types, and (iv) across the entire portfolio.

Furthermore, it has been argued that redundancy and overlap can cause internal competition in alliance portfolios and are therefore a source of potential conflict. Such conflict in alliance portfolios may occur when alliance partners are members of competing networks, rivals in an industry, or promote competing technologies or standards (Parise & Casher, 2003) or when alliances are redundant (Gomes-Casseres, 1994). Internal conflict can on one side fragment a part of the network so much that none of the members reaches efficient scales or earns a sufficient return to reinvest in growth (Gomes-Casseres, 1994).

2.2.4 Alliance Portfolios and Alliance Capability

An important strand of firm level alliance research focuses on the issue of alliance experience and the creation of alliance capability across multiple alliances. Studies that are concerned with this issue examine how firms learn to design and manage individual alliances from an entire portfolio of alliances (Anand & Khanna, 2000; Inkpen, 2002; Kale et al. 2002).

The predominant theoretical lenses in this literature stream are organizational learning (Levinthal & March, 1993) and the knowledge-based view of the firm (Grant,

1996; Kogut & Zander, 1992). From these theoretical perspectives a firm's ongoing as well as past alliances are conceptualized as the firm's alliance experience (Anand & Khanna, 2000; Hoang & Rothaermel, 2005; Kale et al., 2002; Reuer, Park, & Zollo, 2002; Simonin, 1997). A number of empirical studies show that the performance of firms engaging in multiple alliances over time varies with the amount of alliance experience (Simonin, 1997), the learning effects across different alliance scopes (Anand & Khanna, 2000), and the novelty of additional alliance experience related to the characteristics of the existing alliance experience (Reuer et al., 2002). However, these studies focus on the accumulation of alliance experience over time, i.e. the engagement in a string of sequential alliances, and therefore do not problematize the issue of having to manage multiple alliances with different partners simultaneously. In other words, in these learning studies an alliance that is no longer active would still be part of the analysis as it is considered past experience. From a true alliance portfolio perspective however, such an alliance would not matter as the focus lies on the management of multiple active alliances simultaneously.

Empirical research has also shown that alliance experience constitutes indeed an important antecedent for building a firm level alliance capability and collaborative know-how (Kale et al., 2002; Rothaermel & Deeds, 2005; Simonin, 1993). In the portfolio context, Powell et al. (1996) argue that experience and exploitation are not only necessary to structure and manage a diverse portfolio of collaborative ties but also to recognize and benefit from the interdependencies across that portfolio. Technically, alliance capability refers to the ability to identify valuable alliance opportunities, select appropriate alliance partners, design and negotiate alliances, implement and manage alliances, manage partner expectations, restructure the alliance if necessary, and

terminate the alliance (Dyer et al., 2001; Gulati, 1998; Khanna, 1998; Simonin, 1997). By possessing such alliance capability, firms can master the difficult task of alliance management (Kogut, 1989), achieve tangible and intangible collaborative benefits (Simonin, 1993), maximize the probability of alliance success (Kale et al., 2002), and create a competitive advantage through their alliances (Draulans et al., 2003). Firm-level alliance capability however, is neither created automatically nor by simply accumulating more alliance experience, but rather through explicit efforts to leverage the previous alliance experience and facilitate the transfer of lessons learned and specific know-how across alliances (Kale et al., 2002; Powell et al., 1996). In that context, Kale et al. (2002) show that firms that institutionalize knowledge accumulation and codification in a dedicated alliance function that manages or coordinates all alliance-related activity across an alliance portfolio perform better on the single alliance but also on the firm level. In the context of entire alliance portfolios, such a dedicated alliance function has also been described as an effective system for the strategic and operational monitoring and coordination of all alliances across the portfolio (Bamford & Ernst, 2002; Harbison & Pekar, 1998; Kale et al., 2001).

2.2.5 Alliance Portfolios and Performance

While existing alliance studies have extensively addressed the issue of how single alliances affect firm performance (for a comprehensive review see Gulati, 1998), they have only sparsely tackled the question of how alliance portfolios contribute to the performance of interconnected firms. The extant literature examines essentially two different issues related to alliance portfolio and performance: (i) the

performance assessment and control of alliance portfolios and (ii) the performance implication for firms maintaining alliance portfolios.

One challenge for firms engaging in multiple alliances is the management of their alliance portfolio on an ongoing basis and its performance assessment (Hoffmann, 2005; Parise & Casher, 2003). Only a few studies discuss alliance portfolio performance assessment and suggest different views on where and how performance should be assessed. Some authors argue that alliance related performance assessment should be systematic and continuous and should occur on three levels (Bamford & Ernst, 2002; Hoffmann, 2001): (i) on the individual alliance level, where the performance of the alliance is assessed, (ii) on the business unit level where the performance of the alliance portfolio is assessed, and (iii) on the corporate level where the effectiveness of the firm's alliance policy is assessed. Evaluation criteria on the business unit level are the alliance portfolio's financial and strategic contribution to business performance, while criteria on the corporate level include the degree of alliance capability, the reputational capital and the degree of inter-organizational trust to strategically important partners, as well as the positioning in cross-industry networks (Hoffmann, 2001). Draulans et al. (2003) on the other hand suggest two types of assessments on different levels: unstructured evaluation on the individual alliance level and cross-alliance comparison on the organizational level. There are also some claims that most firms are indeed unable to assess and control the performance of their alliance portfolios. The main reasons are the lack of rigorous performance measurement on the individual alliance level, recognition of performance patterns across the whole portfolio, and information on the senior management level to assess whether the alliance portfolio supports the firm's strategy (Bamford & Ernst, 2002).

Moreover, it has been suggested in the managerial literature that the performance assessment of an alliance portfolio can be supported by a number of processes and tools. One study recommends to implement an alliance performance scorecard and identify alliance portfolio performance patterns by asking three questions (Bamford & Ernst, 2002): (i) which types of alliances perform well for the company, (ii) does the company repeatedly fail at a particular stage in the alliance life cycle, and (iii) is there a pattern that makes alliances with specific partners or types of partners more successful than others. Although, this method suggests looking across the whole portfolio and drawing conclusion on that level, the actual assessment and applied performance indicators occur on the individual alliance level.

Regarding the performance implication of alliance portfolios only a few studies address this issue and mainly focus on specific structural portfolio characteristics and their performance implication (Bae & Gargiulo, 2004; Baum et al., 2000; George et al., 2001; Lavie, 2004; Rowley et al., 2000; Stuart, 2000). For example, Powell et al. (1996) provide some interesting insights on how connectivity and learning in alliance networks of biotechnology firms relate to growth. They show how collaborative R&D and network experience not only drive firms' alliance portfolios but also how a more diverse alliance portfolio leads to a better position to access critical resources and information outside firm boundaries. Moreover, in their analysis of the steel and semiconductor industry Rowley et al. (2000) observe a negative relationship between a firm's number of strong ties and performance and a positive relationship between the number of weak ties and performance. In an empirical study of the alliance portfolios of startup firms, Baum et al. (2000) show how variation in alliance portfolio composition creates significant firm performance differentials. Specifically, they show

that an alliance portfolio with similar partners may yield fewer benefits than with differentiated partners. Furthermore, in their analysis of bio-pharmaceutical companies George et al. (2001) show that alliance portfolio features such as structure and knowledge flows impact a firm's innovativeness, performance, as well as absorptive capacity. Specifically, they conclude that an alliance portfolio that grants stability and access to new knowledge yields superior financial performance.

2.2.6 Research Gap

A review of the extant literature on alliance portfolios reveals that the alliance portfolio phenomenon is still under-researched and provides an interesting area for further theoretical and empirical contributions. Existing alliance portfolio research addresses important issues that result from having to deal with multiple alliances simultaneously both conceptually and empirically. While for some alliance portfolio research issues, i.e. the performance implication of alliance portfolio, empirical research has started to emerge, for other issues, i.e. alliance portfolio strategies, existing research is more conceptual. Furthermore, most of the work on synergies and conflict within alliance portfolios is conceptual and there is indeed scarce empirical evidence of how these synergies and conflict affect the performance of interconnected firms. Furthermore, existing research addressing the question of how alliance portfolios affect performance has mainly focused on structural alliance portfolio characteristics and their respective performance impact (Bae & Gargiulo, 2004; Baum et al., 2000; George et al., 2001; Rowley et al., 2000; Stuart, 2000) but neglected the interdependencies between individual alliances and the alliance portfolio in which they are embedded. To summarize, it would be helpful to have more empirical evidence on

the synergies and conflict that occur in alliance portfolios and establish a link to performance.

2.3 Research on Strategic Alliances and Their Effect on Firm Value

One of key research issues in the alliance literature is the impact of strategic alliances on firm performance (Gulati, 1998). By entering into a strategic alliance, firms incur both costs and benefits (Buckley & Casson, 1988; Madhok & Tallman, 1998; Park & Zhou, 2005). Alliance costs occur through the coordination activities related to the alliance, the capital investment into the alliance, or the loss of resources to the partner (Koh & Venkatraman, 1991, Park & Zhou, 2005). Alliance benefits include economies of scale, access to complementary resources, minimized risk and transaction costs, enhanced competitive positioning vis-à-vis rival firms, or learning new skills from the partner (Das & Teng, 2000; Dussauge et al., 2000; Kogut, 1988; Koh & Venkatraman, 1991). Considering its costs and benefits, each alliance formation is essentially a trade off decision and firms will enter into an alliance when its benefits exceed its costs and the anticipated performance implication is positive (Buckley & Casson, 1988; Koh & Venkatraman, 1991).

Most research studying the performance consequences for firms entering into alliances focuses on how the formation of single alliances impact firm performance (Chan et al., 1997; Hagedoorn & Schakenraad, 1994; Kotabe & Swan, 1995; McConnell & Nantell, 1985; Park & Kim, 1997; Shan, Walker & Kogut, 1994). However, the separation between the performance effect of specific features of an alliance and other confounding factors represents a methodological challenge.

Therefore, some researchers focus on specific performance types such as technological performance (Kotabe & Swan, 1995; Shan et al., 1994), learning and knowledge acquisition (Mowery, Oxley, & Silverman, 1996), or managerial satisfaction (Geringer & Hebert, 1991).

A number of researchers took a different tack in measuring the performance implication of single alliances by taking a market-based perspective, using market value as a proxy measure. Authors in this line of research have used event study methodology to track abnormal stock market returns following the announcement of the alliance in order to isolate the performance effect of an individual alliance (Chan et al., 1997; Koh & Venkatraman, 1991; McConnell & Nantell, 1985; Park & Kim, 1997). According to this line of research, alliances generally create value and the distribution of value between partner firms depends on a wide range of factors including: (i) alliance specific factors, (ii) alliance partner specific factors, (iii) focal firm, i.e. announcing firm, specific factors, and (iv) environmental factors. Table 2 summarizes the results and event study design features of the main studies in this line of research.

Study	Sample	Period	Window	Avg. CAR
Anand & Khanna (2000)	1976 joint ventures and license agreements	1990-1993	14 days (-10/+3)	1.61% (JVs) 3.13% (licensing)
Chan, Kensinger, Keown, & Martin (1997)	345 alliances	1983-1992	26 days (-20/+5)	0.64%
Crutchley, Guo, & Hansen (1991)	146 U.S. Japanese joint ventures	1979-1987		1.05% (U.S.) 1.08 (Japan)
Das, Sen, & Sengupta (1998)	119 U.S. Japanese alliances	1987-1991	7 days (-3/+3)	0.20%
Kale, Dyer, & Singh (2002)	1572 alliances	1993_1997	14 days (-10/+3)	not reported
Koh & Venkatraman (1991)	175 joint ventures	1972-1986	2 days (-1/0)	0.87%
Madhavan & Prescott (1995)	108 joint ventures	1978-1991	various, e.g. 2 days (-1/0)	0.684%
McConnell & Nantell (1985)	136 domestic U.S. joint ventures	1972-1979	2 days (-1/0)	0.73%
Merchant & Schendel (2000)	393 international joint ventures	1986-1990	2 days (-1/0)	0.70%
Park & Kim (1997)	158 joint ventures	1979-1988	4 days (-2/+1)	1.2%
Park (2004)	241 international alliances	1986-1998	3 days (-1/+1)	1.1042%
Reuer, Park, & Zollo (2002)	1318 international joint ventures	1995-1997	3 days (-1/+1)	-1.83%

Table 2: Results of Existing Alliance Studies Using Event Study Methodology

2.3.1 Alliance Specific Factors

Empirical alliance research that has used event-study designs has shown that the value created through a strategic alliance and appropriated by the alliance partners depends on a number of alliance specific factors such as the alliance's functional scope and size as well as the alliance's relatedness to the partners' business operations.

By examining the effect of an alliance's scope on market value, Chan et al. (1997) show that horizontal alliances, involving the transfer or pooling of technical knowledge tend to produce larger performance effects than marketing alliances. Furthermore, they report that technical alliances involving firms in the same industry produce a highly significant average abnormal return while in non-technical or marketing alliances significantly positive performance effects only occur when the firms are from unrelated industries. Confirming performance variation across alliance scope, Das, Sen, & Sengupta (1998) show that announcements of technological alliances exhibit greater abnormal returns than announcements of marketing alliances.

In addition to an alliance's functional scope, also the size of the alliance impacts the stock market's reaction to alliance announcements (Chen, Hu, & Shieh, 1991). Moreover, Koh and Venkatraman (1991) show that the relatedness of an alliance to the parent firms' product-market operations causes variation in the stock market's reaction to the alliance announcement. Along the same lines, Park and Kim (1997) show that the partner whose current operation is closer related to the joint venture will report higher abnormal returns. Furthermore, Chan et al. (1997) confirmed that alliances between firms in the same three-digit SIC class produce significantly higher abnormal returns than alliances formed between firms in unrelated industries.

2.3.2 Alliance Partner Specific Factors

Empirical research has also examined partner specific factors and their impact on market value upon alliance formation. Here, an important factor that has been identified is the size of the partnering firms. Crutchley, Guo, and Hansen (1991)

studied 146 joint ventures between US and Japanese firms and showed that the stock market value increased when US partners were smaller than their Japanese counterpart. Another study shows that the performance gain of the smaller partner in an equally owned joint venture is equal to that of the larger partner (Koh & Venkatraman, 1991). Other researchers however, arrive at a different conclusion and report that firm size is inversely related to abnormal returns (Chan et al., 1997). More specifically, Chan et al. (1997) show that the market value of the equity of the larger partner is more than ten times that of the smaller partner. The smaller partners in the alliance however, experience a significant positive announcement day return while the larger partners experience an insignificant return. Moreover, Das et al. (1998) show that the market reaction to smaller firms' alliances is greater than the reaction to larger firms' alliances. In their study, abnormal returns are negatively correlated with firm profitability and size as larger firms may capture less of the gains generated in alliances while smaller partners may benefit more than larger partners.

2.3.3 Firm Specific Factors

Variation in the stock market's reaction to alliance formations has also been attributed to firm specific organizational features such alliance experience (Reuer et al., 2002) or the existence of a dedicated alliance function (Kale et al., 2002). More specifically, Kale et al. (2002) show that a dedicated alliance function is indeed significant in explaining abnormal stock market gains and it seems that the market rewards firms that establish a separate, dedicated mechanism to coordinate their alliances and learn from them.

2.3.4 Environmental Factors

A number of researchers also examine the impact of industry and competitive context and their impact on the abnormal stock market returns following an alliance formation. Madhavan and Prescott (1995) report for example that the information-processing load associated with an industry has an effect on investor response to joint venture announcements. In another study, Merchant and Schendel (2000) show that joint venture based shareholder value of firms is influenced by variables in their task related, competitive, and structural contexts, but not by factors in partner-related and institutional contexts.

2.3.5 Research Gap

A review of the extant literature that addresses the issue of how strategic alliances affect firm value shows that the bulk of prior event study-based alliance research is primarily devoted to dyads and views strategic alliances as stand-alone transactions rather than as part of an entire alliance portfolio. Consequently, explanatory factors that have been identified in explaining variation in firms' abnormal stock market gains following alliance formations are not on the alliance portfolio level of analysis. Therefore, by including the alliance portfolio and the interdependencies between individual alliances and alliance portfolios new light can be shed on the role that alliance portfolios play in explaining abnormal stock market returns following alliance formations.

3 THEORY BUILDING

The theory building part of this dissertation is divided into two parts essentially addressing the two research questions raised in Chapter 1. The first part provides a general static model addressing value creation and appropriation in multilaterally connected firms. The second part focuses on the very specific issue of resource reconfiguration, in particular the addition of new resources to a multilaterally connected firm's resource system through the addition of a new strategic alliance to an existing alliance portfolio.

3.1 Part I: Value Creation and Appropriation in Multilaterally Connected Firms

As Section 2.1 of the literature review revealed, the two recent extensions of the RBV to interconnected firms (Dyer & Singh, 1998; Lavie, 2006), neglect interdependencies between the resources a multilaterally connected firm accesses through its multiple alliances from different partners. Both the Dyer and Singh (1998) and Lavie (2006) frameworks work well on the single alliance level of analysis but when extended to the alliance portfolio level of analysis, they are built on an additive logic when extrapolating from the single alliance to the alliance portfolio level. However, when taking an alliance portfolio perspective this additive approach assumes away the interdependencies between the resources in a multilaterally connected firm's resource system. Indeed, firms that are simultaneously involved in multiple alliances with different partners may be in a position to take advantage of complementarities

existing between resources contributed by various partners, while they may also face incompatibilities that arise between their various alliances and partners.

Thus, to advance the understanding of the role of resources accessed through multiple simultaneous alliances with different partners in creating value, there is a need to better define and examine the types of interdependencies that can arise between these resources. Thus, I argue that the value that multilaterally connected firms derive from their interfirm relationships is a function of synergy exploitation and conflict avoidance in all the possible combinations of resources accessed through their multiple alliances. The extant literature, however, has left a gap in examining these synergies and conflicts that arise within alliance portfolios and in assessing their impact on value creation on the alliance portfolio level.

Therefore, this first part of the theory building of this dissertation focuses on specific issues that arise from being multilaterally connected including: (i) the opportunity to create synergistic and value creating resource combinations based on complementarity between resources accessed through multiple alliances with different partners, (ii) the role of a focal firm's own resources in appropriating value from such synergistic and value creating resource combinations, and (iii) the creation of conflicts between resource combinations involving the multilaterally connected firm's existing partners. The remainder of this first theory section is structured as follows. I first review the concepts of resource complementarity and completeness. Second, I introduce the resource system of the multilaterally connected firm. Next, I develop a fine grained model and propositions of synergy, conflict, and value creation in the context of multilaterally-connected firms.

3.1.1 Resource Complementarity and Completeness

To capitalize on the rent generating services of a particular resource, it usually requires complementary resources (Amit & Shoemaker, 1993; Penrose, 1959; Teece, 1986). However, despite multiple definitions, the concept of resource complementarity is not entirely free of ambiguity. While Wernerfelt's (1984) conceptualization stresses the effective combinability of resources, Teece emphasizes the role of complementary assets in completing a set of capabilities and assets required to make an innovation successful. To illustrate, an R&D resource, e.g. a patent for an innovative technology, and a manufacturing resource, may be effectively combinable but their combination may not be complete because it lacks a marketing resource, e.g. access to a distribution channel through which the end product can be distributed and thus lead to rent generation.

In effect, much of the extant literature views resource complementarity as a necessary and sufficient condition for value creation and assumes that all combinations of complementary resources lead to value creation (Amit & Schoemaker, 1993; Amit & Zott, 2001; Chung et al., 2000). This, however, stretches the concept of complementarity in the sense that it implicitly assumes that complementary resources when combined make up both a synergistic and complete combination. For the purposes of this theorizing, one needs to disentangle these two separate conditions for resource combinations to be value creating. Thus, I posit that resource complementarity and resource completeness are both necessary but individually insufficient conditions for constituting a value creating combination. In this study, I will refer to those conditions as the complementarity and completeness conditions.

Because such resource completeness is a necessary condition for making resource combinations value creating, and because firms rarely possess or are able to develop all complementary resources internally, they often reach beyond their own boundaries to access these missing complementary resources from partner firms in order to pursue new rent generating business opportunities and to ensure long-term success, growth, and survival (Das & Teng, 2000; Mitchell & Singh, 1992; Teece, 1986). Indeed, a number of empirical studies show that resource complementarity is an important antecedent for alliance formation and that firms can create synergistic and rent generating –i.e. complete - resource combinations through the joint deployment of complementary resources that would not otherwise be available to the partnering firms (Arora & Gambardella, 1990; Chung et al., 2000; Eisenhardt & Schoonhoven, 1996; Gulati, 1995; Rothaermel, 2001). Furthermore, disentangling completeness and complementarity can contribute to further the understanding of interfirm alliances. For instance, it helps to explain why firms often engage in multi-partner alliances: each partner contributes a complementary resource but it takes all partners together to make the resource combination complete and therefore value creating.

3.1.2 The Resource System of the Multilaterally Connected Firm

The traditional RBV literature provides a broad range of definitions and classifications for firm resources. Wernerfelt (1984) defines resources as tangible and intangible assets that are semi-permanently tied to the firm. Barney (1991) and Grant (1991) offer more specific resource categorizations: Barney (1991) groups resources into physical capital, human capital, and organizational capital resources and Grant (1991) lists six resource types: financial, physical, human, technological, reputational,

and organizational resources. In the empirical literature, more functional resource categorizations prevail: Capron et al. (1998) for instance group resources into R&D, manufacturing, marketing, managerial, and financial resources.

Dyer and Singh (1998) extended this traditional view by relaxing the RBV resource ownership assumption and arguing that critical firm resources may reside beyond firm boundaries and be embedded in inter-firm relationships. Approaching this issue from a network theory perspective, Gulati (1999) refers to resources located beyond firm boundaries as "network resources" which result from the information advantages firms obtain from participating in inter-firm networks. These network resources not only reside in a firm's ego-network, i.e. the network of partners with which a focal firm has directs ties, but also in its wider network, including indirect ties that go beyond its ego-network. More recently Lavie (2006) has built on the concept of network resources and has distinguished between a focal firm's non-shared resources, a partner firm's non-shared resources and the shared resources which are contributed by both the focal firm and its partner(s) to an alliance.

I draw from these various approaches in order to model how multilaterally connected firms create and extract value from their multiple interfirm relationships. This theorizing about multilaterally connected firms requires a resource categorization from the simultaneous perspectives of ownership (i.e. within or beyond focal firm boundaries) and locus of deployment (shared, i.e. deployed in a resource combination through an alliance, or non-shared, i.e. deployed in a combination of focal firm owned resources). In other words, while Lavie (2006) stresses non-shared versus shared resources, I further distinguish those shared resources which are owned by the focal

firm from those shared resources which are owned by the focal firm's partners, but to which the focal firm has access through its alliances. Thus, I extend Lavie's (2006) resource categorization and divide an interconnected firm's resource stock conceptually into: (i) resources residing within firm boundaries, i.e. resources that are owned and controlled by the interconnected firm, whether they are shared or non-shared, and (ii) resources residing beyond firm boundaries and to which the interconnected firm has access to because they are shared by the focal firm's partners through alliances. By adopting a firm level perspective on the value creation potential of a firm's alliance portfolio, I am led to focus primarily on the distinction between those resources a firm owns and controls, and those resources that a firm can access despite not owning them, rather than on the distinction between a firm's shared and non-shared resources. In other words, while Lavie (2006) emphasizes the demarcation line within firm boundaries to categorize resources into shared and non-shared resources, I emphasize firm boundaries as the demarcation line between resources over which the firm has full control and resources accessed through partners and which can thus only be deployed in agreement with the considered partners (Dyer & Singh, 1998; Gulati, 1999). Henceforth, I shall refer to these resources in the interconnected firm's resource system as (i) the firm's own resources and (ii) its relational resources. To summarize, and in line with Lavie (2006: 643-644), a focal firm *i*'s own resources correspond to its own shared and non-shared resources. A focal firm *i*'s relational resources, however, correspond to the sum of all of firm *i*'s partners' resources that are shared with firm *i*. The objective of this theorizing is to model how a multilaterally connected firm can create additional value from the multiple relational resources accessed from different partners, above and beyond the value created at the single alliance level.

Though the concept of relational resources builds on the network resource concept (Gulati, 1999), I view resources accessed through interfirm relationships as more than just information, because this theorizing is grounded in the RBV rather than in network theory (Dyer and Hatch, 2006; Gulati, 1999). Indeed, creating value in a focal firm's alliance portfolio requires actually combining resources from the firm and its partners, hence establishing direct ties between the focal firm and those partners with which resources are to be combined. In other words, while opportunity recognition of potentially value creating resource combinations does not require direct ties, opportunity exploitation of these combinations does. I thus conceptualize relational resources as those resources residing within the egocentric alliance network of the focal firm, i.e. within firms with which the focal firm is directly connected through an alliance. Figure 1 depicts the various resource types in the resource system of the multilaterally connected firm.

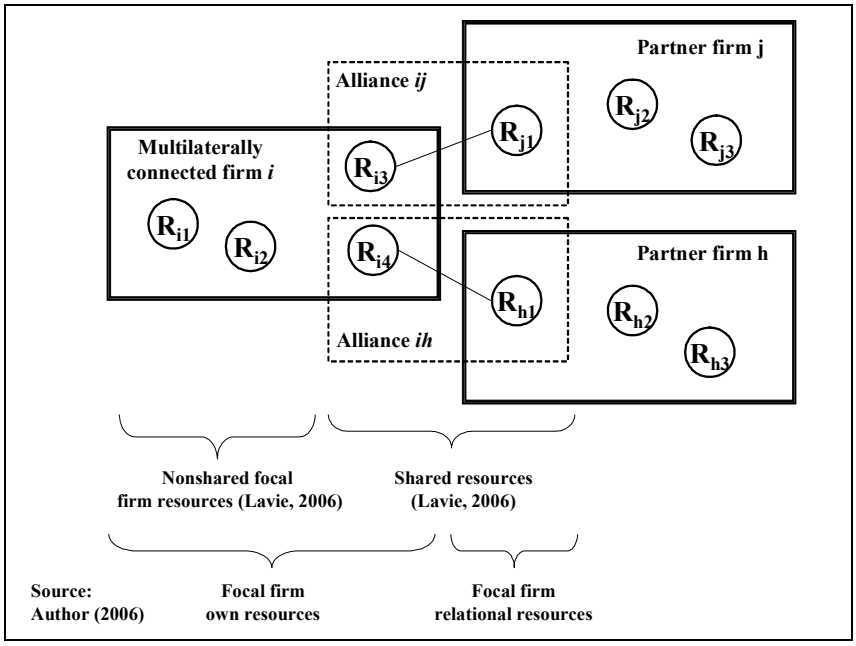


Figure 1: The Multilaterally Connected Firm's Resource System

I also assume that both resource types in this theory, i.e. a firm's own and relational resources, are critical resources that are valuable, rare, inimitable, and non-substitutable (Barney, 1991) and protected from internalization through learning (Hamel, 1991) by the characteristics of their respective accumulation process (Dierickx & Cool, 1989). Put differently, if the resources in this theory were replicable or tradable on the respective factor markets, there would be no need to form an interfirm alliance.

3.1.3 Interdependencies, Value Creation and Appropriation in the Multilaterally Connected Firm's Resource System

Most existing theories that concern multilaterally connected firms adopt an additive view in the sense that they assume that the value creation potential of a firm's alliance portfolio is the sum of the value creation potential of each individual alliance (Dyer and Singh, 1998; Lavie, 2006). However, these existing theoretical frameworks overlook the issues related to the interdependencies of various alliances. Indeed, these interdependencies can result in either greater or smaller overall value creation from the portfolio than the sum of the value created by each alliance. Interdependencies in a firm's alliance portfolio arise from either complementarities that exist across the focal firm's alliances or conflicts that emerge from the firm being simultaneously engaged in multiple alliances. I now discuss both of them in turn.

Much of the extant alliance literature that focuses on resource complementarity adopts a single alliance perspective in the sense that it focuses on the complementarity between the resources of a focal firm and those of its alliance partner (Arora &

Gambardella, 1990; Chung et al., 2000; Mowery, Oxley, & Silverman, 2002; Rothaermel, 2001). Although this single alliance perspective has significant explanatory power, it does not tell the entire story because it assumes away any type of resource complementarity beyond the single alliance level. When multiple alliances are considered, if they are all with the same partner, no additional complementarity can exist beyond the complementarities that are exploited through all possible alliances with that same partner: complementarities between the focal firm's relational resources are all among the same partner's shared resources and result in either privately deployed combinations by that partner or new alliances with the focal firm. When one considers multiple alliances with various partners, if resource complementarity is only between the focal firm's resources and the resources of each partner-firm, the additive view provides an accurate description of value creation in the firm's alliance portfolio. If, on the contrary, resource complementarity is extended to encompass complementarity between relational resources accessed from various partners through several different alliances, then the additive approach is insufficient.

In this theory building effort, I therefore suggest that relational resources in a multilaterally connected firm's resource system can be complementary in the following two ways. First, and in line with the extant literature taking a single alliance perspective, a relational resource can be complementary to one or more of the focal firm's own resources (Arora & Gambardella, 1990; Chung et al., 2000; Mowery et al., 2002; Rothaermel, 2001). In Figure 2 this is depicted through combinations $\{R_{i1},R_{j1}\}$ and $\{R_{i2},R_{h1}\}$. Second, and an extension to resource complementarity beyond the single alliance level, relational resources that are accessed from various partners

through different alliances can also be complementary. In Figure 2 this is depicted through combination $\{R_{j1},R_{h1}\}$.

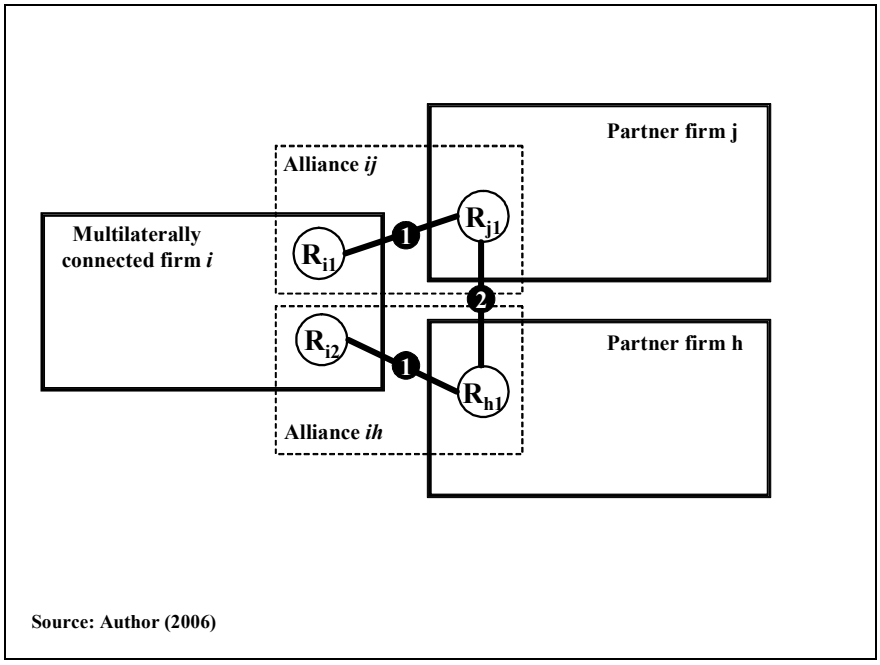


Figure 2: Resource Complementarity Types in Multilaterally Connected Firms

To summarize, multilaterally connected firms may benefit from value creating resource combinations involving complementary relational resources accessed from various partners through different alliances. Therefore, I posit:

> ***Proposition 1:*** *Simultaneous participation in multiple interfirm alliances with different partners can create value for a focal firm, above and beyond the value created by each alliance, provided there exist complementarities between the resources contributed by the various partners (i.e. between the focal firm's relational resources).*

3.1.4 Value Appropriation from Combinations of Complementary Relational Resources

One of the central assumptions in the RBV is that firms can appropriate value through the ownership of critical resources (Amit & Shoemaker, 1993; Barney, 1991; Wernerfelt, 1984). In the context of interfirm alliances, this value appropriation concern focuses on how much value is extracted by each alliance partner from the resource combination that is implemented through the alliance. From the perspective of the multilaterally connected focal firm, the issue with taking advantage of complementary relational resources is that these relational resources are owned and controlled by the focal firm's partners. Although multilaterally connected firms have preferential access to these relational resources, the resource access condition (Dyer & Singh, 1998; Lavie, 2006) will not suffice to appropriate rent from the services that relational resources accessed through multiple alliances with different partners can render as a combination. If a combination comprised of relational resources from different partners fulfilled the complementarity and completeness conditions, the partners owning and controlling these relational resources could in fact partner directly, thus excluding the multilaterally connected focal firm from that combination. Hence the following proposition:

> ***Proposition 2a:*** *For a multilaterally connected firm to be in a position to appropriate value from a combination of complementary relational resources, the considered combination of relational resources must be incomplete.*

Therefore the multilaterally connected focal firm will be able to take advantage of resource complementarity between relational resources of different partners only

when the combination of such complementary relational resources is incomplete and requires some of the focal firm own resources to make it complete. By having one or more of its own resources deployed in such a combination, the interconnected firm can thus appropriate additional value from the resource it contributes (for a comprehensive discussion on which rents occur and are appropriated by alliance partners see Lavie, 2006). Summarizing all of the above leads to:

> ***Proposition 2b:*** *A multilaterally connected firm will be able to appropriate value from a combination of complementary relational resources if and only if it possesses at least one own resource that is needed to make the combination complete.*

3.1.5 Conflict and Incompatibilities in the Multilaterally Connected Firm's Resource System

Previous authors have suggested that the relationship between alliance partners can be disturbed through opportunistic behavior or by defecting from mutual agreement (Hamel, 1991; Parkhe, 1993). According to this view, the cause for the disturbance is endogenous to the alliance and the consequence of the disturbance is internal to the alliance: the opportunistic behavior relates to activities performed in the alliance and will result in reduced benefits derived from the alliance. The causes and consequences of such conflicts can be adequately captured at the single alliance level. However, it may also be that the cause for disturbance between partners is exogenous to the alliance in the sense that one of the partners may undertake a competitive move that is not related to the activities performed in the alliance, but may nonetheless affect the relationship between the alliance partners. Exogenous competitive moves leading

to competitive conflicts between the alliance partners, e.g. the imitation of the other partner's technology or entry into its market domain, are likely to spill over into the relationship within the alliance (Kogut, 1989).

In their quest for enhanced competitive positioning, firms behave strategically and frequently undertake offensive moves vis-à-vis their rivals (Chen & MacMillan, 1992; Kogut, 1988). Indeed, scholars have argued that a firm's alliance behavior often impacts its own as well as its rivals' competitive positioning, performance, and survival and can therefore elicit competitive responses accordingly (Chen & MacMillan, 1992; Chen & Miller, 1994; Gimeno, 2004, Gomes-Casseres, 1996; Kogut, 1988; Silverman & Baum, 2002). Defendants may then respond by forming alliances with either the attacker's alliance partners or with partners through which the attacker's competitive position can be neutralized (Garcia-Pont & Nohria, 2002; Gimeno, 2004; Park & Zhou, 2005). Such exogenous effects of alliances on other alliances cannot be captured with a single alliance perspective and when such exogenous effects occur, an alliance portfolio, i.e. wider resource system, approach is needed to examine the value creation –or destruction- effects of multiple interfirm alliances on one another.

In this study, I take an exogenous perspective on conflict creation and argue that a multilaterally connected firm's alliance behavior may not only impact competitive positioning vis-à-vis its rivals but also vis-à-vis its existing alliance partners. I argue that resource combinations enabled by one alliance may in fact alter the competitive positioning of the multilaterally connected firm vis-à-vis the other existing alliance partners and may therefore cause disturbance in the relationships with

these partners. In other words, resource combinations that involve relational resources from one partner may be ideal from a value creating perspective on a single alliance level, but problematic on an alliance portfolio level from a strategic behavior perspective.

Technically, a competitive conflict between the multilaterally connected firm and an existing alliance partner can occur in two ways. First, it occurs when one or more resource combinations that involve relational resources overlap in product or market domain with the services rendered by one or more resource combinations that are privately deployed by an existing partner. Second, it occurs when one or more resource combinations that involve relational resources overlap in product or market domain with the services produced by other alliances. While in the former case, the conflict creating combination impacts only the multilaterally connected firm's existing partner, in the latter both the focal firm and its partner are affected. The two types of competitive overlap are depicted in Figure 3.

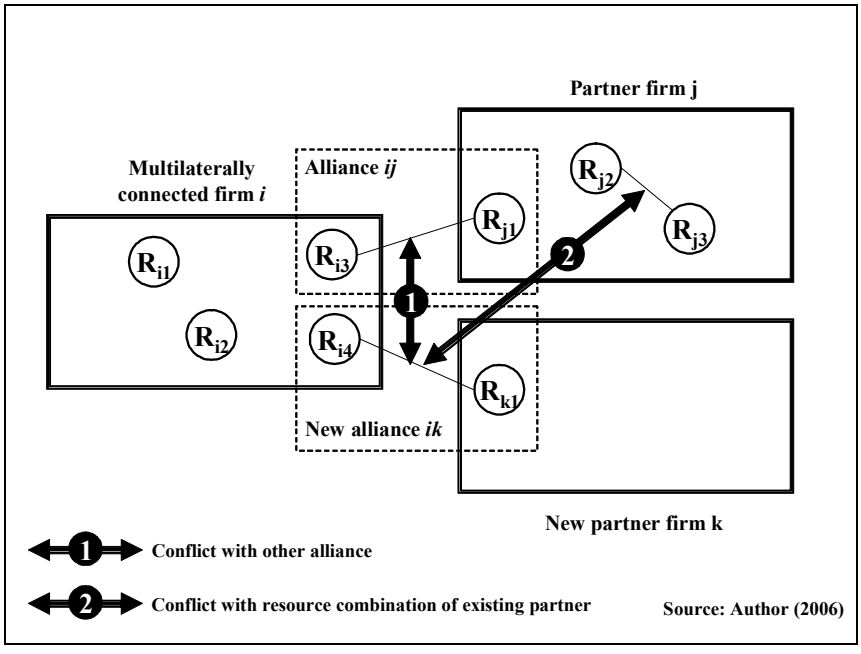


Figure 3: Types of Competitive Overlap in Multilaterally Connected Firms

Conflicts leading to potential alliance termination. Resource combinations that create competitive overlap in product or market domain between the multilaterally connected firm and an existing partner turn the two firms into competitors operating in the same market or offering similar products or services (Chen 1996; Kogut, 1989). Thus, an alliance enabling resource combinations that create competitive overlap in their services with an existing partner or with another existing alliance may be interpreted as an offensive move and may elicit a defensive response by the multilaterally connected firm's affected partner (Chen & MacMillan, 1992; Chen & Miller, 1994). Indeed, it has been argued that the greater the market domain overlap between two firms, the greater the competitive intensity between them and the higher the likelihood of a defensive move (Baum & Korn, 1996). A possible defensive response by an existing partner when facing such an offensive move may be to terminate its alliance with the multilaterally connected firm (Park & Russo, 1996). In such a case the multilaterally connected firm would not only loose its preferential access to the relational resources provided by this partner but also some of its rent generating resource combinations in which these resources are used. Thus, an alliance that is terminated by an existing partner will create a cost for the multilaterally connected firm associated with the deletion of existing value creating resource combinations. To summarize all of the above:

> ***Proposition 3a:*** *Overlap in the services rendered by a combination of a focal firm's own resources and relational resources with services rendered by a resource combination deployed by an existing partner creates a potential for conflict and may destroy value as a consequence of termination of the relationship.*

Proposition 3b: *Overlap in the services rendered by a combination of a firm's own resources and relational resources with services rendered by a resource combination enabled through another alliance of the focal firm creates a potential for conflict and may destroy value as a consequence of termination*

Conflicts leading to value cannibalization. Resource combinations that overlap in product or market domain with the services produced by other alliances in which the focal firm is engaged, will lead to loss of value at the intersection of the targeted product or market domains. Thus, even if they do not result in termination, such overlapping resource combinations will lead to cannibalization issues. Therefore, we propose:

Proposition 3c: *Overlap in the services rendered by a combination of a focal firm's own resources and relational resources with services rendered by a resource combination enabled through another alliance of the focal firm will diminish value through cannibalization.*

3.1.6 Overall Value Derived From Interfirm Alliances

At the core of this theoretical argument is the concept of resource interdependencies in a multilaterally connected firm's resource system. This concept makes it possible to better understand the overall value that such firms derive from their interfirm alliances by conceptually disentangling the value created at the level of each single alliance (be it positive or negative) and the value created by alliance portfolio effects (be it positive or negative). This theorizing suggests that four main factors determine value creation at the portfolio level: (i) complementarity existing

between relational resources, (ii) incompleteness in the combination of such relational resources, (iii) non-substitutability of a focal firm own resource making the combination complete and (iv) incompatibility with resource combinations involving existing partners.

Complementarity existing between relational resources provides opportunities for creating value above and beyond the value created at the single alliance level. Such complementarity is observable only by adopting an alliance portfolio perspective, i.e. focusing on the entire resources system of the multilaterally connected firm, including both own as well as relational resources. While complementarity between relational resources is a necessary condition for potential value creation at the portfolio level, it is individually insufficient. If a combination of relational resources is complete, the focal firm will be bypassed and the partners owning the complementary relational resources could implement the combination alone. Hence, a third necessary condition for value appropriation is therefore that the focal firm possesses one or more own resources required to make the combination of complementary relational resources complete. To summarize, the above stated conditions are all necessary but are individually insufficient for value creation through synergies at the portfolio level and must therefore be met simultaneously. Finally, incompatibilities with other resource combinations involving existing partners can destroy part or all of the value being created through the considered combination of relational and own resources. Figure 4 depicts the decomposition of the overall value multilaterally connected firms derive from their interfirm alliances.

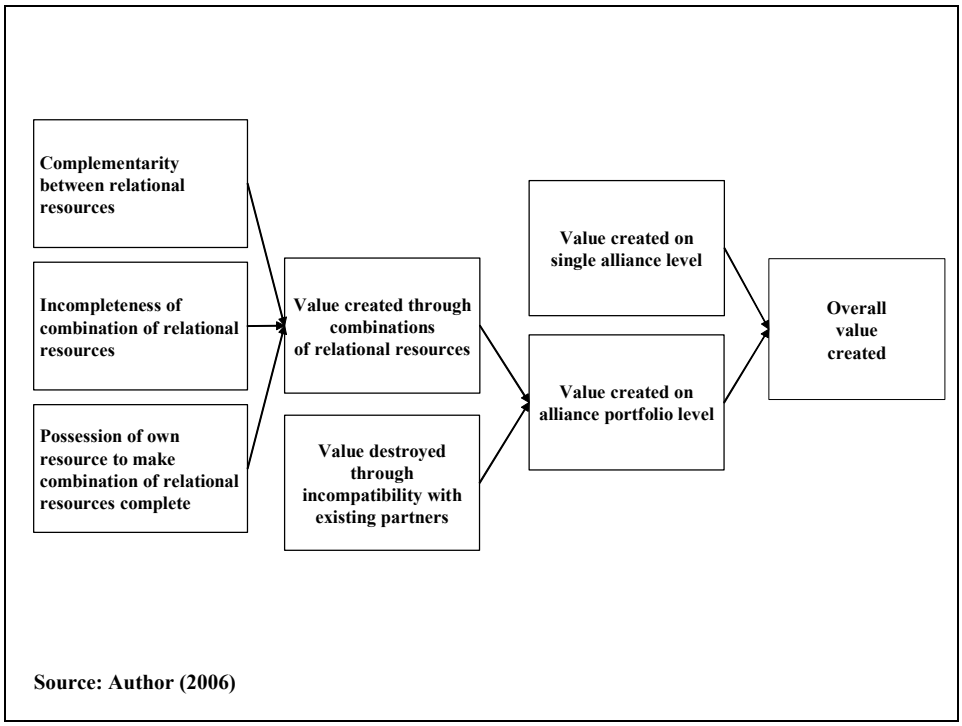


Figure 4: Value Decomposition in Multilaterally Connected Firms

Alliance researchers have also pointed out that by maintaining strategic alliances, firms incur both costs and benefits (Buckley & Casson, 1988; Madhok & Tallman, 1998; Park & Zhou, 2005). Considering its costs and benefits, each alliance formation decision is essentially a trade off and rationally behaving firms will only enter into an alliance when its ex-ante benefits exceed its costs (Buckley & Casson, 1988; Koh & Venkatraman, 1991; Madhok & Tallman, 1998). Park and Zhou (2005) argue that in some cases the cost-benefit evaluation can be carried out at the single alliance level but in many situations costs and benefits need to be assessed in a broader context. The above theoretical model is consistent with that view and I argue that such a broader context can be a multilaterally connected firm's alliance portfolio. Indeed, I argue that there are both benefits and costs related to a firm's alliance portfolio caused by interdependencies between resources in the interconnected firm's resource system

as well as interdependencies between resource combinations of the interconnected firm and its partners.

Therefore, the overall value derived from all interfirm alliances can be expressed through the following value function:

$$V_{Overall} = \sum_{i=1}^{n} V_i + V_{AP}$$

Where

$V_{Overall}$ = Economic value derived from all interfirm alliances

V_i = Economic value derived from individual alliance *i*

V_{AP} = Economic value derived from alliance portfolio effects

Following Madhok and Tallman's (1998) logic, the economic value derived from individual alliance V_i can be expressed as:

$$V_i = R_i - C_i$$

Where

Ri = Rents earned from resource combination deployed in alliance *i*

Ci = Costs associated with transacting through alliance *i*

Consequently, the economic value derived from alliance portfolio effects V_{AP} can be expressed as:

$$V_{AP} = \sum_{i=1}^{n} (R_j - C_j) - \sum_{t=1}^{n} C_t - \sum_{c=1}^{n} C_c$$

Where

Rj = Rents earned from resource combinations resulting from exploitation of resource complementarities between relational resources

Cj = Costs associated with implementing and transacting these additional resource combinations

Ct = Costs associated with alliances at risk for termination due to conflict

Cc = Costs associated with alliances harmed through cannibalization due to conflict

3.2 Part II: Incremental Alliance Portfolio Expansion, Resource Reconfiguration, and Value Creation

3.2.1 Introduction

The review of the prior research focusing on alliance portfolios (Section 2.2) as well as strategic alliances and their impact on firm value (Section 2.3) essentially revealed two shortcomings in the extant empirical alliance literature. First, existing empirical alliance portfolio research that spans the link to performance has mainly focused on structural alliance portfolio characteristics as explanatory factors and neglected the issue of interdependencies between individual alliances in an alliance portfolio (Bae & Gargiulo, 2004; Baum et al., 2000; Rowley et al., 2000; Stuart, 2000). Second, the event study based alliance literature that focuses on the performance consequences for firms that enter into alliances has so far shed little light on the role that alliance portfolios play in explaining the abnormal market returns following

alliance formations (Chan et al., 1997; Koh & Venkatraman, 1991; McConnell & Nantell, 1985; Park & Kim, 1997). Therefore, the objective of part two of the theory building is to address this gap in the literature by extending the theory outlined in part one of this chapter to closer examine the phenomenon of incremental alliance portfolio expansion. Incremental portfolio expansion refers to the situation when a multilaterally connected firm adds one new strategic alliance to its existing alliance portfolio. Such a marginal setting is ideal to isolate and model interdependencies between individual alliances in an alliance portfolio, i.e. in this case the interdependencies between a new alliance and the existing alliances in a focal firm's[2] alliance portfolio.

To recapitulate, the theory outlined in the first part of this chapter identified and examined two interdependencies that are instrumental in value creation at the alliance portfolio level and suggested two resource attributes being critical from an alliance portfolio level of analysis, namely (i) complementarity with other relational resources and (ii) compatibility with existing partners. The implication of the theory developed in part one is that multilaterally connected firms are challenged to pay attention to these alliance portfolio relevant resource characteristics when they engage in additional strategic alliances to upgrade their resource systems with new relational resources. Therefore, this theoretical extension intends to shed further light on how these two alliance portfolio relevant resource attributes affect the value that multilaterally connected firms derive from entering into new alliances. More precisely, the theory developed in this section predicts a newly formed alliance's impact on a focal firm's market value, from the perspective of the synergies and conflict it creates in the firm's resource system. To examine the synergies created by a newly formed

[2] By focal firm I mean the multilaterally connected firm that is entering into the new alliance and in which value creation or destruction will occur.

alliance I adopt a resource-based perspective (Barney, 1991; Peteraf, 1993; Rumelt, 1984; Wernerfelt, 1984) and focus on the complementarity between the newly contributed relational resources and the focal firm's own as well as existing relational resources. Furthermore, to examine conflict in the focal firm's alliance portfolio, I adopt a competitive dynamics and strategic behavior perspective (Baum & Korn, 1996; 1999; Kogut, 1988, 1989; Silverman & Baum, 2002) and focus on competitive overlap between the resource combinations that result from the new alliance and resource combinations involving the focal firm's existing alliance partners.

The remainder of this second theory section is structured as follows. I first review the role of strategic alliances in resource reconfiguration. Second, I address the issue of resource complementarity between the focal firm and the partner firm in the new alliance. Third, I address the relative capacity of the new alliance to strengthen the focal firm's stock of own and relational resources. Forth, I examine the synergy creating potential of the new alliance from the perspective of the focal firm's alliance portfolio. Last, I analyze the conflict that the new alliance creates in the focal firm's alliance portfolio.

3.2.2 Strategic Alliances and Resource Reconfiguration

To ensure long-term success, growth, and survival, firms are challenged to find novel and value creating resource combinations or deploy their existing combinations in new rent generating uses (Penrose, 1959; Schumpeter, 1934). However, competition and changing environmental conditions frequently erode firms' resources and therefore no one firm can possess all the required resources to exploit novel and rent generating

business opportunities (Rumelt, 1984). Thus, in their quest to implement novel and rent generating resource combinations, firms are frequently forced to reconfigure their resource stocks and add new strategically critical resources. Resource reconfiguration constitutes indeed an important dynamic capability for ensuring organizational renewal, success, and survival (Eisenhardt & Martin, 2000; Teece et al., 1997) and technically refers to the addition of new resources as well as the retention and release of existing resources from a firm's resource stock (Capron et al., 1998; Karim & Mitchell, 2000).

Critical firm resources tend to be non-tradeable and non-replicable and therefore cannot be acquired on the respective factor markets (Barney, 1986). Therefore, firms that cannot develop the required strategic resource internally due to time compression diseconomies or causal ambiguity (Dierickx & Cool, 1989) often rely on external resource exchange mechanisms to gain access to such resources (Capron et al., 1998). The extant strategy literature identifies two main types of external resource exchange mechanisms for resource reconfiguration: (i) strategic alliances (Das & Teng, 2000; Eisenhardt & Schoonhoven, 1996) and (ii) mergers and acquisitions (Capron et al., 1998). While in mergers and acquisitions newly obtained resources become fully internalized by the buying firm, in strategic alliances resources are only accessed by a firm as they are essentially owned and controlled by the firm's alliance partner. Indeed, the alliance literature commonly refers to strategic alliances as resource access mechanisms (Bae & Gargiulo, 2004; Stuart, 2000). Thus, by having access to each other's resources, allied firms can combine and coordinate a joint resource bundle instead of operating on their own or merging their operations (Dussauge et al., 2000).

Resources that are accessed through strategic alliances are embedded in a larger organizational resource system (Madhok & Tallman, 1998). Thus, a key issue when adding new strategically critical resources through a new alliance is the effective integration of these new resources within that system. However, integrating such new relational resources to a multilaterally connected firm's resource system can be a complex undertaking because these new relational resource may not only create synergies with own and existing relational resources but may also lead to conflict with existing resource combinations deployed by both the focal firm as well as its existing partners. In other words, a new alliance can create value by bringing in new complementary relational resources that can be synergistically combined with own resources to rent creating combinations (Arora & Gambardella, 1990; Chung et al., 2000; Eisenhardt & Schoonhoven, 1996) but it may also destroy value by creating a competitive conflict between the focal firm and its existing alliance partners. As the theoretical model in part one of this chapter illustrated, such a conflict can make it difficult for the focal firm to retain the relational resources provided by these partners because it can, in the worst case, lead to the deletion of the relational resources provided by this partner. In other words, adding new relational resources through entering into a new alliance may lead to the deletion of existing relational resources accessed through another alliance.

3.2.3 Conceptual Framework and Hypotheses Development

The central idea in the theoretical argument developed in this section is essentially that the value a newly formed alliance creates for the focal firm is not only contingent upon the complementary between the resources of the focal firm and the

new partner but also upon the capacity of the alliance to strengthen the focal firm's resource system as well as synergies and conflict it creates in the focal firm's alliance portfolio. By viewing the new alliance as an access mechanism to new resources (Bae & Gargiulo, 2004; Das & Teng, 2000; Eisenhardt & Schoonhoven, 1996; Stuart, 2000), I posit that there are two types of interdependencies between the new alliance and the focal firm's alliance portfolio: (i) positive interdependencies in the form of synergies and (ii) negative interdependencies in the form of conflict.

To summarize, I suggest that four specific features are crucial of a newly formed alliance's impact on firm valuation: (i) complementarity between the focal firm's and the new partner's resource stock, (ii) the new alliance's capacity to strengthen the focal firm's stock of own and relational resources, (iii) the new alliance's potential to create synergistic resource combinations beyond the dyadic level with other relational resources, (iv) the new alliance's compatibility with existing partners. Figure 5 below graphically summarizes the structure of the conceptual framework and the hypotheses development.

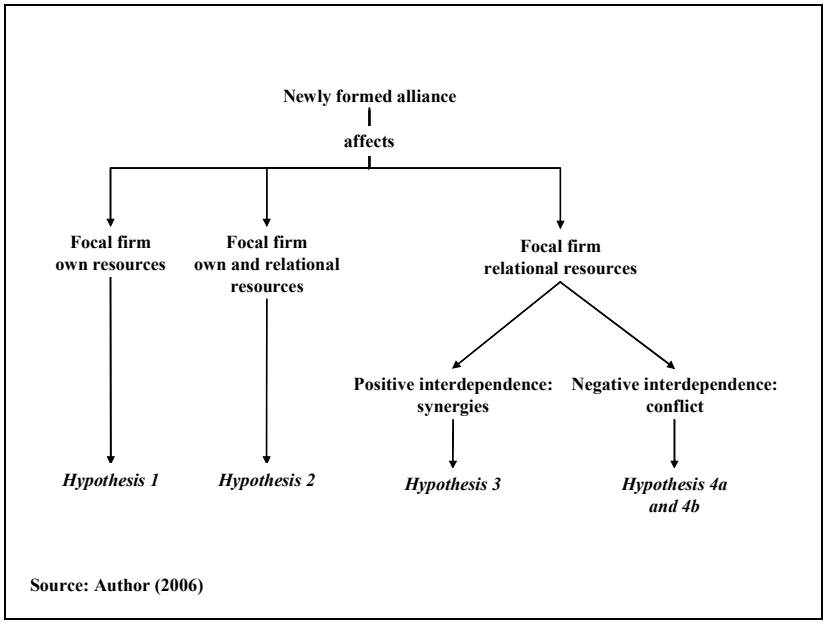


Figure 5: Conceptual Framework and Hypotheses Structure

3.2.3.1 Resource Complementarity of the New Partner's Resources

The RBV suggests that firms can achieve superior performance and a sustainable competitive advantage through possessing and deploying a stock of valuable, rare, imperfectly imitable, and non-substitutable resources (Amit & Shoemaker, 1993; Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). Single resources however, are rarely productive on their own (Grant, 1991). Indeed, it often requires entire resource combinations as well as organizational capabilities to pursue a value creating business opportunity and generate a rent (Amit & Shoemaker, 1993; Eisenhardt & Martin, 2000; Teece et al., 1997). For example, an innovative product alone without complementary resources such as specialized manufacturing, marketing, and access to a distribution channel rarely generates a rent (Teece, 1986). Thus, according to resource-based logic, the primary goal of strategy formulation is to accumulate a stock of critical resources that matches with the firm's external

environment and deploy in as many combinations as possible to exploit the resources' rent generating services (Dierickx & Cool, 1989; Grant, 1991; Penrose, 1959; Wernerfelt & Karnani, 1987).

However, firms do not always possess all the required resources to exploit novel and rent generating business opportunities and therefore frequently form strategic alliances to gain access to new and complementary resources (Das & Teng, 2000; Eisenhardt & Schoonhoven, 1996). Such complementary resources to which a firm gains preferential access through an alliance can be a source for economic rent as they may render value creating services to the firm when synergistically combined with the firm's own resources (Dyer & Singh, 1998; Lavie, 2006). Various empirical studies show that resource complementarity is indeed an important antecedent for alliance formation because partnering firms can create synergistic and rent generating resource combinations through the joint deployment of complementary resources that would not otherwise be available to the partnering firms (Arora & Gambardella, 1990; Chung et al., 2000; Eisenhardt & Schoonhoven, 1996; Gimeno 2004; Rothaermel, 2001).

In this study, I view a strategic alliance as an agreement between two or more independent firms regarding accessing strategically critical and complementary resources (Bae & Gargiulo, 2004; Das & Teng, 2000; Eisenhardt & Schoonhoven, 1996; Stuart, 2000). Thus, by having access to each other's resources, firms that engage in alliances can coordinate a joint resource bundle instead of operating on their own or merging their operations (Dussauge et al., 2000). Moreover, I assume that the resources a firm accesses through a strategic alliance are critical resources that are

valuable, rare, inimitable, and non-substitutable (Barney, 1991) and non-tradeable and protected through the characteristics of their respective accumulation process (Dierickx & Cool, 1989). Put differently, if the resources a firm accesses through a strategic alliance could be acquired on the respective factor markets, there would be no need to form the strategic alliance in the first place in order to obtain them.

To summarize, by forming alliances firms can obtain access to new critical complementary resources that when synergistically combined with their own resources lead to novel rent generating resources combinations that otherwise would not be available to the partnering firms (Chung et al., 2000; Dyer & Singh, 1998; Lavie, 2006; Rothaermel, 2001). The outcome of an alliance is therefore one or more resource combinations that is/are deployed in one or more markets. I argue that the more complementary the resources between a focal firm and its alliance partner, the more rent generating resources combination can be created and the more favorable the market's reaction to such an alliance announcement. Therefore, I hypothesize:

> ***Hypothesis 1:*** *The more complementary the resource stocks of the focal firm and the partner of the newly formed alliance, the higher the abnormal stock market return following the announcement of the new alliance.*

It is important to point out that Hypothesis 1 is in essence not an alliance portfolio argument but rather builds on the argument made in the literature that takes a single alliance perspective (Arora & Gambardella, 1990; Chung et al., 2000; Mowery et al., 2002; Rothaermel, 2001) by tying resource complementarity to value creation. However, the relationship established in Hypothesis 1 between resource complementarity between the focal firm and the partner of the newly formed alliance

and the abnormal stock market return will serve as a baseline for the successive hypotheses that address value creation from an alliance portfolio point of view, i.e. beyond the dyadic perspective applied in Hypothesis 1.

3.2.3.2 Capacity to Strengthen Focal Firm's Resource Stock

The RBV conceptualizes firms as heterogeneous bundles of resources (Grant, 1991; Penrose, 1959; Rumelt, 1984; Wernerfelt, 1984). From an RBV perspective, a firm's stock of valuable, rare, inimitable, and non-substitutable resources is the single most important antecedent to competitive advantage (Barney, 1991). Furthermore, Penrose (1959) suggested that it is in fact not the resource itself but rather the services that a resource renders that create value for a firm. From that perspective, a resource represents a set of potential services with a certain rent generating capacity.

From a traditional RBV perspective a firm's resource strength refers to the amount of rent generating resources, owned and controlled by the firm, that are critical to success in a particular environment. Consequently, firm valuation can be tied to the rent-generating capacity of a firm's own resources (Madhok & Tallman, 1998; Penrose, 1959). However, with the emergence of strategic alliances as important means to gain preferential access to critical resources (Das & Teng, 2000; Eisenhardt & Schoonhoven, 1996), ownership and control of resources is no longer a necessary condition for competitive advantage and resource access suffices (Dyer & Singh, 1998; Lavie, 2006). As outlined in part one of the theory building, multilaterally connected firms access critical resources from multiple simultaneous alliances with different partners and these relational resources make up an important part of the firm's

resource stock and competitive advantage. Therefore, given this perspective firm valuation for multilaterally connected firms should be based on the endowments of both own as well as relational resources. Consequently, the value of a multilaterally connected firm can be tied to the rent-generating capacity of its own as well as relational resources. Indeed, results from empirical studies that examine the stock market's reaction to alliance announcements suggest that a multilaterally connected firm's value should not only be based on the rent-generating capacity of its own resources but also on the capacity of its relational resources (Chan et al., 1997; Koh & Venkatraman, 1991; McConnell & Nantell, 1985; Park & Kim, 1997).

When a multilaterally connected firm adds one or more additional relational resources through a new alliance to its resource system, the contribution of these new relational resources needs to be assessed relative to the already existing endowments of the firm. Although a relational resource contributed by a new alliance may possess a high absolute rent generating capacity, it may add very little to a firm that is already very well endowed, i.e. possesses a resource stock of high rent generating capacity. Thus, I argue that the more the new alliance strengthens a focal firms resource system, i.e. the more it increases the rent generating capacity of the focal firm's resources in relative terms, the more value the new alliance adds to the focal firm. Therefore, I hypothesize:

> ***Hypothesis 2:*** *The more a new alliance strengthens a focal firm's stock of own and relational resources, the higher the abnormal stock market return following the announcement of the new alliance.*

3.2.3.3 Potential to Create Synergies with Existing Relational Resources

The majority of alliance studies that examine synergy creation take the single alliance as the unit of analysis and predominantly focus on whether the resources contributed by the partnering firms to an alliance are complementary and make up a synergistic resource combination that otherwise would not have been available to the partners (Arora & Gambardella, 1990; Chung et al., 2000; Mowery et al., 1996; Rothaermel, 2001). As already pointed out in part one of the theory building, the dyadic perspective on synergy and value creation has significant explanatory power but it does not tell the entire story as it only problematizes the services that a new relational resource renders in combination with a focal firm's own resources (Penrose, 1959). Such combinations only capitalize on a share of the newly added relational resource's potential services and may only realize a fraction of the new resource's rent generating capacity in the focal firm's entire resource system. Indeed, a newly added relational resource may render additional services and thus create additional value when combined with some of the focal firm's existing relational resources. In other words, the rent that a new relational resource may create for the focal firm may not solely depend on the quality and availability of complementary own resources but also on the quality and availability of complementary relational resources.

To illustrate an example of such a synergistic and value creating resource combination in the empirical context of this study, i.e. the global airline industry, let us assume, that airline *i* has an existing code-sharing alliance with airline *j* regarding the access to specific resources in the form of both firms' domestic destinations. Consequently, the alliance results in a number of synergistic resource combinations in the form of routes connecting *i's* domestic destinations with *j's* domestic destinations

and vice versa. Firm *i* can now offer the route from *j's* domestic destinations $D_{j1}…D_{jn}$ via *j's* hub to its own hub and from there to its domestic destinations $D_{i1}…D_{in}$ and international destinations $I_{i1}…I_{in}$. Let us further assume that *i* enters into a new code-sharing alliance with airline *k* regarding the access to specific resources in the form of both firms' domestic destinations. While *i* can now not only offer routes from/to its domestic destinations to/from *k's* domestic destinations, it has also the opportunity to leverage its existing alliance with *j*. In other words, *i* can create additional synergistic and rent generating resource combinations by re-deploying its existing relational resources $D_{j1}…D_{jn}$ with the new relational resources $D_{k1}…D_{kn}$ to offer more comprehensive routes from/to $D_{j1}…D_{jn}$ to/from $D_{k1}…D_{kn}$. An empirical example for such a combination is the following case. It is indeed possible as a Lufthansa customer to book a Lufthansa issued ticket via the firm's website with the trajectory Jerez de la Frontera – Madrid (which is operated by Lufthansa's partner Spanair), Madrid – Bangkok - Auckland (which is operated by Lufthansa's partner Thai Airways).

In other words, the joint deployment of a new relational and an existing relational resource exploits the value creating capacity of both resources by increasing the number of value creating resource combinations. The underlying rationale for such a deployment is the fact that there are some sort of network externalities in the sense that the utility or value of a resource contributed by an alliance partner increases with the number of value creating combinations that require that resource. Hence, I argue that it is not only the resource combinations comprised of new relational and own resources that create value but also all the combinations that can be created with existing relational resources. Thus, when entering into a new alliance the focal firm may not only examine the opportunities to deploy its own resources to create value but

also its existing relational resources to realize the potential of creating additional value through synergistic resource combinations comprised of the new and existing relational resources. Consequently, any given constellation of a new alliance and an alliance portfolio possesses a certain synergy potential to create value creating resource combinations comprised of new and existing relational resources. Therefore, I hypothesize:

> ***Hypothesis 3:*** *The higher a newly formed alliance's potential to create synergistic resource combinations with the focal firm's existing relational resources, the higher the abnormal stock market return following the announcement of the new alliance.*

3.2.3.4 Compatibility with Existing Partners

The competitive positioning of firms vis-à-vis their rivals is one of the central research topics in strategic management (Chen et al., 1992; Porter, 1980; Smith, Grimm, Gannon, & Chen, 1991). In their quest for enhancing their competitive position and market power, firms behave strategically and constantly undertake offensive and defensive moves vis-à-vis their rivals (Chen & MacMillan, 1992; Kogut, 1988). Competitive moves may be (i) tactical, e.g. price cuts or marketing promotions or (ii) strategic, e.g. strategic alliances, new market entries, or new product introductions (Baum & Korn, 1996). Yet, the effectiveness of a competitive move depends on the response of the defendant, i.e. the firm that is being attacked (Chen & MacMillan, 1992). Furthermore, competitive attacks and responses have performance implications for both the attacker and defendant (Chen & Hambrick, 1995). Indeed, the greater the intensity of the attack, the greater the number of responses (Chen et al.,

1992) and the more responses a firm's competitive move provokes, the lower its performance (Chen & Miller, 1994).

More recently, strategy scholars have begun to examine strategic alliances from a competitive dynamics perspective (Baum & Silverman, 2002; Garcia-Pont & Nohria, 2002; Gimeno, 2004; Park & Zhou, 2005). The central idea in that stream of literature is that one firm's alliance behavior impacts the competitive positioning vis-à-vis its rivals and provokes competitive responses accordingly (Chen & MacMillan, 1992; Chen & Miller, 1994). Thus, strategically behaving firms enter into both offensive and defensive alliances impacting their own and rivals' competitive positioning, performance, and survival (Kogut, 1988; Silverman & Baum, 2002). Moreover, defendants often respond by forming alliances with either the attacker's alliance partners or with partners through which the attacker's competitive position can be neutralized (Garcia-Pont & Nohria, 2002; Gimeno, 2004; Park & Zhou, 2005).

Previous authors suggest that the relationship between alliance partners can be disturbed through opportunistic behavior by defecting from mutual agreement by pursuing self-interested goals (Hamel, 1991; Parkhe, 1993). According to this view, the cause for disturbance is internal to the alliance. Furthermore, there are also views that suggest that the cause for disturbance between alliance partners may be external in a sense that one of the partners may undertake a competitive move that is not related to the activities performed in the alliance. For example, competitive conflicts between alliance partners may occur when one partner imitates the other partner's technology or enters into its market domain (Kogut, 1989).

In this study, I take an external perspective and argue that a newly formed strategic alliance may cause disturbance in the relationship between the focal firm and its existing alliance partners. In other words, the new alliance may be ideal from a resource-based perspective by providing access to valuable complementary resources but problematic from an alliance portfolio incompatibility perspective in the sense that those resources may become a source for competitive conflict with some existing alliance partners. Synergistic resource combinations enabled by the new alliance may on one side enhance the focal firm's performance but on the other side may harm the competitive position of its existing alliance partners creating a competitive conflict. Technically, such a competitive conflict occurs when the resources contributed by the new alliance lead to a resource combination that creates a market overlap with existing alliance partners. In defining a market, I follow Abell's (1980: 17) definition of a product market as the "[…] set of goods and services that serve similar functions, are created with the use of similar technology, and are used by similar users". As outlined in part one of this chapter such market overlap can occur in two ways. Firstly, a new alliance may create one or more resource combination that are in direct competition with one or more of the resource combinations deployed by an existing partner. In other words, the new strategic alliance is in direct competition with one or more operations of one of the focal firm's existing alliance partners. Secondly, a new alliance may enable a one or more resource combinations that are in direct competition with a resource combination enabled through another alliance of the focal firm. In other words, the new alliance is in direct competition with another alliance in the focal firm's alliance portfolio. In that case, the combination overlaps partially with the existing partner and partially with the focal firm. In fact, the focal firm may still form such a new alliance and have two alliances for the same purpose when its benefits are

greater than the costs created by disturbing the relationship with the existing partner (Buckley & Casson, 1988).

Resource bundles that create market overlap between the focal firm and an existing alliance partner turn the two firms into competitors as the two firms now operate in the same market by offering similar products, and serving similar customers (Chen 1996). Furthermore, the greater the market overlap between two firms, the greater the competitive intensity between the two firms (Baum & Korn, 1996; Porter, 1980). Consequently, a new alliance contributing resources that create market overlap with an existing alliance partner represent a competitive threat and may cause a defensive response by the partner. While some firms, whose competitive positioning is eroded by the alliance formation of a competitor, respond through countervailing alliances (Gimeno, 2004), in this case competitive overlap may lead the existing partner to terminate the alliance with the focal firm (Park & Russo, 1996). An empirical example for that logic is the case of British Airways which in 1996 announced an alliance with American Airlines after having felt threatened by the code-sharing agreement that was formed between United Airlines and Lufthansa in 1995 (Doganis, 2001). However, as a consequence of the new British Airways-American Airlines alliance, USAir, which was at that point also a British Airways partner, terminated the existing equity partnership with British Airways. Similarly, in 1990 Singapore Airlines entered into a multi-partner alliance with Delta Airlines and Swissair, involving equity swaps. In 1997 however, Singapore Airlines entered into a code-sharing and joint marketing agreement with Lufthansa, which led to the termination of its alliance with Delta Airlines and Swissair (Doganis, 2001).

Technically, emerging strategic conflict between the focal firm and one of its existing partner or a strategic alliance that is terminated by an existing partner before goal achievement will create a cost for the focal firm and thus destroy value as it eliminates the alliance's anticipated benefits. In fact, the greater the market domain overlap between the focal firm and its existing partner becomes through a new strategic alliance, the greater the competitive intensity between the two firms becomes, and the more likely the termination of the existing alliance (Baum & Korn, 1996; Porter, 1980). Therefore, I hypothesize:

> ***Hypothesis 4a:*** *The higher the incompatibility of a newly formed strategic alliance with the focal firm's alliance portfolio, the lower the abnormal stock market return following the announcement of the new alliance.*

Although a new alliance may grant the focal firm access to new valuable and complementary resources, the costs of creating a competitive conflict that may lead to increased coordination costs or even the termination of an existing alliance and therefore eliminate revenue stream from existing relational resources, could exceed the benefits of having access to the new relational resources. As noted by Park and Zhou (2005), each individual alliance is essentially a trade off decision and in some cases the cost-benefit consideration is enough on the single alliance level, while in other situations costs and benefits need to be assessed in a broader context. Applying this cost-benefit logic to the alliance portfolio context, firms will have to carefully examine whether the benefits of the new alliance offset the potential costs of terminating an existing alliance and whether they are willing to incur such costs. Thus, I argue that the value that a newly formed strategic alliance creates through providing benefits in the

form of access to new complementary resources may be diminished by the costs of competitive conflict it creates with existing alliance partners. Therefore, I hypothesize:

> ***Hypothesis 4b:*** *Incompatibility of the new strategic alliance with the focal firm's alliance portfolio negatively moderates the relationship between the complementarity of the resources of the focal firm and the new partner and the abnormal stock market return following the announcement of the new alliance.*

4 RESEARCH SETTING AND METHODS

This chapter describes the empirical setting chosen for this study, the sampling and data collection process, the data, and the variables and their operationalization.

4.1 Empirical Setting

4.1.1 Introduction

In order to address the second research question and to test the hypotheses developed in the second part of the theory building section of this dissertation, an empirical setting is needed in which (i) firms regularly engage in strategic alliances, (ii) maintain alliance portfolios, i.e. are engaged in multiple simultaneous alliances with different partners, (iii) the resource stock of a player is easy to identify, and (iv) the resources that a new alliance contributes to a focal firm can be clearly identified. Indeed, in many key industries, e.g. telecommunications, computer hard-and software, pharmaceuticals, financial services, and air transportation, players frequently engage in strategic alliances to access new and valuable resources and maintain entire alliance portfolios. Therefore, any of these industries would make a good empirical setting to test the proposed theory.

The industry that was ultimately chosen as the empirical setting for this study is the airline industry. More precisely, I limit the study to publicly traded international airlines operating in the segment of scheduled passenger air transportation corresponding to the 1997 North American Industry Classification System (NAICS)

code 481111[3]. I exclude scheduled freight air transportation (NAICS code 481112), nonscheduled chartered passenger air transportation (NAICS code 481211), nonscheduled chartered freight air transportation (NAICS code 481212), and other nonscheduled air transportation (NAICS code 481219). As various international airlines are still or at least partially owned by the governments of their respective home countries and often not publicly traded, I examine this industry on a global basis to achieve a homogeneous large enough sample of publicly traded airlines. Moreover, the single industry focus eliminates the need to control for inter-industry heterogeneity.

The airline industry has received a significant amount of attention in the field of economics (Bittlingmayer, 1990; Borenstein, 1989, 1992; Brandner & Zhang, 1990; Graham, Kaplan, & Sibley, 1983). More specifically, international alliances between airlines have sparked the interest of both industrial organization (Brueckner, 2001; Brueckner & Whalen, 2000; Park & Zhang, 2000; Zhang & Zhang, 2006) as well as transportation economists (Oum, Park, & Zhang, 1996; Oum & Zhang, 2001; Park, Park, & Zhang, 2003; Park, Zhang, & Zhang, 2001). However, the airline industry and airline alliances have been studied less in the field of strategic management. Notable exceptions are Smith et al. (1991), Gimeno and Woo (1996, 1999), Gimeno (2004), as well as Park (2004).

Overall, the airline industry is an ideal empirical setting for this study because reliable data on airline companies, route networks, air traffic, and alliance formation are publicly available. For example, the formation of new alliances between airlines is

[3] The North American Industry Classification System (NAICS) replaced the U.S. Standard Industrial Classification (SIC) in 1997. NAICS provides a more fine-grained classification based on six digits rather than four digits as the SIC. The 1997 NAICS code 481111 for scheduled passenger air transportation corresponds to the 1987 SIC code 4512 for air transportation, scheduled (passenger).

announced in the respective industry press and data on which carrier is connected to whom are available from industry data sources. Thus, information on airlines' newly formed alliances as well as existing alliance portfolios can be reliably constructed.

4.1.2 The Airline Industry

Since the 1980s, international air transport has not only grown rapidly but also undergone dramatic liberalization and privatization. The regulatory environment, e.g. 1944 Chicago Convention and open skies agreements, makes the airline industry indeed very special. Despite its international growth, the airline industry is still a heavily regulated industry and there are legal, political, and institutional constraints on issues such as market entry, mergers, and takeovers. While the 1980s in the airline industry were characterized by a reorganization of the airlines' route structures into hub-and-spoke systems, the creation of frequent flyer programs, and the emergence of computerized reservation systems (Brueckner, 2001), the 1990s were characterized by the formation of alliances amongst airlines in order to overcome existing regulatory restrictions concerning entry into foreign markets (Gimeno, 2004).

Technically, the airline industry consists of so-called city-pair markets representing the demand for air travel between two cities (Bittlingmayer, 1990; Gimeno & Woo, 1999). Airlines compete in city-pair markets by offering direct flights between the origin and destination as well indirect itineraries comprised of multiple flights connecting the origin city through a stopover at transfer hubs with the destination city. For example, in the international city-pair market Barcelona – Stockholm firms that serve the market directly, e.g. Iberia, Spanair, or SAS, compete

with firms that serve that market through indirect itineraries connecting at their transfer hubs, e.g. Lufthansa in Frankfurt or Air France-KLM in Paris or Amsterdam. To be an attractive and feasible alternative to a direct itinerary and to be able to capture some of the direct traffic, firms that compete through indirect itineraries will have to minimize the number of stopovers and transfer times at the hub to minimize overall travel time. Indeed, most city-pair markets have a limited number of competitors offering direct flights due to regulatory constraints such as the open sky agreement. However, as illustrated in the example above competition in a city-pair market may still be high if there are also carriers serving the market through indirect itineraries.

4.1.3 Strategic Alliances between Airlines

According to Oum, Park, and Zhang (2000), cooperation between airlines focuses on a wide range of activities aiming to reduce costs as well as to enhance revenues. On the cost reducing side, airlines cooperate on joint ground handling, IT systems sharing and development, fuel purchase, maintenance, and cabin crew exchanges. To enhance revenues, cooperation mainly occurs regarding code sharing, block space agreements, flight schedule coordination, joint advertising and marketing, and frequent flyer program linkages.

The extant transportation literature provides a number of typologies for alliances between airlines. For example, Doganis (2001) differentiates between four types of airline alliances respective to the scope of the alliance. First, alliances that involve simple pro-rate agreements, i.e. agreements on the revenues that one airline *i* will receive from another carrier *j* for carrying *j's* ticketed passenger on a particular

part of *i's* network. Second, alliances that contain code share agreements. Thirdly, alliances that concern the operation of jointly owned reservation systems, sales offices, and telephone call centers. Forth, alliances that include schedule coordination and joint maintenance. Moreover, Oum et al. (2000) distinguish between route and network based alliances. Route based alliances refer to cooperation between airlines on one or more routes without linking the carriers entire route networks. Network based alliances refer to cooperation between airlines in which the carriers grant each other access to their entire route networks.

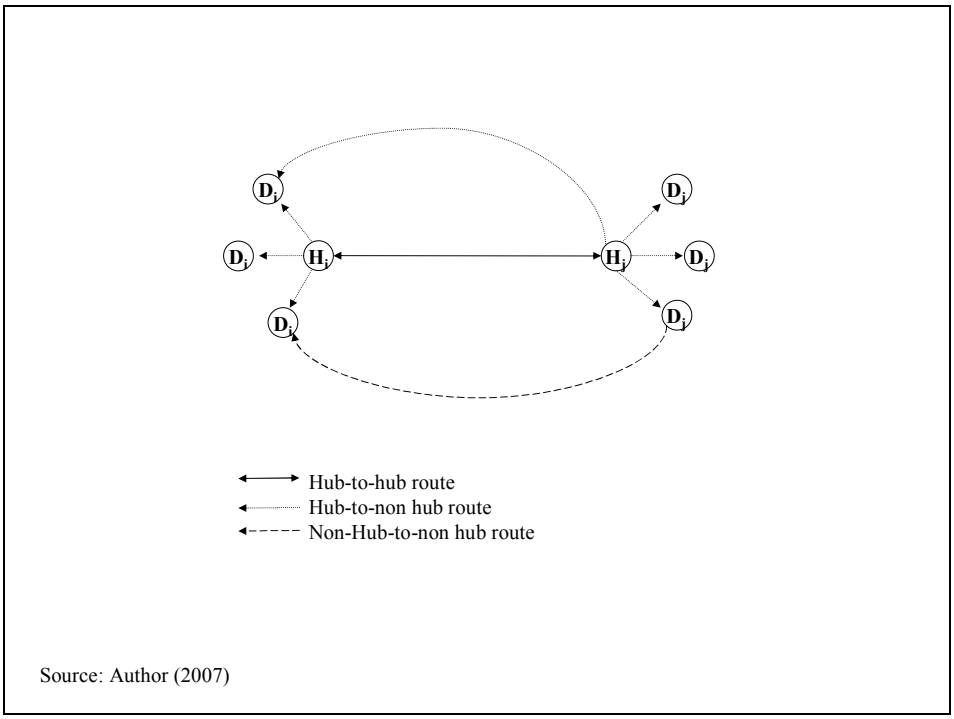
A more recent alliance phenomenon in the global airline industry is the formation of multi-partner alliances or so-called alliance groups or constellations (Gomes-Casseres, 1996). Since the late 1990s global airlines have formed alternative alliance groups (such as Star Alliance, Oneworld, SkyTeam etc.) that compete against each other for both the attraction of new passengers as well as partner airlines. Cooperating amongst members in these alliance groups usually includes a wide range of activities such as code sharing, joint operations, and marketing initiatives such as frequent flyer programs and joint promotions.

4.1.4 Code Sharing Alliances

For an airline the most critical resource to achieve competitive advantage is its route network, i.e. access to a wide range of destinations (Borenstein, 1992; Doganis, 2001; Holloway, 1998). Indeed, airlines that dominate service at a particular airport have a strategic advantage over its competitors serving that airport as they tend to charge higher average fares on routes from and to the airport (Borenstein, 1989) and

attract a disproportionate share of passengers who originate their trips at the airport (Borenstein, 1991). As it is impossible for a single airline to create a global route network, code sharing alliances amongst air carriers are common in order to obtain access to new markets and grow globally. The *International Civil Aviation Organization (ICAO)* defines code sharing as the practice whereby one carrier *i* permits another carrier *j* to use its airline designator code on a particular flight of *i*, or where two carriers share the same designator code on a particular flight (ICAO Circular 296-AT/110, 1997). In other words, a code sharing agreement permits carrier *i* to sell a transportation service on a route branded under *i*'s name and airline designator code when the service is in fact operated by carrier *j*. Such code sharing alliances between international air carriers are essentially responses to the regulatory restrictions on international routes and market entry on routes between given countries (Brueckner, 2001). Through code sharing with another carrier, an airline can indeed offer service to a particular destination for which it does not have route authority. However, for airlines such code share alliances are not only a means to expand into new markets previously inaccessible to them but also to develop existing markets through the extra traffic generated by the feed from the new destination (Doganis, 2001). For example, the Lufthansa-United alliance launched in 1993, enabled United to open up new markets in Eastern Europe via Lufthansa's hub but also offer some of their domestic destinations to connecting Lufthansa passengers.

Technically, airlines code share on (i) hub-to-hub routes, (ii) hub-to-non hub routes, and (iii) non hub-to-non hub routes (Iatrou and Alamdari, 2005). Figure 6 illustrates the three different route types.



Source: Author (2007)

Figure 6: Code Share Types

Furthermore, code sharing alliances can be either of complementary or parallel nature (Oum et al., 1996). Complementary code sharing refers to situations in which two airline partners link their route networks and establish a new complementary network. In complementary code sharing, each airline is the sole operator on a particular route within the network. For example, Delta Air Lines and Air France code share on the route Atlanta - Paris, but Air France is the sole operator. Parallel code sharing refers to the situation in which two airline partners serve the same route, allowing them to join their resources and operations and provide more frequent flights to passengers on that route. For example, Lufthansa and United Airlines code share on the route Chicago – Frankfurt and both partners operate an equal amount of flights on that route. Generally, complementary codesharing is employed on both hub-to-hub as well as beyond hub routes while parallel code sharing occurs mainly on hub-to-hub routes.

4.1.5 Empirical Definitions of Key Concepts

The focus of the empirical part of this study lies on dyadic code share agreements, i.e. agreements for specific routes, rather than alliance constellations (Gomes-Casseres, 1996). In empirical context of this study, I therefore empirically define a strategic alliance as follows:

> ***Empirical Definition 1:*** *A strategic alliance is an agreement between two or more airlines to code share, be it parallel or complementary code sharing, on one or more routes.*

Building on the empirical definition of a strategic alliance, I conceptualize a firm's alliance portfolio as follows:

> ***Empirical Definition 2:*** *An alliance portfolio is an airline's stock of active passenger traffic related codeshare agreements at a given point in time.*

Furthermore, in the empirical context of this study I define a resource as follows:

> ***Empirical Definition 3:*** *A resource represents access to a particular city pair market either through directly granted route authority or through a codeshare agreement with another airline.*

4.2 Sample

4.2.1 Sampling Period

Alliances between airlines evolved from dyadic code share agreements in the late 1980s until the mid/late 1990s to multi-partner alliances or alliance constellations (such as Star Alliance, One World, or Sky Team) at the end of the 1990s and new millennium. The time period chosen for this study is 1994-1998. The five year time window is in line with existing studies (e.g. Gimeno, 2004). The selection of the start date of the sampling period, i.e. 1994, was driven by the availability of reliable alliance data for global airlines[4]. As the focus of this study lies on dyadic code share agreements, i.e. agreements for specific routes, rather than alliance constellations, the time period 1994-1998 is a particularly suitable period because it precedes the formation of most of the major alliance constellations and therefore eliminates confounding effects of the alliance constellation phenomenon.

4.2.2 Sample Firms

The sampling process in this study started with the *Airline Business Top 150 Airline Ranking*, which lists the world's top 150 airlines by revenues and passengers in a given year. *Airline Business* is the leading monthly industry magazine for strategy related issues in the global airline industry. As a first step, I created a subset of airlines by selecting all companies that have ranked in the top 100 at least once during the five year sampling period. Moreover, as I focus on scheduled international passenger air transportation, I eliminated cargo, charter/leisure, pure domestic, and low cost airlines from the subset. Low cost airlines were eliminated because they do not engage in

codeshare agreements. Next, I excluded all airlines in the subset whose shares had not been traded on the local public stock exchange of the airline's country of origin during any of the years of the sampling period or for which the daily stock market returns could not be obtained from the *Thomson Financial Datastream* database. Furthermore, I eliminated air carriers for which the *ICAO Traffic by Flight Stage (TFS)* annual digest of statistics did not contain any route statistics. This elimination process resulted in a final sample of 24 internationally operating airlines, i.e. focal firms, from 19 countries. Table 3 lists the companies included in the final sample.

Airline	IATA Code	Country
Air Canada	AC	Canada
Air France	AF	France
Air New Zealand	NZ	New Zealand
Alitalia	AZ	Italy
All Nippon Airways (ANA)	NH	Japan
American Airlines (AMR)	AA	USA
Austrian Airlines	OS	Austria
British Airways	BA	UK
Cathay Pacific	CX	Hong Kong
Continental Airlines	CO	USA
Delta Air Lines	DL	USA
Finnair	AY	Finland
Japan Airlines	JL	Japan
KLM Royal Dutch Airlines	KL	Netherlands
Korean Air	KE	South Korea
LanChile	LA	Chile
Lufthansa	LH	Germany
Malaysia Airlines	MH	Malaysia
Northwest Airlines	NW	USA
Qantas Airways	QF	Australia
SAS	SK	Sweden
Singapore Airlines	SQ	Singapore
Thai Airways	TG	Thailand
United Airlines	UA	USA

Table 3: Airlines in Sample

[4] Since I used the *Airline Business Alliance Survey* as the main source to identify a carrier's alliance portfolio, I could not start earlier than 1994 because that year was the first year in which the survey was published.

4.3 Data Collection

4.3.1 Data on Newly Formed Code Share Agreements

As a first step in the data collection process, I searched for suitable data sources that contain secondary data on code share agreements between air carriers. The outcome of this search was a short-list of two main data sources: (i) the *Securities Data Company (SDC) Platinum* database from *Thomson Financial* and (ii) the *Airline Business Alliance Survey*. *SDC Platinum* is one of the most comprehensive databases containing data on financial transactions on a global level, sourcing its data regularly from media outlets such as the *Financial Times*, *Wall Street Journal*, *Financial News*, and many more. Besides data on mergers and acquisitions, project finance, and venture capital and private equity, *SDC Platinum* also contains a so-called Joint Venture and Strategic Alliances data module. Indeed, various alliance researchers have used the *SDC Platinum* Joint Venture and Strategic Alliances module to collect data on strategic alliances (Anand & Khanna, 2000; Bae & Gargiulo, 2004; Kale et al., 2002; Reuer et al., 2002). The *Airline Business Alliance Survey* is a comprehensive survey published in the *Airline Business* magazine, tracking all active airline alliances and code share agreements up to the month prior to publication of the survey[5]. Various strategy as well as transportation economics researchers have used this survey before to identify strategic alliances between airline companies (Chen & Chen; 2003; Gimeno, 2004).

However, the two above described data sources are not entirely free of caveats. The *SDC Platinum* data has essentially two major shortcomings: (i) the announcement dates of the listed alliances are highly inaccurate and need to be checked through an additional search of according media outlets (Anand & Khanna; 2000) and (ii) the data

on the airline industry, i.e. code share agreements, are not very comprehensive. Furthermore, the *Airline Business Alliance Survey* is not very precise in regards to two data dimensions: (i) it only specifies the year in which a code share agreement was formed but not the exact date and (ii) the coding of the agreement's scope is often at a very generic level, not specifying the exact details of the routes that are being code shared. Therefore, after a thorough evaluation of these two data sources, I decided to follow the following data gathering strategy: (i) to conduct a thorough press search on code share announcements and build a proprietary dataset and (ii) to use *SDC Platinum* and the *Airline Business Alliance Survey* as a complementary data sources to cross-check and complement the proprietary dataset[6].

In building the proprietary dataset, I followed the following procedure. First, I identified 259 passenger traffic related code share agreements formed by the sample firms during the period 1994-1998 from the *Factiva* press database in which I searched major news and business publications such as for example the *Dow Jones Business News*, *Dow Jones International News*, *Reuters News*, *The Wall Street Journal* (including other editions such as *WSJ Europe, WSJ Asia, etc.*) as well as major industry specific publications such as for example *Aviation Daily*, *Air Transport World*, or *Airline Business*. The following is the sample of a code share announcement:

> *"American Airlines unit signed a code sharing contract with Japan Airlines Co. (JAPNY). In a press release Monday, American said it will place its AA designator code on Japan Airlines flights between Tokyo and Chicago, Dallas/Fort Worth, Los Angeles, New York and San Francisco; between Osaka and Chicago and Los Angeles; and between some cities within Japan. […]"*

[5] The *Airline Business Alliance Survey* is published once a year since 1994.
[6] The cross-check revealed that most code share agreements that appeared in the SDC Platinum database also appeared in my own press search. However, some alliances reported in the *Airline Business Alliance Survey* did not appear in any press announcements identified in my search.

In the case of multiple announcements of the same event in different media outlets, I selected the announcement with the earliest date to be consistent with the efficient market hypothesis which suggests that the identical subsequent news will have no additional effect on the stock price. Moreover, I only included announcements in which the routes and the respective operating partner were explicitly specified. Next, I excluded 44 code share announcements that were still in the planning or memorandum of understanding phase or were awaiting government approval. I also excluded 19 announcements for which the *Thomson Financial Datastream* data did not occur reliable, i.e. for which the return index was reported as zero over a long period of time, and 35 announcements for which the route statistics for the focal firm's partner were not contained in the *ICAO Traffic by Flight Stage (TFS)* annual digest of statistics. This elimination process resulted in a total of 161 announcements. As expected, the sample contains more events for larger airlines and for airlines that have a larger domestic market. In line with the trends in the industry, the sample also contains more events for the later years in the observation period. For each code share announcement the following information was coded: (i) the focal firm, (ii) the partner firm, (iii) the announcement date, (iv) the type of code share agreement, i.e. parallel versus complementary (Oum et al., 1996), (v) the origin and destination city/-ies, and (vi) the operating carrier(s) (v) the cooperation scope, i.e. route-based versus network-based cooperation (Oum et al., 2000), and (vi) route type, i.e. hub-to-hub, hub-to-non hub, or non hub-to-non hub (Iatrou & Alamdari, 2005). Table 4 shows the distribution of sample firms and observations across countries.

Country and firms	Number of firms	Number of events
Australia	1	**8**
Qantas		8
Austria	1	**4**
Austrian Airlines		4
Canada	1	**10**
Air Canada		10
Chile	1	**1**
LAN Chile		1
Finland	1	**10**
Finnair		10
France	1	**5**
Air France		5
Germany	1	**15**
Lufthansa		15
Hong Kong	1	**1**
Cathay Pacific		1
Italy	1	**7**
Alitalia		7
Japan	2	**5**
All Nippon Airways		1
Japan Airlines		4
Malaysia	1	**1**
Malaysian Airlines		1
Netherlands	1	**4**
KLM		4
New Zealand	1	**6**
Air New Zealand		6
Singapore	1	**5**
Singapore Airlines		5
South Korea	1	**2**
Korean Air		2
Sweden	1	**2**
SAS		2
Thailand	1	**3**
Thai Airways		3
UK	1	**12**
British Airways		12
USA	5	**60**
American Airlines		10
Continental		**7**
Delta Air Lines		31
Northwest		5
United Airlines		7
n = 19	**n = 24**	**n = 161**

Table 4: Distribution of Events by Sample Firms and Countries

As a next step I identified confounding events for each of the 161 code share announcements (McWilliams & Siegel, 1997). Previous alliance studies using event study methodology, employed a broad range of event windows: (i) a two day window, i.e. from day -1 to 0 (Koh & Venkatraman, 1991; Madhavan & Prescott, 1995; Merchant & Schendel, 2000), a three day window, i.e. from day -1 to +1 (Park, 2004; Reuer et al., 2002), and a two week window, i.e. from day -10 to +3 (Anand & Khanna, 2000; Kale et al., 2002). In order to be able to conduct some robustness checks by using different event windows that have been used by previous authors, I identified confounding events for three different time windows around the announcement date, i.e. day 0, including: (i) a two day window, i.e. from day -1 to 0, (ii) a three day window, i.e. from day -1 to +1, (iii) a two week window, i.e. from day -10 to +3. Confounding events that were considered included CEO or board changes (as in the case of Air Canada and Air France), posting of operating results (as in the case of Air Canada, Lufthansa and Air France), stock splits (as in the case of Lufthansa), plane crashes (as in the case of Air France), mergers and acquisitions (as in the case of Air New Zealand), and major job cuts (as in the case of American Airlines). As expected, for the longer time window there was a higher number of confounding events than for the two short windows. Table 5 shows the number of confounded events by event window and the usable number of announcements after eliminating the confounding events.

Time window	Confounded events	Non-confounded events
Two days (-1/0)	18	143
Three days (-1/+1)	25	136
Two weeks (-10/+3)	56	105

Table 5: Confounded Events by Event Window

In event study methodology, sample size is critical as the test statistics applied are based on normality assumptions associated with large sample (McWilliams & Siegel, 1997). Therefore, applying the rule of a desired ratio of 15 to 20 observations per independent variable, at least 60 events need to be included in the sample (Hair, Anderson, Tatham, & Black, 1998: 166). The minimum sample size of 105 to 143 observations (depending on the time window chosen) meets this condition and is also in line with previous research (Crutchley et al., 1991; Das et al., 1998; Koh & Venkatraman, 1991; Madhavan & Prescott; 1995; McConnell & Nantell, 1985). Table 6 shows the distribution of observations by year.

Year	Total number of events	Confounded events (-1/0)	Confounded events (-1/+1)	Confounded events (-10/+3)
1994	16	2	3	4
1995	26	1	3	8
1996	34	3	5	12
1997	39	6	7	14
1998	46	6	7	18
	n = 161	**n = 18**	**n = 25**	**n = 56**

Table 6: Distribution of Events by Year

4.3.2 Data on Focal Firms' Alliance Portfolios

To map the alliance portfolios of the 24 focal firms in any given year of the five year time window, I used the *Airline Business Alliance Survey*. In addition, I complemented the alliance survey data with my own alliance announcement data obtained from the *Factiva* press database search. Since the focus of this study lies on passenger transportation, I included only alliances in a firm's alliance portfolio that were passenger related (e.g. code share agreements, blockspace agreements, pro-rate agreements etc.), marketing related (frequent flyer program partnerships, joint

marketing and sales etc.), or operations related (e.g. joint ground handling, joint purchasing, joint terminals, joint maintenance etc.). I excluded all alliances that focused only on cargo cooperation. Code share agreements that were reported as pending for government approval were also not included in the alliance portfolio mapping. The average focal firm was tied to 13.2 partners (median = 12.5) in any given year.

4.3.3 Resource Level Data

The research design of this study requires both resource flow as well as resource stock data. In other words, the new resources that a focal firm accesses by forming a new alliance need to be identified as well as the focal firm's stock of own and relational resources needs to be mapped. The data for modeling the inflow of new resources contributed through a newly formed alliance was extracted from the code share announcements identified in the press search. The mapping of the resource inflow is best explained by looking at the following sample code share announcement from before:

> *"American Airlines unit signed a code sharing contract with Japan Airlines Co. (JAPNY). In a press release Monday, American said it will place its AA designator code on Japan Airlines flights between Tokyo and Chicago, Dallas/Fort Worth, Los Angeles, New York and San Francisco; between Osaka and Chicago and Los Angeles; and between some cities within Japan. […]"*

In this announcement, the focal firm (i.e. American Airlines) obtains access to the following seven new resources, i.e. city-pair markets, from its alliance partner (i.e. Japan Airlines): Tokyo-Chicago, Tokyo-Dallas/Fort Worth, Tokyo-Los Angeles, Tokyo-New York, Tokyo-San Francisco, Osaka-Chicago, and Osaka-Los Angeles.

Following this logic, each newly formed alliance was coded for the new resources it contributes to the focal firm.

Moreover, the mapping of a focal firm's existing resource stock included both the identification of the focal firm's own as well as relational resources. Data for the mapping of the focal firm's own resources were obtained from the *Traffic by Flight Stage (TFS)* annual digest of statistics published by the *International Civil Aviation Organization (ICAO)*[7]. *ICAO-TFS* contains data on international city-pair markets including the carriers operating in the market, passenger seats available, revenue passengers carried, load factors, and aircrafts used. *ICAO-TFS* has been used in previous studies by transportation economists (Chen & Chen, 2003) as well as strategy researchers (Gimeno, 2004). Furthermore, data for the mapping of the focal firm's relational resources were mainly obtained from the *Airline Business Alliance Survey* and complemented with data from *ICAO-TFS*.

4.4 Measures

4.4.1 Dependent Variable

I operationalized the dependent variable impact on firm value (CAR) through the cumulative abnormal stock market return over a two-day event window following the press announcement of a code share agreement between airlines. I followed a standard event study approach used in previous alliance studies (Koh & Venkatraman, 1991; Madhavan & Prescott, 1995; McConnell & Nantell, 1985; Park & Kim, 1997) and as described in McWilliams and Siegel's (1997). Table 7 shows the ten step process for implementing an event study (McWilliams & Siegel, 1997: 652).

Steps for implementing an event study	
Step 1:	Define an event that provides new information to the market
Step 2:	Outline a theory that justifies a financial response to this new information
Step 3:	Identify a set of firms that experience this event and identify the event date
Step 4:	Choose an appropriate event window and justify its length, if it exceeds two days
Step 5:	Eliminate or adjust for firms that experience other relevant events during the event window
Step 6:	Compute abnormal returns during the event window and test their significance
Step 7:	Report the percentage of negative returns and the binomial Z or Wilcoxon test statistic
Step 8:	For small samples, use bootstrap methods and discuss the impact of outliers
Step 9:	Outline a theory that explains the cross-sectional variation in abnormal returns and test this theory econometrically
Step 10:	Report firm names and event dates in data appendix

Table 7: Steps for Implementing an Event Study

I estimated a market model for each focal firm and then calculated the abnormal return for each announcement. The abnormal return is assumed to reflect the investors' reactions to the announced event. The equation for the rate of return on the stock price of firm *i* on day *t* is:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

Where R_{it} = is the expected stock return of firm *i* on day *t*

R_{mt} = the rate of return on a respective market index on day *t*

α_i = the intercept term

β_i = the systematic risk of stock i

ε_{it} = the market model error term for firm i on day t which is iid

As a next step, I derived estimates of the daily abnormal returns for each firm *i* on day *t* through:

[7] ICAO is a specialized United Nations agency based in Montreal (Canada).

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$$

Where R_{it} = the actual stock market return of firm i on day t

R_{mt} = the rate of return on the value weighted index on day t

α_i, β_i = the ordinary least squares parameter estimates obtained from the regression of R_{it} on R_{mt} over an estimation period preceding the event

The abnormal return AR_{it} is the return earned by firm *i* on day *t* after the adjustment for the normal return process. In other words, the rate of return on the stock is adjusted by subtracting the expected return from the actual return and any difference represents the abnormal return attributable to the code share announcement.

For the assignment of the respective market index to each airline, I use the market indexes that include airlines in their home countries. As a robustness check I also estimated the market model with a global airline industry specific market index, i.e. the DJTM World Airlines $ index, instead of the respective stock market indexes. Results, however, did not change significantly. Table 8 shows the respective stock market indexes that were assigned for each airline in the market model.

Airline	Stock Market Index
Air Canada	S&P/TSX COMPOSITE INDEX
Air France	SBF 120
Air New Zealand	NZX ALL
Alitalia	MILAN COMIT 30 DS-CALCULATED
All Nippon Airways (ANA)	TOPIX
American Airlines (AMR)	S&P 500 COMPOSITE
Austrian Airlines	AUSTRIA ATX DS-CALCULATED
British Airways	FTSE ALL SHARE
Cathay Pacific	HANG SENG
Continental Airlines	S&P 500 COMPOSITE
Delta Air Lines	S&P 500 COMPOSITE
Finnair	OMX HELSINKI (OMXH)
Japan Airlines	TOPIX
KLM Royal Dutch Airlines	AEX INDEX (AEX)
Korean Air	KOREAN KOSPI 200 DS-CALC
LanChile	DJTM CHILE GENERAL INDS
Lufthansa	DAX 30 PERFORMANCE
Malaysia Airlines	KUALA LUMPUR COMP. DS-CALC
Northwest Airlines	S&P 500 COMPOSITE
Qantas Airways	ASX ALL ORDINARIES
SAS	SWEDEN-DS MARKET
Singapore Airlines	SINGAPORE STRAITS T. DS-CALCULATED
Thai Airways	BANGKOK S.E.T. DS-CALCULATED
United Airlines	S&P 500 COMPOSITE

Table 8: Stock Market Indexes Assigned to Airlines in Sample

Selection of the Event Window and Estimation Period

The selection of the event window is a key issue in event study methodology (Bromiley, Govekar, & Markus, 1988; Lubatkin & Shrieves, 1986; McWilliams & Siegel, 1997). The event window, also called announcement period, is the time period over which the announcement impact on the stock price is measured. In some studies, researchers selected very long event windows due to the assumption that the effect of the announced event is not quickly incorporated into the stock prices, which in fact can be seen as a violation of the market efficiency assumption (McWilliams & Siegel, 1997). On the contrary, a number studies, subscribing to the market efficiency assumption, have often used a two-day event window starting with the trading day prior to the announcement and the announcement day itself (Koh & Venkatraman, 1991; Madhavan & Prescott, 1995; Merchant & Schendel, 2000).

As it is more difficult to control for confounding effects in long event windows and because there was no reason to believe that in the given empirical context information to investors is more slowly revealed than normal or leaked out before the event, I decided to use a two-day event window during which I calculated the cumulative abnormal return. The two-day day event window consisted of the day prior to the event $t = -1$ and the day of the event itself $t = 0$. Such a two-day window is in line with previous event study-based alliance research (Koh & Venkatraman, 1991; Madhavan & Prescott, 1995; Merchant & Schendel, 2000). However, as a robustness check (see Chapter 5) I also employed two additional event windows that have been used by some authors in a number of alliance studies: (i) a three day window, i.e. from day -1 to +1 (Park, 2004; Reuer et al, 2002), and (ii) a two week window, i.e. from day -10 to +3 (Anand & Khanna, 2000; Kale et al., 2002). For the estimation period, I used approximately one-year of daily stock returns, i.e. 250 trading days (Park & Kim, 1997), beginning with day $t = -260$ and ending with day $t = -11$. By excluding the 10 days prior to the announcement from the estimation of the market model, I made sure that data that may have been affected by the event was removed.

4.4.2 Independent Variables

4.4.2.1 Complementarity of New Partner Resources

Empirically, I view access to a particular destination as a valuable and strategically critical resource for an airline company. Thus, through engaging into an alliance with another carrier, the focal firm can obtain access to new destinations that it can synergistically combine with its own route network. Therefore, I measured resource complementarity between the focal firm *i* and the partner *j* of the new alliance

as the number of destinations served by *j* but not by *i* in year *t* in which the new alliance was formed. After the assessment of the properties of this variable's distribution (see Chapter 5 for a more detailed explanation), I concluded that this variable was not normally distributed. Thus, to achieve a more normal distribution, I transformed this variable by taking the square root.

4.4.2.2 Capacity to Strengthen Focal Firm's Resource Stock

Airlines generally incur high fixed operating costs because the costs for a flight segment vary little with the number of passengers on the flight. Thus, to operate profitably passenger focused airlines are forced to achieve a high level of productivity[8], i.e. achieve a maximum output with given input (Schefczyk, 1993). For passenger focused airlines, the main operational output is the revenue passenger kilometres (RPK), while the main operational input is the available seat kilometres (ASK). ASK is a standard capacity measure in the airline industry and is calculated by multiplying the number of passenger seats available for sale on each flight stage by the stage distance. For example, if an airline operates one scheduled flight per day on route *A-B*, of length 1,000 kilometres, using an aircraft with 100 seats, the total scheduled ASKs for route *A-B* in a year by this airline equal to 36,500,000.

Codeshare alliances between airlines are important means to achieve a high load factor because they feed additional passengers into an airline's network that can

[8] A common productivity indicator in the airline industry is the load factor, which measures how many revenue passenger kilometres an airline has per available seat kilometres (see also section on control variables.)

be routed to onward flights and generate extra traffic (Doganis, 2001). For example, the codeshare agreement between Lufthansa and United Airlines on transatlantic routes helps both airlines to feed additional passengers into their domestic and regional route networks and generate additional traffic for both firms. Thus the greater the feed into an airline's network from alliance partners, the greater the chance that the airline can fill its seats on its own flights and therefore improve its load factor. ASK can be used to proxy the rent generating potential of a codeshare agreement (Park & Martin, 2001). As the most critical resource for airlines is access to routes, the rent generating capacity of an airline's stock of own and relational resources can therefore be proxied as the ASK of all own flight segments as well as segments served by codeshare partners. Therefore, I measure the capacity of the new alliance to strengthen the focal firm's stock of own and relational resources (STRENGTH) as the increase ΔRC_i in the rent generating capacity of focal firm *i*'s entire resource stock after the formation of the new alliance:

$$\Delta RC_i = \frac{\sum_{k=1}^{n} ASK_k}{\sum_{m=1}^{n} ASK_{im} + \sum_{j=1}^{n}\sum_{n=1}^{n} ASK_{jn}}$$

Where ASK_{im} = Available seat kilometers for city pair market *m* served by the focal firm *i*

ASK_{jn} = Available seat kilometers for city pair market *n* to which the focal firm *i* has access through partner *j*

ASK_k = Available seat kilometers for city pair market *k* to which the focal firm *i* has access through the newly formed alliance

After the assessment of the properties of this variable's distribution (see Chapter 5 for a more detailed explanation), I concluded that this variable was not normally distributed. Thus, to achieve a more normal distribution, I transformed this variable by taking the logarithm.

4.4.2.3 Synergy Creating Potential of New Alliance

I operationalized a new alliance's potential to create synergistic resource combinations (SYNERGY) with existing relational resources of the focal firm as the number of potential itineraries that can be created by combining a newly contributed route with an existing route in the focal firm's alliance portfolio. More precisely, I followed the following procedure. I identified all possible combinations involving routes to which the focal firm had access through its existing alliance partners and routes contributed by the new alliance. Here, all combination were included where (i) the to-destination of the existing route matched the from-destination of the new route, (ii) the from-destination of the existing route matched the to-destination of the new route, and (iii) the total flight stage length of that combination that did not exceed 125 percent of the direct itinerary (Gimeno, 2004). The direct flight stage length between two cities was calculated as the surface kilometer distance of two points of latitude and longitude. Moreover, after the assessment of the properties of this variable's distribution (see Chapter 5 for a more detailed explanation), I concluded that this variable was not normally distributed. Thus, to achieve a more normal distribution, I transformed this variable by taking the square root.

4.4.2.4 Alliance Portfolio Incompatibility

Technically, the airline industry consists of so-called city-pair markets representing the demand for air travel between an origin and destination point (Bittlingmayer, 1990; Gimeno & Woo, 1999). Airlines serve city-pair markets with direct flights as well as indirect itineraries comprised of multiple connecting flights via airport hubs. For example, the international city-pair market Lisbon – Oslo may be served directly or an indirectly with a connecting stopover at a hub such as Frankfurt, Paris, or Amsterdam depending on the operating carrier. Thus, I operationalized the independent variable alliance portfolio incompatibility (INCOMP) of a newly formed strategic alliance through the increase in competitive overlap (ΔCO_i) with all affected partners *j = 1,..., n* in focal firm *i's* alliance portfolio. Here, I build on Gimeno's (2004) measure of dyadic niche overlap between two firms and calculated ΔCO_i as:

$$\Delta CO_i = \sum_{j=1}^{n} \left(\frac{\sum_{m=1}^{n} I_{jmt2} \times I_{imt2}}{\sum_{m=1}^{n} I_{jmt2}} - \frac{\sum_{m=1}^{n} I_{jmt1} \times I_{imt1}}{\sum_{m=1}^{n} I_{jmt1}} \right)$$

Where I_{im} and I_{jm} are dummies taking a value of 1 when a firm is present in a given market *m* and 0 if the firm is not present. Moreover, t_1 represents the time before the new alliance was formed and t_2 the time after the new alliance was formed. In the cases where the new alliance enabled indirect itineraries and because passengers rarely consider indirect itineraries with more than one stopover or that are significantly longer than a direct flight, I only considered indirect itineraries enabled through the new alliance as a competitive route to a direct flight offered by one of the existing partners if they had only one stopover more than the direct flight and a total stage

length that did not exceed 125 percent of the direct itinerary (Gimeno, 2004). The flight stage length between two cities was calculated as the surface kilometer distance of two points of latitude and longitude.

4.4.3 Control Variables

To ensure the robustness of the results and account for other possible explanations, I included various control variables.

4.4.3.1 Focal Firm Size

Firm size is widely used as a control variable in studies focusing on firm performance (e.g. Hagedoorn & Schakenraad, 1994). One explanation why larger firms may have superior performance derives from economies of scale. Moreover, the size of firms entering into strategic alliances may impact their stock prices (Chan et al., 1997). Firm size is frequently operationalized as the annual turnover of the firm, the total number of employees, or as a weight of the two indicators. In this study, I controlled for the size of focal firm *i* in year *t* (SIZE), which I measured as:

$$Size_{it} = Number\ of\ employees * Seat\ Capacity\ of\ Fleet$$

After the assessment of the properties of this variable's distribution (see Chapter 5 for a more detailed explanation), I concluded that this variable was not normally distributed. Thus, to achieve a more normal distribution, I transformed this variable by taking the logarithm.

The employee data for this variable were obtained from the *Compustat* and *Osiris* databases. To calculate the seat capacity of the fleet in service for each focal firm in a given year, I first identified the number and types of aircraft for each focal firm in a given year through the *World Aviation Directory*. The *World Aviation Directory* is the aviation and aerospace's industry's standard reference that is published twice a year, i.e. summer and winter edition. The number of aircrafts for each model (i.e. Boeing 747-400, Airbus A340-300 etc.) in the fleet was then multiplied by the respective number of seats of each aircraft type. The seat capacity for a focal firm's fleet therefore represents the sum of all seats across all aircrafts in service in a given year. The following data is an example from the *World Aviation Directory* (1997, summer edition, p.10) that illustrates an entry for a focal firm's aircrafts in service:

> *"**AIR CANADA Fleet***
> *Aircraft in Service:*
> *34 A320-200's; 2 A340-300's; 3 B-747-100's; 3 B-747-200B Combi's; 3 B747-400 Combi's; 8 B-767-200's; 15 B-767-200ER's; 24 Canadair RJ's; 35 DC-9-30's"*

4.4.3.2 Focal Firm Performance

Like firm size, the performance of firms entering into strategic alliances may impact their stock market's reaction to the announcement of any alliance formation (Chan et al., 1997). Better performing firms are often more attractive alliance partners because they may be able to contribute more and stronger resources to the alliance (Ahuja, 2000a). Thus, in order to control for performance heterogeneity amongst the sample firms, I added two performance related control variables that address both financial as well as operational performance.

Financial performance. To control for the financial performance of focal firm *i* in year *t,* I added control variable FPERFORM, which I operationalized through the firm's return on sales (i.e. operating income/sales) in the year the new alliance was formed. The data for this variable were obtained from the *Compustat* and *Osiris* databases.

Operational Performance. Moreover I controlled for a focal firm's operational performance (OPERFORM) which I operationalized as the load factor across all routes served by focal firm *i* in year *t*. Technically, the load factor is an indicator of an airline's aircraft capacity utilization and is calculated as follows:

$$Load\_Factor_{it} = \frac{\text{Re}venue\_Passenger\_Kilometers\_(RPK)}{Available\_Seat\_Kilometers\_(ASK)}$$

The data for this variable were obtained from the *ICAO Traffic by Flight Stage* digest of statistics.

4.4.3.3 Focal Firm Age

Firm age has been shown to affect firm performance because the longer a firm has been present in an industry, the more experience in the industry it has (Lazzarini, 2006). Moreover, the older the firm, the more time it has had to build its resource stock. Therefore, to control for heterogeneity amongst the sample firms' experience in the industry and its resource endowments, I added the control variable Age_{ti} (AGE). The age of focal firm *i* in year *t* is operationalized as:

$$Age_{it} = Year_t - Year_{Founding}$$

Where $Year_t$ is the year in which the new alliance is formed and $Year_{Founding}$ is the year in which focal firm *i* was founded. The founding year for the focal firms was identified through the *Corporate Affiliations* and *Osiris* databases and complemented through an Internet search for the cases where these two databases did not contain any data. After the assessment of the properties of this variable's distribution (see Chapter 5 for a more detailed explanation), I concluded that this variable was not normally distributed. Thus, to achieve a more normal distribution, I transformed this variable by squaring it.

4.4.3.4 Focal Firm Alliance Experience

Firms that frequently engage in strategic alliances accumulate knowledge on about how to manage alliances (Anand & Khanna, 2000; Kale et al., 2002; Reuer et al., 2002). This accumulated alliance experience can then influence the performance of any successive alliance. Thus, I operationalized alliance experience (EXPERIENCE) as the count of a focal firm *i*'s prior alliances over the ten year period prior to year *t* in which the new alliance was formed (Anand & Khanna, 2000; Kale et al., 2002; Reuer et al., 2002). After the assessment of the properties of this variable's distribution (see Chapter 5 for a more detailed explanation), I concluded that this variable was not normally distributed. Thus, to achieve a more normal distribution, I transformed this variable by taking the square root. The data on all past alliances are drawn from the *Airline Business Alliance Survey*. A firm's alliance experience reflects all alliance types that occur in the airline industry: joint ventures, marketing agreements, block

space agreements, codesharing, maintenance agreements, joint frequent flyer programs, ground handling, and schedule coordination.

4.4.3.5 Previous Ties with Partner of New Alliance

As stated in the previous section, past alliance experience can influence the performance of any future alliances (Anand & Khanna, 2000; Kale et al., 2002; Reuer et al, 2002). Besides the more general experience on how to manage alliances, the specific experience on how to work with a certain partner is particularly important (Gulati, 1995a, Inkpen, 2001). Indeed, in alliances with repeated partners, the accumulated experience with and knowledge about a certain partner can create trust amongst the alliance partners and therefore limit the transaction costs of the alliance (Gulati, 1995a). Moreover, knowledge about a partner can be important to influence the evolution of an alliance and therefore also its performance (Inkpen, 2001). Thus, to control for experience with repeated partners, I introduce the control variable TIES, which I operationalized as a dummy variable where 0 means no experience with the partner of the newly formed alliance and 1 means that the focal firm and the partner firm of the new alliance have had at least one alliance in the past. The data on all past alliances are drawn from the *Airline Business Alliance Survey*.

.

4.4.3.6 Country-Specific Controls

I also employ a country-specific control variable to control for time-varying effects related to an airline's domestic market. Therefore, I include the country's annual GDP growth in percent (GDP) and total population (POPULATION) into the

model. After the assessment of the properties of these variables' distributions (see Chapter 5 for a more detailed explanation), I concluded that the variable POPULATION was not normally distributed. Thus, to achieve a more normal distribution, I transformed this variable by taking the logarithm. The data for these control variables were obtained from the *World Bank World Development Indicator* database.

5 DATA ANALYSIS AND RESULTS

In this chapter I describe the data analyses that were conducted to empirically test the hypotheses submitted in Chapter 3, report the results of the analyses, and summarize the key findings of the set of analyses conducted.

5.1 Data Examination

Assessing normality. Before the multivariate data analysis was conducted, the data set was screened for normality. Meeting the condition of univariate normality does not always guarantee multivariate normality, i.e. that all linear combinations of the variables are also normally distributed, but it will help gaining multivariate normality (Hair et al., 1998). In order to examine the distribution of all explanatory variables, I first used graphical methods to inspect the data. For each variable, I plotted a histogram, box plot, stem-and-leaf plot, and normal probability plot in which I examining the skewness and kurtosis. Furthermore, I tested univariate normality of the variables by conducting the Shapiro-Wilk test[9].

Transformations. In the case of non-normal distributions, a commonly used remedy for achieving a more normal distribution is to transform the variables (Hair et al., 1998). After having assessed each variable's distribution, I transformed the variables that were not normally distributed according to the following procedure. As there are many potential transformations including taking the logarithm, the square root, or squaring the variable (Kleinbaum, Kupper, Muller, & Nizam, 1998: 251), I used the *Stata SE9* "ladder" and "gladder" commands to select the most appropriate

transformation. The *Stata SE9* "ladder" function reports numeric results by searching a subset of the ladder of powers for a transformation that converts a variable into a more normally distributed variable. The *Stata SE9* "gladder" function displays a number of histograms with normal curves of transformations of a variable according to the ladder of powers. In order to select the most appropriate transformation, I first performed the "ladder" command and selected the transformation with the smallest chi-square and then verified these result graphically using the "gladder" function. As a result, a number of explanatory variables were transformed. Table 9 shows the variables and their respective transformations.

Variable	Transformation
COMPLEMENT	Square root
SYNERGY	Square root
POPULATION	Logarithm
EXPERIENCE	Square root
AGE	Squared
SIZE	Logarithm

Table 9: Variable Transformations

Assessing linearity. In order to assess linearity between the independent variables and the dependent variable, I assessed the respective scatter plots to check whether non-linearity was present. In addition, I plotted the standardized residuals against each of the explanatory variables in the regression model. After the examination of these graphs, I concluded that no violation of the linearity assumption was present.

Assessing multicollinearity. In order to assess multicollinearity, i.e. correlation among the independent variables, I assessed the degree of multicollinearity and

[9] The Shapiro-Wilk is available in *Stata SE9* through the "swilk" command. In addition, I also used Stata's "sktest" to test the skewness and kurtosis for normality.

determined its impact on the results. With increasing multicollinearity, the regression model estimates of the coefficients become unstable and the standard errors for the coefficients can become inflated. To identify collinearity among the independent variables, I examined the correlation matrix for the independent variables. High correlations (> 0.90) are an indication of collinearity (Hair et al., 1998). I also assessed the variance inflation factor (VIF) for each regression model[10] (Hair et al., 1998) and followed the following rule of thumb: a variable whose VIF values are greater than 10 may merit further examination because the variable could be considered as a linear combination of other independent variables (Kleinbaum et al., 1998). All VIFs were below 10 (i.e. the highest VIF was 7.23) and therefore there was no reason to believe that multicollinearity was present.

Addressing heteroscedasticity. One of the main assumptions for the ordinary least squares regression is the homogeneity of variance of the residuals, i.e. homoscedasticity (Hair et al., 1998). As a first step to check the homoscedasticity assumption, I plotted the residuals versus fitted values. Second, I conducted the Cook-Weisberg test for heteroscedasticity (Cook & Weisberg, 1983)[11]. After the assessment of the graphical plots and the Cook-Weisberg test, I concluded that heteroscedasticity was present.

Assessing independence. Another critical assumption in ordinary least squares regression is that the observed values are statistically independent of one another (Kleinbaum et al., 1998). This assumption, however, is easily violated when there are

[10] To check the variance inflation factors of the variables, I used Stata's "vif" command after each regression run.

different observations for the same observational unit at different points in time. In other words, one may expect that firm performance at one time is related to performance at a later point in time. Thus, ignoring the dependence between different observations for the same firm can lead to invalid statistical conclusions (Kleinbaum et al., 1998). Unfortunately, there are no statistical tests that can detect with an absolute certainty all forms of dependence (Hair et al., 1998). Thus, in order to explore whether the observations in the dataset were independent, I followed the following procedure[12]. For the focal firms making up 85% of the observations (i.e. 14 focal firms), I plotted the histograms and stem-and-leaf plots for the dependent variable and assessed their distributions. The assessment of the distributions revealed that there was no reason to believe that the different observations for each firm were dependent. I repeated the same procedure for the entire sample for each of the five years of the sample period but also here the analysis revealed that there was no reason to believe that the different observations for each of the years were dependent.

5.2 Testing if Alliances Create Value

In their seminal study, Chan et al. (1997) showed that entering into strategic alliances generally affects the value of the partnering firms. Therefore, a first step in the analysis of this study is to test whether the formation of codeshare agreements affects the value of the announcing airlines, i.e. is significantly different from zero. The respective null-hypothesis to be tested is therefore:

[11] The Cook-Weisberg test is available in *Stata SE9* through the "estat hettest" command which executes the Cook-Weissberg and Breusch-Pagan tests for heteroscedasticity. Both tests test the null hypothesis that the variance of the residuals is homogenous.
[12] I thank Joan-Manuel Batista for suggesting this procedure to me.

***H_0**: The announcement of codeshare agreements does not affect the market value of the announcing airlines.*

To perform this test I followed the following process. The individual estimations of the daily abnormal return for each firm *i* on day *t* can be averaged in order to draw inferences. Given a sample of N events, AR_t is defined as the daily average abnormal return on day *t* and is calculated as

$$AR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it}$$

The daily average abnormal returns are then standardized to determine whether they are statistically different from zero (Dodd & Warner, 1983). The average standardized abnormal return on day *t* is calculated as

$$ASAR_t = \frac{1}{N}\sum_{i=1}^{N} \frac{AR_{it}}{SD_{it}}$$

Where $ASAR_t$ = the daily average standardized abnormal return on day *t*

N = the number of events

AR_{it} = the daily abnormal stock return of firm i on day t

$SD_{it'}$ = the standard deviation of the daily abnormal stock return of firm i on day *t*

SD_{it} is calculated as the square root of firm *i*'s estimated forecast variance using Patell's (1976) estimation:

$$SD_{it} = \left(S_i^2 * \left(1 + \frac{1}{T} + \frac{(R_{mt} - R_m)^2}{\sum_{t=1}^{T} (R_{mt} - R_m)^2} \right) \right)^{0.5}$$

Where S_i^2 = the residual variance for firm *i* from the market model regression

T = the number of days of the estimation period

R_{mt} = the return on the market portfolio on day t

R_m = the mean return on the market portfolio for the estimation period

The test statistic used to test the null hypothesis that the average standardized abnormal return is equal to zero, i.e. the event has no impact on firm value, is

$$Z_t = \sqrt{N} \times ASAR_i$$

In addition to the above described test statistic, I also conducted two additional test. First, I ran a simple t-test in which I tested whether the abnormal value is significantly different from zero. Moreover, I conducted the Wilcoxon signed rank test in order to control for outliers (Hollander & Wolfe, 1999; McWilliam & Siegel, 1997). Table 10 reports a 14 day time series of average daily abnormal returns, average standardized abnormal returns *ASAR* (Patell, 1976), the Patell Z-statistic, the proportion of positive abnormal returns, the t-value from the t-test, and the Wilcoxon Z statistic. Table 10 reports that the average abnormal return on the announcement day, i.e. day 0, is 0.31 percent ($p < 0.05$). I also ran these test with the reduced sample, i.e.

without the confounded observations (n = 143). The average abnormal return on the announcement day is 0.39 percent ($p < 0.05$).

Event day	Mean AR (%)	ASAR (Patell)	Z statistic (Patell)	Proportion of positive returns (%)	t-value	Wilcoxon Z
-10	-0.21	-0.10	-1.25	42.86	-1.21	-1.67 †
-9	0.21	0.05	0.62	50.93	1.36	0.75
-8	-0.08	0.01	0.10	45.34	-0.52	-0.69
-7	-0.09	0.00	-0.03	44.72	-0.50	-0.74
-6	-0.04	0.04	0.51	54.04	-0.23	0.05
-5	0.18	0.09	1.14	52.80	1.23	0.99
-4	-0.28	-0.12	-1.56	47.20	-1.65 †	-1.45
-3	-0.19	-0.15	-1.92	44.72	-1.06	-2.13 *
-2	-0.14	-0.08	-1.07	42.86	-0.74	-0.98
-1	-0.12	-0.01	-0.11	49.07	-0.64	0.05
0	0.31	0.20	2.59	54.66	1.96 *	1.97 *
1	0.07	0.00	0.05	47.83	0.42	0.29
2	-0.04	-0.07	-0.94	42.24	-0.23	-1.62 †
3	0.18	0.08	1.06	50.31	1.05	0.01

† p-value < 0.10; * p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001

Table 10: Time series of average daily abnormal returns

5.3 Descriptive Statistics

Table 11 presents the descriptive statistics.

Variable	N	Mean	S.D	Min.	Max.
CAR	161	0.002	0.032	-0.145	0.096
COMPLEMENT	161	6.899	3.316	1.000	14.000
STRENGTH	161	0.027	0.065	0.000	0.633
SYNERGY	161	1.874	1.990	0.000	11.620
INCOMP	161	0.004	0.007	0.000	0.045
AGE	161	3669.9	1660.4	400.000	6400.000
SIZE	161	21.079	1.649	16.691	23.236
FPERFORM	161	0.070	0.057	-0.113	0.175
OPERFORM	161	0.661	0.049	0.544	0.735
TIES	161	0.584	0.494	0.000	1.000
EXPERIENCE	161	4.270	1.038	1.410	6.780
POPULATION	161	17.933	1.460	15.120	19.440
GDP	161	3.515	1.731	-1.407	9.829

Table 11: Descriptive Statistics

The average newly cumulative abnormal stock market return over a two day window following the announcement of the new alliance was 0.19 percent. The partner of the newly formed alliance provided the average focal firm with access to 58.52 complementary destinations. The average new alliance increased the focal firm's available seat kilometers by 2.68 percent, could yield 7.44 new synergistic combinations with existing relational resources, increased the competitive overlap with the focal firm's existing alliance partners by 0.4 percent.

The average focal firm was 58.32 years old, had 45,101 employees, a fleet in service with a capacity of 55,949 seats, a return on sales of 7.04 percent, a load factor of 66.1 percent, and an alliance experience of 19.3 alliances. The average focal firm's country of origin had a total population of 127.3 million and an annual GDP growth of 3.52 percent. As one could expect, larger firms on the average performed better financially ($p < 0.001$) as well as operationally ($p < 0.001$), had more alliance experience ($p < 0.05$), and came from more populated countries ($p < 0.001$). Firms that performed better financially tended to had on the average more alliance experience ($p < 0.01$) and came from countries with a bigger population ($p < 0.05$) and a higher GDP growth rate ($p < 0.01$). Firms that performed better operationally tended to come from countries with a bigger population ($p < 0.001$). Lastly, larger firms ($p < 0.05$) with high financial ($p < 0.01$) as well as operational ($p < 0.05$) performance engaged on the average more with a repeated partner.

Table 12 presents the correlation matrix. Resource complementarity between the average focal firm and the new partner tended to be higher for firms with better operational performance ($p < 0.05$) and less alliance experience ($p < 0.1$). As expected,

the resource strength of large firms was on the average increased less by the new alliance ($p < 0.1$). Moreover, firm with more alliance experience ($p < 0.001$), better operational performance ($p < 0.001$), and a higher age ($p < 0.01$) tended on the average to engage in alliance with a higher synergy creating potential with relational resources of existing partners. Lastly, firms that performed better operationally ($p < 0.1$) tended to experience on the average more conflict in their alliance portfolio.

	Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	**CAR**	1.000												
2	**COMPLEMENT**	0.226 **	1.000											
3	**STRENGTH**	-0.014	0.072	1.000										
4	**SYNERGY**	-0.037	-0.265 ***	0.155 *	1.000									
5	**INCOMP**	-0.105	0.205 **	0.103	0.062	1.000								
6	**AGE**	-0.039	-0.075	0.059	0.218 **	0.043	1.000							
7	**SIZE**	0.024	-0.078	-0.198 *	-0.065	-0.094	-0.005	1.000						
8	**FPERFORM**	0.126	-0.045	0.030	-0.039	-0.061	-0.112	0.385 ***	1.000					
9	**OPERFORM**	0.118	0.175 *	-0.047	-0.269 ***	-0.195 *	-0.110	0.565 ***	0.432 ***	1.000				
10	**TIES**	0.119	0.238 **	-0.120	-0.101	-0.154 †	-0.047	0.177 *	0.210 **	0.170 *	1.000			
11	**EXPERIENCE**	-0.112	-0.136 †	-0.104	0.369 ***	0.102	0.080	0.171 *	0.206 **	0.054	0.050	1.000		
12	**POPULATION**	0.057	-0.006	-0.198 *	-0.149 †	-0.064	-0.027	0.876 ***	0.196 *	0.429 ***	0.174 *	0.006	1.000	
13	**GDP**	0.118	0.081	-0.025	-0.281 ***	0.003	0.012	0.019	0.226 **	0.082	0.128 †	-0.220 **	0.053	1.000

† p-value < 0.10; * p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001

Table 12: Correlation Matrix

5.4 Modeling and Hypotheses Testing

In this sub-section the hypotheses submitted in Chapter 3 will be tested. To test the hypotheses, I used pooled ordinary least squares (OLS) regression analysis to determine whether the (i) resource complementarity between the focal firm and the partner of the new alliance, (ii) the new alliance's relative capacity to strengthen the focal firm's resource stock, (iii) the new alliance's potential to yield synergistic resource combinations with existing relational resources, as well as (iv) the new alliance's compatibility with the focal firm's alliance portfolio were significant explanatory factors for the value that a focal firm derives from entering into a new strategic alliance. In the analysis I examined whether the regression coefficients were consistent with the hypotheses and if they were significantly different from zero.

To correct for heteroscedasticity (see Section 5.1), I used the robust estimates of the standard errors (White, 1980), clustered by firm (Rogers, 1993). The robust-cluster estimator provides correct standard errors in the presence of any pattern of heteroscedasticity[13]. It also remains valid and provides correct coverage in the presence of any pattern of correlation among errors within units. By using this estimator, the assumption of error independence in the OLS regressions can be relaxed. As for some firms there are repeated observations, they may create correlated error terms and bias estimates due to unobserved firm-specific effects (Greene, 2000). However, the robust-cluster estimates of the standard errors are unaffected by the presence of unobserved firm-specific effects causing correlation among errors observations for the same firm. By using this clustering approach, the observations

[13] The robust variance comes under various names and in *Stata* it is known as the Huber-White sandwich estimate of variance.

within a cluster may not be treated as independent, but the clusters themselves are independent.

Table 13 provides the results of the set of regression analyses with the focal firm's cumulated abnormal stock market return over a two-day event window (CAR) as the dependent variable. The extant literature suggests adjusting or eliminating observations that were affected by confounding events (McWilliams & Siegel, 1997). Thus, I ran two sets of regression models: one for the full set of code share announcements (n = 161, Models 1a, 2a, and 3a) and the adjusted set of code share announcements without the confounded events (n = 143, Models 1b, 2b, and 3b). All six models are significant. Model 1a and 1b are significant at the 0.01 level and models 2a, 2b, 3a, and 3b are significant at the 0.001 level.

Dependent variable: CAR						
	Model 1a	**Model 1b**	**Model 2a**	**Model 2b**	**Model 3a**	**Model 3b**
Intercept	-0.0190	-0.0300	-0.0208	-0.0283	-0.0262	-0.0292
	(0.0312)	(0.0329)	(0.0334)	(0.0404)	(0.0309)	(0.0401)
COMPLEMENT	0.0018 *	0.0015 †	0.0025 **	0.0022 *	0.0019 †	0.0018 †
	(0.0009)	(0.0008)	(0.0009)	(0.0009)	(0.001)	(0.0010)
STRENGTH	-	-	-0.0278	-0.0332 †	-0.0208	-0.0290
			(0.0186)	(0.0193)	(0.0207)	(0.0217)
SYNERGY	-	-	0.0023 *	0.0025 *	0.0022 *	0.0026 **
			(0.0008)	(0.0009)	(0.0009)	(0.0010)
INCOMP	-	-	-0.6219 *	-0.5338	-1.6935 *	-1.4393
			(0.2368)	(0.4246)	(0.8066)	(1.6808)
COMPLEMENT * INCOMP	-	-	-	-	0.1378	0.1020
					(0.0895)	(0.1519)
AGE	1.62E-07	-2.76E-08	-1.21E-07	-3.41E-07	8.11E-08	-2.12E-07
	(1.06E-06)	(1.06E-06)	(1.04E-06)	(1.07E-06)	(9.78E-07)	(1.04E-06)
SIZE	-0.0033	-0.0040	-0.0039	-0.0052	-0.0037	-0.0052
	(0.0029)	(0.0032)	(0.0028)	(0.0032)	(0.0028)	(0.0032)
FPERFORM	0.0857	0.0884	0.0928	0.0975 †	0.0875	0.0945 †
	(0.0542)	(0.0549)	(0.0558)	(0.0574)	(0.0538)	(0.5438)
OPERFORM	0.0305	0.0390	0.0297	0.0457	0.0259	0.0404
	(0.0455)	(0.0458)	(0.0464)	(0.0472)	(0.0432)	(0.0447)
TIES	0.0025	-0.0008	0.0001	-0.0015	0.0008	-0.0008
	(0.0049)	(0.0047)	(0.0051)	(0.0047)	(0.0055)	(0.0055)
EXPERIENCE	-0.0027	-0.0018	-0.0034	-0.0025	-0.0029	-0.0022
	(0.0022)	(0.0020)	(0.0021)	(0.0018)	(0.0019)	(0.0016)
POPULATION	0.0033	0.0044	0.0040	0.0053 †	0.0043	0.0055 †
	(0.0027)	(0.0020)	(0.0028)	(0.0027)	(0.0027)	(0.0028)
GDP	0.0007	0.0011	0.0012	0.0015	0.0011	0.0013
	(0.0011)	(0.0010)	(0.0012)	(0.0012)	(0.0012)	(0.0012)
Model F	3.97 **	3.58 **	15.55 ***	12.76 ***	11.87 ***	10.39 ***
R2	0.0901	0.0822	0.121	0.1072	0.1301	0.1114
N	161	143	161	143	161	143

† p-value < 0.10; * p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001
Robust standard errors are in parentheses.

Table 13: Regression Results with CAR as Dependent Variable

Since prior research views resource complementarity between alliance partners as a key factor for alliance formation (Arora & Gambardella, 1990; Chung et al., 2000; Eisenhardt & Schoonhoven, 1996; Gimeno 2004; Rothaermel, 2001), I initially tested for the direct effect of the resource complementarity between the focal firm and the partner of the new alliance on the dependent variable. Models 1a and 1b therefore present a baseline model consisting of the control variables and the effects of resource complementarity between the focal firm and its new partner on the cumulated abnormal market return following the alliance announcement. Model 1 is specified as follows:

$$CAR = \alpha + \beta_1 COMPLEMENT + \beta_2 AGE + \beta_3 SIZE + \beta_4 FPERFORM + \beta_5 OPERFORM + \beta_6 TIES + \beta_7 EXPERIENCE + \beta_8 POPULATION + \beta_9 GDP + \varepsilon$$

Where CAR	=	the cumulative abnormal stock market return over a two-day event window
α	=	the intercept
COMPLEMENT	=	resource complementarity between the focal firm and the partner of the new alliance
AGE	=	the focal firm's age
SIZE	=	the focal firm's size
FPERFORM	=	the focal firm's financial performance
OPERFORM	=	the focal firm's operational performance
TIES	=	Previous tie between focal firm and partner of new alliance
EXPERIENCE	=	the focal firm's alliance experience

POPULATION	=	the population size of the focal firm's home country
GDP	=	the annual GDP growth rate of the focal firm's home country
ε	=	the error term

Hypothesis 1 predicted that the more complementary the resource stocks of the focal firm and the partner of the new alliance, the higher the abnormal stock market return following the announcement of the new alliance. Results of Model 1a indicate that COMPLEMENT has indeed a positive effect on CAR ($p < 0.05$). When replicated with the reduced sample, the results of Model 1b also indicate the COMPLEMENT has a positive effect on CAR however only at the 0.1 level. Therefore, these results provide support for Hypothesis 1.

In order to test Hypotheses 2, 3, and 4a, Model 2 adds the direct effects of the alliance portfolio relevant independent variables STRENGTH, SYNERGY, and INCOMP on the abnormal stock market return following the announcement of the new alliance (CAR). Model 2 is specified as follows:

$$CAR = \alpha + \beta_1 COMPLEMENT + \beta_2 STRENGTH + \beta_3 SYNERGY + \beta_4 INCOMP + \beta_5 SIZE + \beta_6 AGE + \beta_7 FPERFORM + \beta_8 OPERFORM + \beta_9 TIES + \beta_{10} EXPERIENCE + \beta_{11} POPULATION + \beta_{12} GDP + \varepsilon$$

Where STRENGTH	=	New alliance's capacity to strengthen focal firm's resource stock
SYNERGY	=	Synergy creating potential of new alliance
INCOMP	=	Alliance portfolio incompatibility

By adding these three additional variables to the baseline model, the model F-value and R^2 increases quite dramatically compared to Model 1, suggesting that by incorporating the alliance portfolio relevant variables STRENGTH, SYNERGY, and INCOMP into the model, a greater explanatory power can be achieved than by the dyad focused variable COMPLEMENT alone. Results of Model 2a show that: (i) STRENGTH is not significant in explaining CAR and even negatively related, (ii) SYNERGY is significant ($p < 0.05$) in explaining CAR and positively related as hypothesized, and (iii) INCOMP is significant ($p < 0.05$) in explaining CAR and negatively related as hypothesized. When replicated with the reduced sample, the results of Model 2b indicate that: (i) STRENGTH is significant ($p < 0.1$) in explaining CAR but negatively related, (ii) SYNERGY is significant ($p < 0.05$) in explaining CAR and positively related as hypothesized, and (iii) INCOMP is negatively related as hypothesized but not significant in explaining CAR. Overall, results of Models 2a and 2b provide strong support for Hypothesis 3 but only limited support for Hypotheses 4a in the sense that the elimination of confounded events influences the significance of INCOMP to explain CAR. However, results of Models 2a and 2b provide no support for Hypothesis 2.

Model 3 adds the COMPLEMENT * INCOMP interaction effect is specified as follows:

$$CAR = \alpha + \beta_1 COMPLEMENT + \beta_2 STRENGTH + \beta_3 SYNERGY + \beta_4 INCOMP + \beta_5 COMPLEMENT*INCOMP + \beta_6 SIZE + \beta_7 AGE + \beta_8 FPERFORM + \beta_9 OPERFORM + \beta_{10} TIES + \beta_{11} EXPERIENCE + \beta_{12} POPULATION + \beta_{13} GDP + \varepsilon$$

Hypothesis 4b posited that INCOMP negatively moderates the relationship between COMPLEMENT and CAR. While by incorporating the interaction effect into the model, the explanatory power of model 3 relative to models 1 and 2 increases. The interaction term however, is not negatively related as predicted and insignificant in both Models 3a and 3b. Hypothesis 4b is therefore not supported.

5.5 Robustness Checks

In order to test the robustness of the above reported results, I conducted a number of additional checks. First, I replicated the regression analyses with two different event windows. Second, I used the standardized abnormal return as the dependent variable and replicated the regression analyses. Last, I controlled for both year as well as country fixed effects.

Different event windows. In order to test the robustness of above reported result, I checked the sensitivity of the event window by replicating the regression analyses with a three-day, i.e. from day -1 to +1 (Park, 2004; Reuer et al., 2002) as well as a two-week event window, i.e. from day -10 to +3 (Anand & Khanna, 2000; Kale et al., 2002). Table 14 provides the results of the regression analyses using the cumulated abnormal stock market return over a three-day event window (CAR3) as the dependent variable. Table 15 provides the results of the regression analyses using the cumulated abnormal stock market return over a two-week event window (CAR14) as the dependent variable. Models 2a, 2b, 3a, and 3b of the regression using CAR3 are significant. Model 2a is significant at the 0.1 level, Models 2b and 3b at the 0.05 level, and Model 3a at the 0.01 level. Models 2a, 3a, and 3b of the regression using CAR14

are significant. Models 2a and 3a are significant at the 0.05 level and Model 3b at the 0.01 level.

Results of Model 1a with CAR3 indicate that COMPLEMENT has a positive effect on CAR3 ($p < 0.1$). When replicated with the reduced sample ($n = 136$), the results of Model 1b also indicate the COMPLEMENT has a positive effect on CAR3 however this effect is insignificant. Using CAR14 as the dependent variable, results of Model 1a indicate that COMPLEMENT has a positive effect on CAR14 but is not significant. When replicated with the reduced sample ($n = 105$), the results of Model 1b also indicate the COMPLEMENT has a positive effect on CAR14 however this effect is also insignificant.

Moreover, results of Model 2a with CAR3 as the dependent variable show that: (i) STRENGTH is not significant in explaining CAR3 and even negatively related, (ii) SYNERGY is not significant in explaining CAR3 but positively related as hypothesized, and (iii) INCOMP is not significant explaining CAR3 but negatively related as hypothesized. When replicated with the reduced sample ($n = 136$), the results of Model 2b indicate that: (i) STRENGTH is significant ($p < 0.05$) in explaining CAR3 but not positively related as hypothesized, (ii) SYNERGY is not significant in explaining CAR3, and (iii) INCOMP is negatively related as hypothesized but not significant in explaining CAR3. Results of Model 2a with CAR14 as the dependent variable show that none of the independent variables are significant in explaining CAR14. When replicated with the reduced sample ($n = 105$), the results of Model 2b indicate that STRENGTH is significant ($p < 0.1$) in explaining

CAR14 but not positively related as hypothesized and all the other independent variables are not significant in explaining CAR14.

Furthermore, results of Model 3a and 3b indicate that when CAR3 is the dependent variable, the COMPLEMENT * INCOMP interaction term is not negatively related as predicted and insignificant in both cases. With CAR14 as the dependent variable, results of Model 3a and 3b indicate that the COMPLEMENT * INCOMP interaction term is negatively related as predicted but insignificant in both cases.

Dependent variable: CAR3						
	Model 1a	**Model 1b**	**Model 2a**	**Model 2b**	**Model 3a**	**Model 3b**
Intercept	-0.0070	-0.0441	0.0065	-0.0351	-0.0022	0.0355
	(0.0330)	(0.0339)	(0.0274)	(0.0292)	(0.0270)	(0.0300)
COMPLEMENT	0.0018 †	0.0012	0.0002 †	0.0014	0.0013	0.0012
	(0.0010)	(0.001)	(0.0011)	(0.001)	(0.0011)	(0.0012)
STRENGTH	-	-	-0.0486	-0.0651 *	-0.0373	-0.0627 †
			(0.0301)	(0.0303)	(0.0328)	(0.0305)
SYNERGY	-	-	0.0005	0.0010	0.0004	0.0010
			(0.0008)	(0.0008)	(0.0008)	('0.0001)
INCOMP	-	-	-0.4893	-0.0530	-2.2074 †	-0.6229
			(0.3774)	(0.4888)	(1.2844)	(1.7184)
COMPLEMENT * INCOMP	-	-	-	-	0.2209	0.0614
					(0.1532)	(0.1686)
AGE	-1.45E-07	-6.98E-07	-3.13E-08	6.70E-07	2.92E-07	5.95E-07
	(9.90E-07)	(8.56E-07)	(9.61E-07)	(8.01E-07)	(8.67E-07)	(7.48E-07)
SIZE	-0.0025	-0.0030	-0.0029	-0.0040	-0.0025	-0.0046
	(0.0028)	(0.0026)	(0.0028)	(0.0026)	(0.0028)	(0.0026)
FPERFORM	0.0555	0.0249	0.0686	0.0389	0.0602	0.0370
	(0.0537)	(0.045)	(0.0536)	(0.0461)	(0.0529)	(0.0462)
OPERFORM	0.0240	0.0435	0.0109	0.0572	0.0048	0.0534
	(0.0384)	(0.0422)	(0.0469)	(0.0489)	(0.0485)	(0.0479)
TIES	0.0000	-0.0078	-0.0023	-0.0088	-0.0013	-0.0084
	(0.0063)	(0.0056)	(0.0063)	(0.0060)	(0.0068)	(0.0061)
EXPERIENCE	-0.0004	0.0048	-0.0005	0.0040	0.0004	0.0042
	(0.0031)	(0.0032)	(0.0033)	(0.0033)	(0.0030)	(0.0033)
POPULATION	0.0020	0.0034	0.0022	0.0036 †	0.0026	0.0038 †
	(0.0029)	(0.0024)	(0.0027)	(0.0021)	(0.0025)	(0.0022)
GDP	-0.0012	0.0004	-0.0016	0.0004	-0.0014	0.0003
	(0.0014)	(0.0012)	(0.0014)	(0.0013)	(0.0016)	(0.0013)
Model F	1.25	1.16	1.93 †	2.39 *	4.36 **	2.28 *
R2	0.0311	0.0386	0.0443	0.0531	0.0598	0.0543
N	161	136	161	136	161	136

† p-value < 0.10; * p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001

Robust standard errors are in parentheses.

Table 14: Regression Results with CAR3 as Dependent Variable

Dependent variable: CAR14						
	Model 1a	**Model 1b**	**Model 2a**	**Model 2b**	**Model 3a**	**Model 3b**
Intercept	0.0019	0.0304	-0.0056	0.0323	-0.0051	0.0286
	(0.0786)	(0.1011)	(0.0878)	(0.1132)	(0.0887)	(0.1076)
COMPLEMENT	0.0013	0.0004	0.0012	0.0002	0.0013	0.0006
	(0.0019)	(0.0021)	(0.0023)	(0.0028)	(0.0025)	(0.003)
STRENGTH	-	-	0.0125	-0.0881 †	0.0119	-0.0917 **
			(0.0767)	(0.0472)	(0.0778)	(0.0398)
SYNERGY	-	-	0.0004	0.0005	0.0004	0.0004
			(0.0023)	(0.0024)	(0.0024)	(0.0025)
INCOMP	-	-	0.1456	0.3895	0.2308	1.6498
			(1.2017)	(2.0552)	(2.4130)	(5.1346)
COMPLEMENT * INCOMP	-	-	-	-	-0.0110	-0.1267
					(0.2816)	(0.4480)
AGE	2.81E-06	9.83E-07	2.68E-06	1.07E-06	2.66E06	1.05E-06
	(2.93E-06)	(4.00E-06)	(2.91E-06)	(3.99E-06)	(2.95E-06)	(4.03E-06)
SIZE	-0.0019	0.0002	-0.0019	-0.0013	-0.0019	-0.0019
	(0.0065)	(0.0068)	(0.0065)	(0.0071)	(0.0064)	(0.0071)
FPERFORM	0.0872	0.0651	0.8290	0.0831	0.0833	0.0898
	(0.0912)	(0.1034)	(0.0997)	(0.1106)	(0.0996)	(0.1124)
OPERFORM	0.0969	-0.0013	0.1066	0.0339	0.1070	0.0403
	(0.0866)	(0.1083)	(0.1298)	(0.1511)	(0.1280)	(0.1421)
TIES	-0.0042	-0.0094	-0.0035	-0.0094	-0.0035	-0.0105
	(0.0100)	(0.0185)	(0.0118)	(0.0205)	(0.0120)	(0.0198)
EXPERIENCE	-0.0037	0.0042	-0.0039	0.0037	-0.0040	0.0035
	(0.0045)	(0.0077)	(0.0052)	(0.0087)	(0.0052)	(0.0090)
POPULATION	-0.0021	-0.0030	-0.0021	-0.0025	-0.0021	-0.0027
	(0.005)	(0.0065)	(0.0049)	(0.0070)	(0.0052)	(0.0073)
GDP	0.0005	-0.0012	0.0006	-0.0015	0.0058	-0.0014
	(0.0029)	(0.0034)	(0.0031)	(0.0038)	(0.0032)	(0.0039)
Model F	1.19	1.35	2.28 *	1.78	2.42 *	3.44 **
R2	0.018	0.0156	0.0185	0.0221	0.0185	0.0232
N	161	105	161	105	161	105

† p-value < 0.10; * p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001

Robust standard errors are in parentheses.

Table 15: Regression Results with CAR14 as Dependent Variable

Standardized returns as dependent variable. As an additional robustness check, I used standardized cumulative abnormal return (SCAR) over the two-day window as the dependent variable and replicated the regression analyses. The abnormal returns following the announcement of the new alliance were standardized according to the Patell (1976) correction (see previous Section on Testing if Alliances Create Value). Table 16 provides the results of the regression analyses using the standardized cumulated abnormal stock market return over a two-day event window (SCAR) as the dependent variable. All six models are significant. Model 1b is significant at the 0.01 level and Models 1a, 2a, 2b, 3a, and 3b are significant at the 0.001 level.

Results of Model 1a with SCAR indicate that COMPLEMENT has a positive effect on SCAR but is not significant When replicated with the reduced sample (n = 143), the results of Model 1b also indicate the COMPLEMENT has a positive effect on SCAR3 but remains insignificant in explaining SCAR. Moreover, results of Model 2a with SCAR as the dependent variable show that: (i) COMPLEMENT is significant ($p < 0.05$) in explaining SCAR and positively related as predicted (ii) STRENGTH is significant ($p < 0.05$) in explaining SCAR but negatively related, (iii) SYNERGY is significant ($p < 0.01$) in explaining SCAR and positively related as hypothesized, and (iv) INCOMP is significant ($p < 0.01$) explaining SCAR and negatively related as hypothesized. When replicated with the reduced sample (n = 143), the results of Model 2b indicate that: (i) COMPLEMENT is significant ($p < 0.1$) in explaining SCAR and positively related as predicted (ii) STRENGTH is significant ($p < 0.05$) in explaining SCAR but negatively related, (iii) SYNERGY is significant ($p < 0.01$) in explaining SCAR and positively related as hypothesized, and (iv) INCOMP is negatively related

as hypothesized but not significant in explaining SCAR. Furthermore, results of Model 3a and 3b indicate that when SCAR is the dependent variable, the COMPLEMENT * INCOMP interaction term is not negatively related as predicted, although significant ($p < 0.1$) in Model 3a but insignificant in Model 3b.

Year and country fixed effects. As an additional robustness check, I also controlled for year fixed effects as well as country fixed effects. When controlling for country fixed effects, I omitted the two country specific control variables GDP and POPULATION from the model specification. For both year and country, results did not change dramatically and the model statistics did not support the inclusion of these extra variables.

Dependent variable: SCAR2						
	Model 1a	**Model 1b**	**Model 2a**	**Model 2b**	**Model 3a**	**Model 3b**
Intercept	-1.4514	-2.0566	-1.6800	-2.2413	-1.8152	-2.2531
	(1.4387)	(1.4446)	(1.5405)	(1.6423)	(1.4254)	(1.6454)
COMPLEMENT	0.0506	0.0367	0.0754 *	0.0536 †	0.0527	0.0493
	(0.0312)	(0.0267)	(0.0331)	(0.0281)	(0.3310)	(0.0343)
STRENGTH	-	-	-1.4608 *	-1.6784 **	-1.1797 †	-1.6230 *
			(0.06593)	(0.7538)	(0.6857)	(0.7636)
SYNERGY	-	-	0.1017 **	0.1063 **	0.0989 **	0.1074 **
			(0.0286)	(0.0364)	(0.0317)	(0.0373)
INCOMP	-	-	-19.5440 **	-7.2961	-62.0784 **	-19.0745
			(5.4762)	(10.6969)	(19.9517)	(40.6498)
COMPLEMENT * INCOMP	-	-	-	-	5.4699 †	1.3272
					(2.8052)	(3.912)
AGE	-5.48e-07	-3.37e-06	-1.00E-05	-2.00E-05	-4.97e-06	-1.47E-05
	(4.44E-05)	(4.59E-05)	(4.00E-05)	(5.00E-05)	(4.16E-05)	(4.59E-05)
SIZE	-0.0671	-0.0778	-0.0987	-0.1247	-0.0910	-0.1248
	(0.1031)	(0.1105)	(0.1016)	(0.1096)	(0.9925)	(0.1099)
FPERFORM	1.1360	1.1099	1.4366	1.4231	1.2272	1.3837
	(1.4610)	(1.3938)	(1.5440)	(1.4638)	(1.4850)	(1.4455)
OPERFORM	2.6986 †	2.8718 †	3.0225 †	3.7584 **	2.8731 †	3.6899 *
	(1.5495)	(1.6636)	(1.5311)	(1.6628)	(1.4134)	(1.5996)
TIES	0.0682	-0.0883	-0.0130	-0.0926	0.0130	-0.0842
	(0.1638)	(0.1268)	(0.1731)	(0.1341)	(0.1859)	(0.1478)
EXPERIENCE	-0.0899	-0.0412	-0.1315 †	-0.0928	-0.1116	-0.0885
	(0.0765)	(0.0574)	(0.0762)	(0.0587)	(0.0692)	(0.0581)
POPULATION	0.0581	0.0967	0.0876	0.1272	0.0990	0.1310
	(0.1010)	(0.1002)	(0.1057)	(0.1008)	(0.1021)	(0.1026)
GDP	0.0273	0.0431	0.0491	0.0571	0.0432	0.0555
	(0.0440)	(0.0392)	(0.0486)	(0.0463)	(0.0495)	(0.0464)
Model F	5.47 ***	3.51 **	7.79 ***	5.16 ***	9.24 ***	4.82 ***
R2	0.0628	0.0547	0.0974	0.0831	0.1081	0.0837
N	161	143	161	143	161	143

† p-value < 0.10; * p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001

Robust standard errors are in parentheses.

Table 16: Regression Results with SCAR as Dependent Variable

5.6 Summary of Findings

From the results of the performed analyses and robustness checks the following can be concluded. First, the results are robust regarding the elimination of confounded events. In the analysis with CAR as the dependent variable, the results for Hypotheses 1, 2, 3, and 4b did not change when the confounded events were excluded. However, results for Hypothesis 4a changed and when the confounded events were excluded INCOMP became insignificant in predicting CAR. Moreover, results for the additional regression analyses that were conducted as robustness checks by using different event windows and the standardized cumulative abnormal return (SCAR) did not change when the confounded events were excluded. Therefore, it can be concluded that the exclusion of confounded events is not critical in this study in order to obtain more robust results. Indeed, this may stem from the fact that the identification of confounding events is generally a very subjective matter and leaves it up to the researcher to decide what is an confounding event and what is not. While CEO layoffs or earning announcements are generally regarded as confounding events, it is unclear if, for instance, the announcement of major price cuts should be regarded as a confounding event. The inclusion of such events may then indeed lead to more confounded observations and hence may affect the sample size, which then may change results.

Second, the results are highly sensitive to the length of the event window. This was expected and is in line with the extant event study literature that acknowledges that the selection of the event window is a key issue (Bromiley et al., 1988; Lubatkin & Shrieves, 1986; McWilliams & Siegel, 1997). As the robustness check with the two additional event windows revealed results changed dramatically by employing either a

three-day or two-week event window. With a three-day window the results for all Hypotheses except Hypothesis 1 changed in the sense that they were statistically not significant. When employing an extremely long event window, i.e. two weeks, the results became all statistically insignificant. While in the research setting of this study, there was no reason to believe that that information to investors leaked out that much time before the event, I interpret the fact that results changed dramatically with the employment of a long event window as not critical. Indeed, previous authors have recommended the use of short event windows instead of long windows (McWilliams & Siegel, 1997). More worrying is that fact that the inclusion of day +1 to the two-day event window (i.e. day -1 to day 0) changes results quite dramatically. However, also here is has been argued that the according to the efficient market hypothesis the effect of the announced event is normally incorporated very quickly into stock prices. Thus, in the research setting of this study there was no reason to believe that information on a codeshare announcement was revealed slower than normal that justified the inclusion of a day after the announcement day (i.e. day 0) into the event window.

Third, when the non-standardized cumulative abnormal return (CAR) as the dependent variable was substituted by the standardized cumulative abnormal return (SCAR), results actually improved. For example, SYNERGY was significant at the 0.05 level in predicting CAR but was significant at the 0.01 level in predicting SCAR. Similarly, INCOMP was significant at the 0.05 level in predicting CAR but was significant at the 0.01 level in predicting SCAR. Therefore, by taking CAR as the dependent variable, the reported results represent a more conservative estimate.

Last, the robustness checks in which I controlled for year and country fixed effects using CAR as the dependent variable, indicated that the results did not change. Therefore, the results from the regressions using CAR as the dependent variable and where firm fixed controls are employed hold across different countries and years.

To summarize, the above performed analyses revealed that: (i) ***Hypothesis 1 is supported,*** (ii) ***Hypothesis 2 is rejected***, (iii) ***Hypothesis 3 is supported***, (iv) ***Hypothesis 4a is supported***, and (v) ***Hypothesis 4b is rejected***. These findings contribute to the understanding of the role of alliance portfolios in value creation by supporting the proposition that firms entering into strategic alliances can create as well as destroy market value. The market seems to reward firms entering into strategic alliances that create access to valuable and complementary partner resources. The positive relationship between resource complementarity and a firm's abnormal stock market return following the alliance announcement supports the view that the market regards alliances as an effective mean to access strategically critical resources and create novel and rent generating resource combinations. Moreover, the relative capacity of the newly accessed relational resources to strengthen a focal firm's alliance portfolio does not seem to be a relevant factor in predicting the value that multilaterally connected firms derive from entering into new alliances. When it comes to the synergies and conflict that a new alliance can create in a focal firm's alliance portfolio, it seems that the market rewards firms that engage in alliances that provide access to resources that can not only be combined with the focal firm's own resources but also with its existing relational resources. Furthermore, the stock market seems to penalize firms for entering into alliances that are incompatible with their alliance portfolios. Indeed, the negative relationship between a firm's abnormal stock market

return following alliance announcements and incompatibility of a newly formed alliance with the firm's alliance portfolio may be a signal of the market's concern with the potential loss of revenue streams contributed by existing alliances that are in conflict with the newly formed alliance. The prediction of alliance incompatibility being a moderator of the relationship between resource complementarity and value creation was however not confirmed and suggests that the market is not aware of such a relationship. Lastly, the results also indicate that the resource complementarity between the focal firm and a partner of a new alliance together with the amount of synergies and conflict the new alliance creates in the focal firm's alliance portfolio are a more significant predictor of value creation than just resource complementarity alone.

6 DISCUSSION

In this chapter I discuss the implications of this research for theory on firm resources and capabilities. I also examine the implications for alliance research as well as the implications for alliance managers and practitioners. I end this discussion by highlighting some of the limitations and future avenues for empirical research.

6.1 Implications for Literature on Firm Resources and Capabilities

RBV. The proposed theoretical model in Section 3.1 builds on prior RBV research that problematizes beyond firm boundary resources (Dyer & Singh, 1998; Lavie, 2006). More specifically, this theory extension suggests that relational resources accessed through multiple alliances with different partners can also be combined in a value creating way and specifies the conditions under which a focal firm can appropriate value from such combinations of beyond firm boundary resources. By specifying which interdependencies are instrumental in value creation at such an alliance portfolio level this theorizing suggests additional resource attributes beyond the (i) single resource level of analysis (Barney, 1991) and (ii) dyad level of analysis, i.e. resource complementarity (Arora & Gambardella, 1990; Chung et al., 2000; Mowery et al., 2002; Rothaermel, 2001). The critical resource characteristics on the portfolio level of analysis are: (i) complementarity with other relational resources and (ii) compatibility with existing partners. These additional resource characteristics suggest that the resources should be evaluated in the context of an entire resource system and not as standalone resources. Multilaterally connected firms are therefore challenged to pay attention to these additional resource characteristics when they

upgrade their resource system with new resources from alliance partners. This leads into the implication on the literature on dynamic capabilities.

Dynamic capabilities. The theory developed in this dissertation has implications for the literature on dynamic capabilities, i.e. a firm's ability to recombine and reconfigure its resources (Eisenhardt & Martin, 2000; Galunic & Rodan, 1998; Teece et al., 1997).

Technically, resource recombination refers to the process within a firm of synthesizing existing resources and reconfiguring linkages between these resources (Galunic & Rodan, 1998). In the context of multilaterally connected firms, resource recombination means synthesizing not only existing own resources but also relational resources and reconfiguring linkages between these resources in novel and value-generating ways. Thus, when recombining their resources multilaterally connected firms may be presented with additional opportunities to create novel and rent generating combinations through complementarities existing between their relational resources. In other words, they have an opportunity to further exploit the rent generating capacity of their relational resources by leveraging them into additional synergistic and value creating combinations (Galunic & Rodan, 1998). In that line of thought, it is important, however, to point out that recombining relational resources from multiple partners is different from recombining multiple resources from the same partner. Assume that a multilaterally connected firm has two relational resources from the same partner that are accessed through two different alliance agreements with that partner. If these two resources were complementary, the partner firm would capitalize on that opportunity itself and would only need the help of a partner such as the

multilaterally connected firm if that combination were incomplete and lacked some resources. However, this issue has already been extensively discussed in the dyadic argument on resource complementarity (Arora & Gambardella, 1990; Chung et al, 2000; Eisenhardt & Schoonhoven, 1996).

Resource reconfiguration is the process concerned with managing a firm's resource stock by (i) retaining valuable existing resources, (ii) bringing in new strategically critical resources, and (iii) removing existing resources that have ceased to render rent generating services (Capron et al., 1998; Karim & Mitchell, 2000; Eisenhardt & Martin, 2000; Teece et al., 1997). According to this theory, a key issue when bringing in new relational resources is their effective integration into the focal firm's resource system by taking the interdependencies with the other resources into account. Adding new relational resources to a multilaterally connected firm's resource system becomes indeed a complex undertaking because these new relational resources may not only create synergies with existing own and relational resources but may also lead to conflict with resource combinations of existing partners. Such a conflict can make it difficult for the multilaterally connected firm to retain the relational resources provided by these partners and can even lead to the deletion of the relational resources provided by this partner. In other words, adding new relational resources may lead to the deletion of existing valuable relational resources from a multilaterally connected firm's resource system. Indeed the empirical results of this research confirms the notion that when adding new relational resources to its resource system, a multilaterally connected firms need to pay close attention how the newly accessed relational resources affect their alliance portfolios.

Alliance capability. An important firm level capability relevant for the success of interconnected firms is alliance capability (Simonin, 1997; Kale et al., 2002). It has also been suggested that through a dedicated alliance function, interconnected firms are able to monitor their alliance portfolio (Kale et al., 2002). This research is therefore consistent with that view because only through a central alliance function can a firm manage its alliance portfolio in a deliberate way so that it can exploit all synergies between relational resources and avoid conflicts with existing partner. Such alliance capability is particularly important when a multilaterally connected firm adds new alliances to its alliance portfolio. According to the alliance capability argument, firms that institutionalize this capability in a dedicated alliance function achieve are more successful not only on the firm level but also with their alliances (Kale et al., 2002). This suggests indeed that alliance capability may be a key antecedent in picking new alliances that are high in synergy creating potential with other relational resources and low in conflict potential with existing alliance partners.

6.2 Implications for Alliance Research

As discussed earlier, the bulk of existing alliance research on has applied a dyadic perspective when studying the performance consequences for firms entering into strategic alliances. However, as firms have become increasingly multilaterally connected, i.e. maintain alliance portfolios, it has become necessary for alliance scholars to shift the attention to the alliance portfolio as the unit of analysis. This research shows that multilaterally connected firms differ quite significantly in terms of the value they derive from alliance they enter into. This research also shows that part of the explanation may lie in how these alliances interact with the firms' existing

alliance portfolio, especially how newly added alliances can create synergies as well as conflict in an alliance portfolio.

This research lays a foundation for future research on alliance portfolios and their impact on firm performance. By having identified some explanatory factors on how individual alliances interact with alliance portfolios at the time of formation and how this interaction affects firm performance, future research can take a reverse perspective and focus on how alliance terminations, i.e. the situation when alliances get deleted from an alliance portfolio, affect firm performance. Furthermore, this research also laid a foundation for research on the performance of alliance portfolios. While research on the performance of single alliances exists (Gulati, 1998), research on the performance of alliance portfolios is still rare. The theory developed in this study established the notion that the value that alliance portfolios create is not just the sum of the value that each single alliance in the alliance portfolio creates but greater or sometimes even smaller depending on the synergies and the conflicts present in the alliance portfolio.

Moreover, this research also affects future research on the multi-partner alliance phenomenon. Although the proposed theoretical framework in Section 3.1 is not a theory about multi-partner alliances, it can be extended to theorize about the formation of multi-partner alliances with repeated partners. In other words, a focal firm that seeks to exploit resource complementarity between relational resources provided by different partners may create a new multi-partner alliance with these partners to exploit these complementarities. Thus, exploitation of complementarities between relational resources can indeed lead to multi-partner alliances with existing, i.e.

repeated, partners.

6.3 Managerial Implications

Finally, what are the managerial implications of this research? While the traditional dyadic view of alliance formation has suggested that firms select new alliance partners based on the complementarity between their own and the partner's resources, I argue that alliance managers should also take a broader systems perspective and consider the complementarities between a new partner's resources and their existing relational resources as potential sources for value creation. Moreover, alliance managers should not only evaluate the benefits of new relational resources but also potential costs related to the deletion of other relational resources as an outcome of conflict with existing partners. Multilaterally connected firms that reconfigure their resource systems in a way that they can exploit all complementarities between their resources and minimize the release of rent generating resource combinations with partners will have a competitive advantage over interconnected firms that are unaware of these issues.

As the review of the literature on alliance portfolios revealed, one of the managerial challenges for multilaterally connected firms lies in the performance evaluation of the alliance portfolio (Hoffmann, 2005; Parise & Casher, 2003). Thus, by taking a portfolio rather than individual alliance perspective, managers of multilaterally connected firm will have to pay close attention to the synergies and conflicts between the existing alliances in the portfolio but also to the effect any new alliance may have on the portfolio.

6.4 Limitations and Future Research

This study is conditioned by a number of limitations. Because the RBV served as the main theoretical lens in this study, a shortcoming is that such a resource focused perspective does not allow problematizing any structural characteristics of a multilaterally connected firm's alliance portfolio. Therefore, the integration with social network theories, i.e. Burt's (1992) theory on structural holes and information brokering, may provide additional insights on the synergies and conflicts in a multilaterally connected firm's resource system. Furthermore, the proposed theory does not allow making inferences about how much value is actually appropriated by the focal firm. Therefore, integration with transaction cost economics can help to develop some more fine grained theory on value appropriation in such multilateral setting. Lastly, our theory does not formalize the exact flow of different types of rents in interconnected firm as outlined by Lavie (2006). Therefore, future research should incorporate these rent types into any formalized model.

The interpretation of the empirical results of this study is also conditioned by a number of limitations, which can be addressed in future research. First, the results of this study may be influenced by the particular characteristics of the chosen empirical setting, i.e. the global airline industry. Thus, the results presented in this study may not apply to other industries. Future research may therefore address this concern through a multi-industry sample. Second, this study is also conditioned by some data limitations. More specifically, the *ICAO Traffic by Flight Stage* digest of statistics cover only international routes and therefore domestic routes had to be excluded from the analysis. While this may not be an issue for player with a small domestic market, such as KLM of the Netherlands, it may be for players with a large domestic market, such

as all U.S. airlines in the sample. Therefore, it could be useful to collect additional data and incorporate additional data on domestic traffic.

Another limitation of this study is that actual alliance terminations were actually not taken into account. In other words, conflict in a focal firm's alliance portfolio was measured as the competitive overlap between the focal firm and an existing partner. Here, it was assumed that the higher the overlap, the higher the risk that the alliance between these two firm could actually be terminated. Thus, to take a more evolutionary perspective and measure not only the resource inflows but also the outflows, i.e. the actual terminations of codeshare agreements, it would be useful to gather additional data on alliance terminations. However, this data may be difficult to collect as firm rarely announce the termination of their alliances.

Moreover, the interpretation of the results of this study may also be conditioned by a multilevel issue. The conceptual model somewhat assumes a nested structure in the sense that a particular resource is nested in a strategic alliance which is nested in an alliance portfolio which is nested in a focal firm. The statistical method applied in this study is ordinary least squares (OLS) regression analysis which does not estimate individual and group level residuals separately. Thus, from a methodological perspective a future research opportunity to address this issue of hierarchically nested data structure would be replicate the analysis using hierarchical linear models (Bryk & Raudenbusch, 1992; Hofman, 1997; Klein, Danserau, & Hall, 1994; Kozlowski & Klein, 2000).

Furthermore, the research setting of this study is a global setting and the sample firms are therefore internationally operating airlines of a certain size. The question is therefore: do these results also apply for smaller firms such as pure domestic players? It may therefore be useful to replicate this study in a domestic context. However, here the critical issue here would certainly be to pick a large enough domestic market, such as the U.S., in order to ensure a large enough sample size of both firms and events. Lastly, the fact that the research was conducted on a global scale may offer some methodological research opportunities. In this study, I conducted an event study using an international sample but chose to follow a traditional event study approach (McWilliams & Siegel, 1997). A future research opportunity may be to repeat the analysis following an event study approach for multi-country settings as recently outlined by Park (2004).

7 CONCLUSION

This dissertation started by noting that the recent extensions of the RBV to interconnected firms have overlooked interdependencies between resources. In that context, I identified a research gap and suggested that important RBV concepts such as resource complementarity and incompatibility need to be integrated into the theorizing about multilaterally connected firms. Furthermore, the review of the extant alliance portfolio literature revealed that there is indeed scarce empirical evidence on how synergies and conflict in alliance portfolios affect the performance of multilaterally connected firms. Especially, little seems to be known about the dynamics and interdependencies between individual alliances and the alliance portfolios in which they are embedded. Lastly, the review of the event study based alliance literature indicated that the bulk of prior studies is primarily devoted to single alliance and views alliances as stand-alone transactions rather than as part of an entire alliance portfolio. Consequently, existing research has not included factors on the alliance portfolio level to explain the value that firms derive from entering into strategic alliances. Therefore, this dissertation set out to address these gaps in the theoretical and empirical literature by providing new theory and empirical evidence on value creation in alliance portfolios.

The central idea in the first theoretical argument presented is that a multilaterally connected firm's resource system is comprised of own and relational resources and that the interdependencies between these resources are sources for potential synergies as well as conflict. I argued that the value a relational resource creates in a multilaterally connected firm's alliance portfolio is a function of the

potential synergies and conflicts it creates. Regarding the positive interdependencies, I identified an additional type of resource complementarity that has not yet been discussed in the literature. This type of resource complementarity occurs between relational resources accessed through multiple alliances with different partners. I also suggested that an important determinant for the synergy creating potential of a relational resource is its complementarity to the own and other relational resources in the resource system. Furthermore, I highlighted that the exploitation of a synergy creating opportunity based on complementarity between relational resources can only occur via the interconnected firm. In other words, relational resources from different alliances with different partners can only be leveraged into a synergistic resource combination via some of the multilaterally connected focal firm's own resources. Furthermore, I argued that the resources combinations enabled through alliances may also affect the multilaterally connected firm's partners negatively by causing a competitive conflict leading to alliance termination or value cannibalization.

Moreover, the empirical model suggested that four specific features are crucial of a newly formed alliance's impact on firm valuation: (i) complementarity between the focal firm's and the new partner's resource stock, (ii) the new alliance's capacity to strengthen the focal firm's stock of own and relational resources, (iii) the new alliance's potential to create synergistic resource combinations beyond the dyadic level with other relational resources, (iv) the new alliance's compatibility with existing partners. Indeed, the empirical part of this dissertation revealed that the stock market reward firms entering into strategic alliances with partners that possess complementary resources. However, the value that firms derive from entering into strategic alliances can be better explained when alliance portfolio relevant factors are added into the

equation. In particular two factors seem to play a critical role: the synergies and the conflict that an alliance can create in the alliance portfolio to which it is added. More specifically, the empirical analysis showed that on one side the stock market rewards firms that engage in alliances that provide access to resources that can not only be combined with the focal firm's own resources but also with its existing relational resources. On the other side, the stock market seems to penalize firms for entering into alliances that are incompatible with their alliance portfolios.

I submit that the contribution of this dissertation rests in three main areas. First, I have drawn on an important stream of literature central to research about interconnected firms and developed an alliance portfolio based perspective of value creation. Second, this dissertation addresses the broader question: do alliance portfolios matter? The answer is yes they do matter, because they provide multilaterally connected firms not only with additional opportunities for value creation but they may also be a source of conflict leading to the deletion of valuable resources and therefore potential value destruction. Lastly, this dissertation provides new empirical evidence on the role of alliance portfolios in value creation. To sum up, the theoretical analysis and empirical research in this dissertation contribute to two important streams of strategic management research, namely the RBV and its recent extension to interconnected firms (Barney, 1991; Dyer & Singh, 1998; Lavie, 2006; Penrose, 1959; Rumelt, 1984; Wernerfelt, 1984) as well as the performance consequences for firms entering alliances (Gulati, 1998). I am confident that this dissertation provides a useful perspective and further understanding on some of the issues that multilaterally connected firms face. I hope that this theorizing and empirical research will motivate further work in the exciting area of alliance portfolios.

8 BIBLIOGRAPHY

Abell, D. F. 1980. Defining the business: The starting point of strategic planning. Englewood Cliffs, NJ: Prentice-Hall.

Ahuja, G. 2000a. The duality of collaboration: Inducements and opportunities in the formation of interfirm linkages. *Strategic Management Journal* 21, no. Special Issue: 317-43.

Ahuja, G. 2000b. Collaborative networks, structural holes, and innovation: A longitudinal study. *Administrative Science Quarterly* 45: 425-55.

Amit, R., and P. J. H. Schoemaker. 1993. Strategic assets and organizational rent. *Strategic Management Journal* 14: 33-46.

Amit, R., and C. Zott. 2001. Value creation in e-business. *Strategic Management Journal* 22, no. 6/7: 493-520.

Anand, B. N., and T. Khanna. 2000. Do firms learn to create value? The case of alliances. *Strategic Management Journal* 21: 295-315.

Arora, A., and A. Gambardella. 1990. Complementarity and external linkages: the strategies of the large firms in Biotechnology. *Journal of Industrial Economics* 38: 361-79.

Bae, J., and M. Gargiulo. 2004. Partner substitutability, alliance network structure, and firm profitability in the telecommunications industry. *Academy of Management Journal* 47, no. 6: 843-59.

Bamford, J. D., and D. Ernst. 2002. Managing an alliance portfolio. *The McKinsey Quarterly* 3: 29-39.

Barley, S. R., J. H. Freeman, and R. C. Hybels. 1992. Strategic alliances in commercial biotechnology. in *Networks and organizations: Structure, form, and action.* eds. N. Nohria, and R. G. Eccles, 311-47. Boston, MA: Harvard Business School Press.

Barney, J. B. 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17, no. 1: 99-120.

Baum, J. A. C., T. Calabrese, and B. S. Silverman. 2000. Don't go it alone: Alliance network composition and startups' performance in Canadian biotechnology. *Strategic Management Journal* 21: 267-94.

Baum, J. A. C., and H. J. Korn. 1996. Competitive dynamics of interfirm rivalry. *Academy of Management Journal* 39, no. 2: 255-91.

Bittlingmayer, G. 1990. Efficiency and entry in a simple airline network. *International Journal of Industrial Organization* 8: 245-57.

Black, J. A., and K. B. Boal. 1994. Strategic resources: Traits, configurations and paths to sustainable competitive advantage. *Strategic Management Journal* 15, no. Summer: 131-48.

Borenstein, S. 1989. Hubs and high fares: Dominance and market power in the U.S. airlines industry. *RAND Journal of Economics* 20: 344-65.

———. 1991. The dominant-firm advantage in multi-product industries: Evidence from the U.S. airlines. *Quarterly Journal of Economics* 106, no. November: 1237-66.

———. 1992. The evolution of U.S. airlines competition. *Journal of Econmics Perspectives* 6, no. 2: 45-73.

Brandner, J. A., and A. Zhang. 1990. Market conduct in the airline industry: An empirical investigation. *RAND Journal of Economics* 21, no. 4: 567-83.

Bromiley, P., M. Govekar, and A. Marcus. 1988. On using event study methodology in strategic management research. *Technovation* 8: 25-42.

Brueckner, J. K. 2001. The economics of international codesharing: An analysis of airline alliances. *International Journal of Industrial Organization* 19, no. 10: 1475.

Brueckner, J. K., and W. T. Whalen. 2000. The price effects of international airline alliances. *Journal of Law and Economics* 43, no. 2: 503-46.

Bryk, A. and W. Raudenbusch. 1992. *Hierarchical linear models: Applications and data analysis methods.* Advanced Quantitative Techniques in the Social Sciences Series, 1. Newbury Park, CA: Sage Publications.

Buckley, P. J., and Casson M. 1988. A theory of cooperation in international business. *Cooperative Strategies in International Business.* eds. F. J. Contractor, and P. Lorange, 31-53. Lexington, MA: Lexington Books.

Burt, R. S. 1992. *Structural holes: The social structure of competition*. Cambridge, MA: Harvard University Press.

Capron, L., P. Dussauge, and W. Mitchell. 1998. Resource redeployment following horizontal acquisitions in Europe and North America, 1988 - 1992. *Strategic Management Journal* 19, no. 7: 631-61.

Casciaro, T. 1999. "The formation of strategic alliance networks." Unpublished dissertation, Carnegie Mellon University.

Chan, S. H., J. W. Kensinger, A. J. Keown, and J. D. Martin. 1997. Do strategic alliances create value? *Journal of Financial Economics* 46: 199-221.

Chen, F. C-Y., and C. Chen. 2003. The effects of strategic alliances and risk pooling on the load factors of international airline operations. *Transportation Research, E (Logistics)* 39: 19-34.

Chen, H., M. Y. Hu, and J. Shieh. 1991. The wealth effect of international Joint Ventures: The case of U.S. investment in China. *Financial Management* Winter: 31-41.

Chen, M-J. 1996. Competitor analysis and interfirm rivalry: Toward a theoretical integration. *Academy of Management Review* 21: 100-134.

Chen, M-J., and D. C. Hambrick. 1995. Speed, stealth, and selective attack: How small firms differ from large firms in competitive behavior. *Academy of Management Journal* 38, no. 2: 453-82.

Chen, M-J., and MacMillan I. C. 1992. Nonresponse and delayed response to competitive moves: The roles of competitor dependence and action irreversibility. *Academy of Management Journal* 35, no. 3: 539-70.

Chen, M-J., and D. Miller. 1994. Competitive attack, retaliation and performance: An expectancy-valence framework. *Strategic Management Journal* 15, no. 2: 85-102.

Chen, M-J., K. G. Smith, and C. M. Grimm. 1992. Action characteristics as predictors of competitive responses. *Management Science* 38, no. 3: 439-55.

Chung, S., H. Singh, and K. Lee. 2000. Complementarity, status similarity and social capital as drivers of alliance formation. *Strategic Management Journal* 21, no. 1: 1-22.

Contractor, F. J., and P. Lorange. 1988. *Cooperative Strategies in International Business*. Lexington, MA: Lexington Books.

———. 2002. *Cooperative strategies and alliances*. Oxford: Pergamon.

Cook, R. D., and S. Weisberg. 1983. Diagnosis for heteroscedasticity in regression. *Biometrika* 70: 1-10.

Crutchley, C., E. Guo, and R. Hansen. 1991. Stockholder benefits from Japanese-US joint ventures. *Financial Management* 20, no. 4: 22-30.

Das, S., P. K. Sen, and S. Sengupta. 1998. Impact of strategic alliances on firm valuation. *Academy of Management Journal* 41, no. 1: 27-41.

Das, T. K., and B. S. Teng. 2000. A resource-based theory of strategic alliances. *Journal of Management* 26, no. 1: 31-61.

Deeds, D. L., and C. W. L. Hill. 1996. Strategic alliances and the rate of new product development: An empirical study of entrepreneurial biotechnology firms. *Journal of Business Venturing* 11, no. 1: 41-55.

Dierickx, I., and K. Cool. 1989. Asset Stock Accumulation and Sustainability of Competitive Advantage. *Management Science* 35: 1504-11.

Dodd, P., and J. Warner. 1983. On corporate governance. *Journal of Financial Economics* 11: 401-38.

Doganis, R. 2001. *The airline business in the twenty-first century*. London: Routledge.

Doz, Y., and G. Hamel. 1998. *Alliance advantage: The art of creating value through partnering*. Boston, MA: Harvard Business School Press.

Draulans, J., A-P. deMan, and H. W. Volberda. 2003. Building alliance capability: Management techniques for superior alliance performance. *Long Range Planning* 36, no. 2: 151-66.

Dussauge, P., B. Garrette, and W. Mitchell. 2000. Learning from competing partners: Outcomes and durations of scale and link alliances in Europe, North America, and Asia. *Strategic Management Journal* 21, no. 2: 99-126.

Dyer, J. H., and N. W. Hatch. 2006. Relation-specific capabilities and barriers to knowledge transfers: Creating advantage through network relationships. *Strategic Management Journal* 27, no. 8: 701-20.

Dyer, J. H., and H. Singh. 1998. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review* 23, no. 4: 660-679.

Eisenhardt, K., and J. A. Martin. 2000. Dynamic capabilities: What are they? *Strategic Management Journal* 21, no. 10-11: 1105-21.

Eisenhardt, K., and C. B. Schoonhoven. 1996. Resource-based view of strategic alliance formation: Strategic and social effects in entrepreneurial firms. *Organization Science* 7, no. 2: 136-50.

Galunic, D. C., and S. Rodan. 1998. Resource recombinations in the firm: Knowledge structures and the potential for Schumpeterian innovation. *Strategic Management Journal* 19, no. 12: 1193-201.

Garcia-Pont, C., and N. Nohria. 2002. Local versus global mimetism: The dynamics of alliance formation in the automobile industry. *Strategic Management Journal* 23: 307-21.

George, G., S. A. Zahra, K. K. Wheatley, and R. Khan. 2001. The effects of alliance portfolio characteristics and absorptive capacity on performance: A study of biotechnology firms. *Journal of High Technology Management Research* 12: 205-26.

Geringer, J. M., and L. Hebert. 1991. Measuring performance of international joint ventures. *Journal of International Business Studies* 22, no. 2: 249-63.

Gimeno, J. 2004. Competition within and between networks: The contingent effect of competitive embeddedness on alliance formation. *Academy of Management Journal* 47, no. 6: 820-842.

Gimeno, J., and C. Y. Woo. 1996. Hypercompetition in a multimarket environment: The role of strategic similarity and multimarket contact in competitive deescalation. *Organization Science* 7: 322-41.

———. 1999. Multimarket contact, economics of scope, and firm performance. *Academy of Management Journal* 433, no. 3: 239-59.

Gomes-Casseres, B. 1994. Group versus group: How alliance networks compete. *Harvard Business Review* July-August: 62-74.

———. 1996. *The alliance revolution: The new shape of business rivalry*. Cambridge, MA: Harvard University Press.

Graham, D. R., D. P. Kaplan, and D. S. Sibley. 1983. Efficiency and competition in the airline industry. *The Bell Journal of Economics* 14: 118-38.

Granovetter, M. 1985. Economic action and social structure: The problem of embeddedness. *American Journal of Sociology* 91: 481-510.

Grant, R. M. 1991. The resource-based theory of competitive advantage. *California Management Review* 33, no. 3: 114-35.

———. 1996. Prospering in dynamically-competitive environments: Organizational capability as knowledge integration. *Organization Science* 7: 375-87.

Greene, W. H. 2000. *Econometric analysis*. Upper Saddle Rivefr, NJ: Prentice Hall.

Gulati, R. 1995a. Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Academy of Management Journal* 38: 85-112.

———. 1995b. Social structure and alliance formation pattern: A longitudinal analysis. *Administrative Science Quarterly* 40: 619-52.

———. 1998. Alliances and networks. *Strategic Management Journal* 19, no. 4: 293-318.

Gulati, R. 1999. Network location and learning: The influence of network resources and firm capabilities on alliance formation. *Strategic Management Journal* 20, no. 5: 397-410.

Gulati, R., N. Nohria, and A. Zaheer. 2000. Strategic networks. *Strategic Management Journal* 21: 203-15.

Hagedoorn, J., and J. Schakenraad. 1994. The effect of strategic technology alliances on company performance. *Strategic Management Journal* 15: 291-309.

Hair, J. F., R. E. Anderson, R. L. Tatham, and W. C. Black. 1998. *Multivariate Data Analysis*. Upper Saddle River, NJ: Prentice Hall.

Hamel, G. 1991. Competition for competence and inter-partner learning within international strategic alliances. *Strategic Management Journal* 12, no. Special Issue: 83-103.

Harbison, J. R., and P. Pekar. 1997. *Smart alliances: A practical guide to repeatable success*. San Francisco: Booz, Allen & Hamilton.

Hoang, H., and F. T. Rothaermel. 2005. The effect of general and partner-specific alliance experience on joint R&D project performance. *Academy of Management Journal* .

Hoffmann, W. H. 2001. *Management von Allianzportfolios: Strategien für ein erfolgreiches Unternehmensnetzwerk*. Stuttgart: Schäffer-Poeschel.

———. 2006. Strategies for managing a portfolio of alliances. *Strategic Management Journal* forthcoming.

Hofman, D. A. 1997. An overview of the logic and rationale of hierarchical linear models. *Journal of Management* 23: 723-44.

Hollander, M., and D. A. Wolfe. 1999. *Nonparametric statistical methods*. New York: John Wiley & Sons.

Holloway, S. 1998. *Changing places: A strategic management perspective on an industry in transition*. Sydney: Ashgate.

Iatrou, K., and F. Alamdari. 2005. The empirical analysis of the impact of alliances on airline operations. *Journal of Air Transport Management* 11: 127-34.

ICAO. 1997. *Circular 296-AT/110*.

Inkpen, A. C. 2002. Learning, knowledge management and strategic alliances: So many studies, so many unanswered questions. in *Cooperative strategies and alliances.* eds. F. J. Contractor, and P. LorangeOxford: Pergamon.

Kale, P., J. H. Dyer, and H. Singh. 2001. Value creation and success in strategic alliances: Alliancing skills and the role of alliance structure and systems. *European Management Journal* 19, no. 5: 463-71.

Kale, P., J. H. Dyer, and H. Singh. 2002. Alliance capability, stock market response, and long-term alliance success: The role of the alliance function. *Strategic Management Journal* 23, no. 3: 317-43.

Karim, S., and W. Mitchell. 2000. Path-dependent and path-breaking change: Reconfiguring business resources following acquisitions in the U.S. medical sector, 1978-1995. *Strategic Management Journal* 21, no. 10: 1061-81.

Khanna, T. 1998. The scope of alliances. *Organization Science* 9, no. 3: 340-355.

Klein, K. J., F. Danserau, and R. J. Hall. 1994. Levels issues in theory development, data collection, and analysis. *Academy of Management Review* 19: 195-229.

Kleinbaum, D. G., L. L. Kupper, K. E. Muller, and A. Nizam. 1998. *Applied regression analysis and multivariable methods*. Pacific Grove, CA: Duxbury Press.

Kogut, B. 1988. Joint ventures: Theoretical and empirical perspectives. *Strategic Management Journal* 9: 319-32.

———. 1989. The stability of joint ventures: Reciprocity and competitive rivalry. *Journal of Industrial Economics* 38, no. 183-198.

Kogut, B., and U. Zander. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science* 3, no. 3: 383-97.

Koh, J., and N. Venkatraman. 1991. Joint venture formations and stock market reactions: An assessment in the information technology sector. *Academy of Management Journal* 34, no. 4: 869-92.

Kotabe, M., and K. S. Swan. 1995. The role of strategic alliances in high-technology new product development. *Strategic Management Journal* 16: 621-36.

Koza, M. P., and A. Y. Lewin. 1999. The co-evolution of network alliances: A longitudinal analysis of an international professional services network. *Organization Science* 10, no. 5: 638-53.

Kozlowski, S. W. J., and K. J. Klein. 2000. A multilevel approach to theory and research in organizations. in *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions.* eds. S. W. J. Kozlowski, and K. J. Klein, 3-90. Jossey-Bass: San Francisco.

Lavie, D. 2004. "The interconnected firm: Evolution, strategy, and performance." Unpublished Doctoral Dissertation, The University of Pennsylvania.

———. 2006. The competitive advantage of interconnected firms: An extension of the resource-based view of the firm. *Academy of Management Review* 31, no. 3: 638-58.

Lazzarini, S. G. 2006. The impact of membership in competing alliance constellations: Evidence on the operational performance of global airlines. *Strategic Management Journal* forthcoming.

Levinthal, D. A., and J. G. March. 1993. The myopia of learning. *Strategic Management Journal* 14, no. Winter special issue: 95-112.

Lorenzoni, G., and C. Baden-Fuller. 1995. Creating a strategic center to manage a web of partners. *California Management Review* 37, no. 3: 146-63.

Lorenzoni, G., and A. Lipparini. 1999. The leveraging of interfirm relationships as a distinctive organizational capability: A longitudinal study. *Strategic Management Journal* 20: 317-38.

Lubatkin, M., and R. Shrieves. 1986. Towards reconciliation of market performance measures to strategic management research. *Academy of Management Review* 11, no. 3: 497-512.

Madhavan, R., and J. E. Prescott. 1995. Market value impact of joint ventures: The effect of industry information-processing load. *Academy of Management Journal* 38: 900-915.

Madhok, A., and S. B. Tallman. 1998. Resources, transactions, and rents: Managing value through interfirm collaborative relationships. *Organization Science* 9, no. 3: 1-14.

McConnell, J., and T. Nantell. 1985. Corporate combinations and common stock returns: The case of joint ventures. *Journal of Finance* 60, no. 2: 519-36.

McWilliams, A., and D. Siegel. 1997. Event studies in management research: Theoretical and empirical issues. *Academy of Management Journal* 40, no. 3: 626-57.

Merchant, H., and D. Schendel. 2000. How do international joint ventures create shareholder value? *Strategic Management Journal* 21, no. 7: 723-37.

Milgrom, P., and J. Roberts. 1990. The economics of modern manufacturing: Technology, strategy, and organization. *American Economic Review* 80, no. June: 511-28.

Miller, D., and J. Shamsie. 1996. The resource-based view of the firm in two environments: The Hollywood film studios from 1936-1965. *Academy of Management Journal* 39, no. 3: 519-43.

Mitchell, W., and K. Singh. 1992. Incumbents' use of pre-entry alliances before expansion into new technical subfields of an industry. *Journal of Economic Behavior and Organization* 18: 347-72.

Mowery, D. C., J. E. Oxley, and B. S. Silverman. 1996. Strategic alliances and interfirm knowledge transfer. *Strategic Management Journal* 17, no. Winter Special Issue: 77-91.

———. 2002. The two faces of partner-specific absorptive capacity: Learning and cospecialization in strategic alliances. in *Cooperative strategies and alliances.* eds. F. J. Contractor, and P. Lorange, 291-319. Oxford: Pergamon.

Nielsen, L. E., and V. Mahnke. 2004. Managing R&D alliance portfolios: The case of mobile service providers. Working Paper Copenhagen Business School.

Oum, T. H., J. H. Park, and A. Zhang. 1996. The effects of airline codesharing agreements on firm conduct and international air fares. *Journal of Transport Economics and Policy* 30: 187-202.

———. 2000. *Globalization and strategic alliances: The case of the airline industry*. Oxford: Pergamon Press.

Oum, T. H., and A. Zhang. 2001. Global strategic alliances and the impacts on the Canadian airline industry. *Journal of Air Transport Management* 7: 287-301.

Parise, S., and A. Casher. 2003. Alliance portfolios: Designing and managing your network of business-partner relationships. *Academy of Management Executive* 17, no. 4: 25-39.

Park, J. H., N. K. Park, and A. Zhang. 2003. The impact of international alliances on firm value. *Transportation Research, E (Logistics)* 39: 1-198.

Park, J. H., and A. Zhang. 2000. An empirical analysis of global airline alliances: Cases in North Atlantic Markets. *Review of Industrial Organization* 16, no. 4: 367-83.

Park, J. H., A. Zhang, and Y. Zhang. 2001. Analytical models of international alliances in the airline industry. *Transportation Research, B (Methodological)* 35: 865-86.

Park, N. K. 2004. A guide to using event study methods in multi-country settings. *Strategic Management Journal* 25, no. 7: 655-68.

Park, N. K., and X. Martin. 2001. When do alliances create value? Testing alliance and resource effects on firm value. Working Paper University of Miami.

Park, S. H., and D. Kim. 1997. Market valuation of joint ventures: Joint venture characteristics and wealth gains. *Journal of Business Venturing* 12: 83-108.

Park, S. H., and M. V. Russo. 1996. When competition eclipses cooperation: An event history analysis of joint venture failure. *Management Science* 42: 875-90.

Park, S. H., and Zhou D. 2005. Firm heterogeneity and competitive dynamics in alliance formation. *Academy of Management Review* 30, no. 3: 531-54.

Parkhe, A. 1993. Strategic alliance structuring: A game theoretic and transaction cost examination of interfirm cooperation. *Academy of Management Journal* 36: 794-829.

Patell, J. M. 1976. Corporate forecasts of earnings per share and stock price behavior: Empirical tests. *Journal of Accounting Research* 14, no. 2: 246-76.

Penrose, E. T. 1959. *The theory of the growth of the firm*. London: Basil Blackwell.

Peteraf, M. A. 1993. The cornerstones of competitive advantage: A resource based view. *Strategic Management Journal* 14: 179-91.

Powell, W. W., K. W. Koput, and L. Smith-Doerr. 1996. Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly* 41: 116-45.

Reuer, J. J., K. M. Park, and M. Zollo. 2002. Experimental learning in international joint ventures: The role of experience heterogeneity and venture novely. in *Cooperative strategies and alliances.* eds. F. J. Contractor, and P. Lorange, 321-44. Oxford: Pergamon.

Reuer, J. J., and R. Ragozzino. 2006. Agency hazards and alliance portfolios. *Strategic Management Journal* 27, no. 1: 27-44.

Rogers, W. H. 1993. Regression standard errors in clustered samples. *Stata Technical Bulletin* 13: 19-23.

Rothaermel, F. T. 2001. Incumbent's advantage through exploiting complementary assets via interfirm cooperation. *Strategic Management Journal* 22: 687-99.

Rothaermel, F. T., and D. L. Deeds. 2005. Alliance type, alliance experience, and alliance management capability in high-technology ventures. *Journal of Business Venturing*.

Rowley, T., D. Behrens, and D. Krackhardt. 2000. Redundant governance structures: An analysis of relational embeddedness in the steel and semiconductor industries. *Strategic Management Journal* 21, no. Special issue: 369-86.

Rumelt, R. P. 1984. Towards a strategic theory of the firm. in *Competitive strategic management.* Lamb, R., 556-70. Englewood Cliffs, NJ: Prentice Hall.

Schefczyk, M. 1993. Operational performance of airlines: An extension of traditional measurement paradigms. *Strategic Management Journal* 14, no. 4: 301-17.

Schumpeter, J. A. 1934. *The theory of economic development*. Cambridge, MA: Harvard University Press.

Shan, W., G. Walker, and B. Kogut. 1994. Interfirm cooperation and startup innovation in the biotechnology industry. *Strategic Management Journal* 15: 387-94.

Silverman, B. S., and J. A. C. Baum. 2002. Alliance-based competitive dynamics. *Academy of Management Journal* 45, no. 4: 791-806.

Simonin, B. L. 1993. Do organizations learn? An empirical test of organizational learning in international strategic alliances. *Academy of Management Journal* : 222-26.

———. 1997. The importance of collaborative know-how: An empirical test of the learning organization. *Academy of Management Journal* 40, no. 5: 1150-1174.

Smith, K. G., C. M. Grimm, M. J. Gannon, and M-J. Chen. 1991. Organizational information processing, competitive responses, and performance in the U.S. domestic airline industry. *Academy of Management Journal* 34, no. 1: 60-85.

Stuart, T. E. 2000. Interorganizational alliances and the performance of firms: A study of growth and innovation rates in a high-technology industry. *Strategic Management Journal* 21: 791-911.

Teece, D. J. 1986. Profiting from technological innovation: Implications for integration, collaboration, licensing, and public policy. *Research Policy* 15: 285-305.

Teece, D. J., G. P. Pisano, and A. Shuen. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* 18, no. 7: 509-33.

Wernerfelt, B. 1984. A resource based view of the firm. *Strategic Management Journal* 5: 171-80.

White, H. 1980. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica* 48: 817-30.

Zhang, A., and Y. Zhang. 2006. Rivalry between strategic alliances. *International Journal of Industrial Organization* 24, no. 2: 287-301.