Harmancioglu, N., Griffith, D. A., & Yılmaz, T. (2019). Short- and long-term market returns of international codevelopment alliances of new products. *Journal of the Academy of Marketing Science*. doi:10.1007/s11747-018-00622-w

SHORT- AND LONG-TERM MARKET RETURNS OF INTERNATIONAL NEW PRODUCT CODEVELOPMENT ALLIANCES

Abstract

Strategic alliances entail process-oriented decisions, in which information about outcomes is unveiled over time. Therefore, it is difficult for investors to gauge the value of such decisions in the short term; longitudinal analysis is necessary. Accordingly, the authors apply latent growth modeling to a data set of 270 international codevelopment alliances announced over an 18-year period. The results demonstrate that investors reward firms for their international codevelopment alliances in the short term but punish them in the long term. Initially, exchange conditions have positive effects, but these effects decrease over time. However, the decrease slows when firms' market updates contain positive news. Although investors view sharing of innovation resources as a competitive advantage in the short term, they perceive exchange conditions as transaction hazards in the long term. The results also show that long-term decreases in market returns are greater when codevelopment activities are conducted offshore rather than onshore.

Keywords: International codevelopment alliance, new products, event study analysis, latent growth analysis

Introduction

Increasingly, firms are engaging in international codevelopment alliances and collaborating with international partners to bring together two or more organizations that have their own nationalities, resources, and capabilities (Wu et al. 2015). International new product codevelopment alliances—non–equity-based collaborative relationships between two or more firms from at least two countries established to develop new products (Fang, Lee, and Yang 2015)[1]—are a common form of interfirm arrangement. For example, U.S.-based General Motors (GM) announced a codevelopment alliance with Japan-based Honda to create new technology for plug-in hybrid vehicles. The alliance combined GM's electric propulsion technology with Honda's know-how in the green car sector.

The growth of such alliances has resulted in substantial academic research (see Table 1), but findings about related stock market performance are mixed. Some scholars report positive returns (Raassens, Wuyts, and Geyskens 2012), others show negative results (Mani and Luo 2015), and some find no impact at all (Fang et al. 2015; Swaminathan and Moorman 2009). This lack of consistent findings is an important limitation, because managers are under increasing pressure to demonstrate the stock market performance implications of their strategic marketing decisions (Hanssens, Rust and Srivastava 2009). In a recent survey of over 1300 CEOs from the world's leading companies, more than half of the executives cited "collaborative growth" as the key vehicle to drive shareholder value (KPMG 2016). Despite their importance, more than half of strategic alliances are reported to fail in reaching their financial goals (KPMG 2017; Whitler 2014). Hence, weighing the benefits versus the costs and understanding the

[1] Our conceptualization of international codevelopment alliances is similar to international marketing alliances defined by Bello, Katsikeas and Robson (2010), because both entail cooperative arrangements in which autonomous firms based in different countries pool resources for the joint accomplishment of individual corporate goals. However, compared with these authors' focus on equity and non-equity joint ventures, our study is specific to non-equity codevelopment alliances in which the parties implement activities together. We examine alliances that have the highest levels of not only adaptation opportunities but also opportunistic misappropriation risks.

wealth effects of international codevelopment relationships can be vital to the firms' future competitive strengths, indeed their very survival.

*** *Place Table 1 about here* ***

Table 1 indicates that researchers have focused primarily on short-term event studies. Their studies are based on the efficient market hypothesis that short-term stock returns reflect the true value of future firm performance (Chen, Ganesan and Liu 2009). However, some scholars have questioned the broad application of this hypothesis to decision contexts, arguing that it may lead to inconsistent findings; they have called for the examination of long-term stock returns (Friedman 1980; Sorescu, Shankar and Kushwaha 2007). The rationale for moving from a short- to a long-term horizon is based on the rational learning (or structural uncertainty) literature (Brav and Heaton 2002), which argues that the effects of decisions cannot be incorporated by the stock market in the short term; rather, they depend on the period after an announcement when information pertaining to the rationale underlying the decision is made public (Kurz 1994; Lewellen and Shanken 2002). This call for the study of long-term returns is most notable with regard to strategic decisions, such as alliance announcements, in which impacts become evident over time.

We contend that this lack of clarity in research findings derives from a scarcity of studies that examine both short- and long-term market returns from firms' alliance decisions. Therefore, we seek to make three important contributions. First, we extend prior literature by arguing that international codevelopment alliances are strategic decisions that entail business processes over time; we examine longitudinal market value outcomes to provide a differentiated picture of the short- and long-term of international codevelopment alliances. In contrast with a dominant "snapshot view" of relationships (Palmatier et al. 2013), we address an important but neglected area by using latent growth curve modeling, to better understand

the developmental, path-dependent nature of marketing relationships (Dwyer, Schurr and Oh 1987; Jap and Anderson 2007).

Second, whereas the literature has traditionally examined governance–exchange alignment (e.g., Geyskens, Steenkamp and Kumar 2006; Mooi and Ghosh 2010), we hold the governance form constant under varying exchange conditions to determine whether investors reward (or punish) firms for their codevelopment alliance decisions over time (cf. Nordberg, Campbell and Verbeke 1996; Carson and John 2013). We draw on transaction cost economics (TCE) to understand whether this governance form (i.e., international codevelopment alliances, a hybrid governance form that lies between market and hierarchical governance) is best suited for particular new product codevelopment alliances. We extend TCE literature by demonstrating significant and differing effects in terms of short- and long-term market returns. International codevelopment alliances constitute an avenue for resource sharing and interfirm learning on a global scale, so investors may regard them as strategic signals of superior market adaptation, characterized by increases in product variety, market resources, and global leverage (Mani and Luo 2015; Rubera and Kirca 2012). However, like other knowledge-based relationships, these arrangements can lead to *partner lock-in*, that is, difficulty in switching or replacing products or partners (Dutta, Narasimhan and Rajiv 1995; Mooi and Ghosh 2010). Over time, as firms refrain from engaging in new innovations, and their partners opportunistically misappropriate their existing know-how, firms may lose their innovation capabilities. They may experience *knowledge leakage*, that is, the involuntary spillover of technological knowledge across firms during day-to-day collaborative activities (Frazier et al. 2009). This threat is inherent in all types of innovation collaborations. In the context of codevelopment alliances, partners may share proprietary knowledge with competing firms or expropriate it to develop innovations internally (Stremersch et al. 2003).

Third, we extend interorganizational literature by examining how the location of codevelopment activities influences firm value. Investors may perceive that the value-claiming risks that arise from partner lock-in are greater in foreign markets than in domestic markets. Foreign-market operations create operational difficulties and outcome uncertainty because of spatial separation and a lack of understanding of formal and informal institutions (Boeh and Beamish 2012; Zaheer 1995). Such value-claiming risks may be more intense when collaboration occurs on a global scale, because there are international differences in the protection of intellectual property (IP). For example, when Motorola allied with Taiwan's BenQ Corp. to develop mobile phones, it experienced a major downside of offshore relationships; BenQ became its direct competitor by selling phones in China under its own brand. Companies reportedly “worry about the message they send to their investors” when they source innovation activities from offshore locations (Engardio and Einhorn 2005). For example, Apple’s product labels indicate that its products are designed in California but assembled in China. Our analysis of the moderating effects of location of alliances suggests that when codevelopment takes place offshore, the negative effects of exchange conditions on market returns escalate over time.

By examining the short- and long-term market returns associated with international codevelopment alliance announcements, we answer four questions: (1) Under what conditions do investors reward (or punish) firms for engaging in international codevelopment alliances? (2) Do investors react differently over time? (3) Do market updates drive firms’ long-term value? (4) How do offshore codevelopment activities influence the extent of value claimed and created? We use a latent growth modeling approach (Bollen and Curren 2006; Haumann et al. 2014) and a dataset of 270 international codevelopment alliances of new products announced between April 1993 and December 2008. In line with our research objectives, we first review the literature on market return effects in relation to strategic decisions, with an

emphasis on studies that argue for the need to differentiate short- and long terms. We then provide our conceptualization of international codevelopment alliances by drawing on research related to the market value outcomes of interorganizational relationships.

Literature review

Understanding the differences between short- and long-term market return effects

Company announcements are "signals" to investors; they influence investors' evaluations of firms' strategic and operational progress and their expectations of future performance (e.g., future cash flows) (Sorescu et al. 2007). Event studies have examined how marketing decisions influence short-term market returns (e.g., Raassens et al. 2012; Swaminathan and Moorman 2009). These studies are based on the premises of market efficiency, perfect information, and investor rationality; they assume that current stock prices incorporate the discounted value of all future cash flows and reflect all relevant information (Srinivasan and Hanssens 2009). For these conditions to be satisfied, investors must immediately and efficiently understand the information conveyed by announcements and be able to determine their strategic and financial consequences (i.e., structural knowledge assumption) (Brav and Heaton 2002).

Although many researchers have employed the structural knowledge assumption, it has been questioned, following two important empirical findings: (1) investors exhibit differences in their reactions when exposed to the same information (Kurz 1994), and (2) systematic patterns in long-term stock returns of firms following announcements above the expected return, as measured by asset pricing models, imply deviations from market efficiency (financial anomalies; Francis et al. 2007). These findings have given rise to rational learning theory and cast doubt on the validity of the analysis of short-term returns (Lyon, Barber and Tsai 1999), particularly for strategic decisions. According to financial economics literature, even though investors do not have complete knowledge of the fundamental structure of the

economy, they are rational information processors (Friedman 1980). As more information becomes available, they revise their prior beliefs through a Bayesian updating scheme (Lewellen and Shanken 2002). This updating process involves their observations of events over time as the events affect firms' future cash flows. Therefore, through rational learning, long-term returns accrue to firms when (1) new information becomes available in the market and (2) investors improve their understanding of the structural relations of the economy.

Strategic decisions (particularly those entailing business relationships) are process-oriented; information relevant to outcomes is unveiled over time. Thus, it is difficult for investors to understand performance implications in the short term (Palmatier et al. 2013). We contend that strategic decisions (e.g., engaging in international codevelopment alliances) are appropriately modeled over long-term horizons, in which the informational content of market updates is reflected in firms' stock prices (Sorescu et al. 2007).

A conceptual model of international codevelopment alliances

Alliances allow firms to pool resources and adapt more effectively to the requirements of their competitive environments (Dyer and Singh 1998). Value creation (i.e., rent-generating capacity of resources) and value claiming (i.e., firms' abilities to appropriate these rents) are two major but contradictory motives for firms' decisions to codevelop new products with offshore alliance partners (Gooner, Morgan and Perreault 2011). Alliances are unique governance forms, in which cooperative behaviors maximize joint returns from resource sharing (i.e., value creation) but competitive actions maximize individual firms' share of returns (i.e., value claiming) (Das and Teng 2000).

Furthermore, international codevelopment alliances involve tension between adaptation and safeguarding processes (Liu, Pu and Schramm 2016); they entail higher adaptation capabilities but weaker safeguards against transaction hazards (Buvik and John 2000). We believe that the discrepancy between short- and long-term returns stems from this

tension. Codevelopment alliances facilitate learning when partners exchange know-how; they help firms move quickly into new markets and technologies (Kale, Singh and Perlmutter 2000; Rubera and Kirca 2012) and allow better adaptation. However, efforts to improve adaptation through interorganizational arrangements paradoxically result in transaction hazards (Heide and John 1988), thereby creating the need for safeguarding. The differing resource profiles of partners, along with pursuit of their own interests, creates tension in how, and by whom, value created is claimed. Codevelopment alliances lead to situations in which firms obtain the resources and capabilities to develop new products, but partner lock-in may lead to misappropriation of firms' know-how, or lull managers into failing to develop new capabilities (Frazier et al. 2009). For example, in the case of GM sharing its proprietary electric-propulsion technology with Honda, GM is at risk of Honda acting opportunistically using GM's know-how to compete, and Honda is at risk of GM leaking Honda's know-how to competitors.

Without properly aligned governance mechanisms, firms are unable to claim the rents generated by newly developed products (Carson and John 2013; Wang et al. 2008). A key implication of TCE's normative rule is that governance structures that deviate from proper attribute–governance alignment adversely influence performance (Mooi and Ghosh 2010). Thus, we argue that investors may either reward or punish firms that engage in international codevelopment alliances, depending on the appropriateness of governance structures to exchange conditions. Following rational learning or structural uncertainty literature, we argue that the new information that firms disseminate to the market influences investor perceptions of the threats posed by alliances. Over time, stock prices of partner firms reflect this newly obtained knowledge. To observe how international codevelopment alliances can create value, and whether this value persists over time, we study investor reactions to exchange conditions that not only provide access to external resources but also create partner lock-in. These

conditions include an alliance's *proprietary technology* (i.e., licensed and patented technologies and innovations, either owned by the firm or developed by partner firms; Jap and Ganesan 2000), *alliance scope* (i.e., number of functional areas in, and number of new products for which, partners cooperate; Kalaignanam, Shankar and Varadarajan 2007; Li et al. 2012), *alliance concentration* (i.e., total number of alliance partners maintained by the firm; Lin, Yang and Demirkan 2007), *(a)symmetry of capabilities* (Oxley and Sampson 2004; Wu et al. 2015), and whether the firm has *prior experience with its partner* (Gulati, Lavie and Singh 2009) (see Figure 1).

*** *Place Figure 1 about here* ***

Hypotheses development

Short- and long-term effects of exchange conditions

From a governance alignment perspective, investors may reward firms' decisions to codevelop products if the firms' relationships entail the previously mentioned five conditions, which potentially increase adaptability and provide opportunities to create value. The first is proprietary technologies, that is, resources generated in interfirm relationships that have the potential to create investor value (Rokkan, Heide and Wathne 2003). The second is alliance scope: broader scope alliances involve multiple functional activities to be jointly conducted (e.g., idea generation, R&D, manufacturing and/or marketing of the products) and multiple new products to be codeveloped. Given that alliances involving proprietary technologies and a broader scope signal greater partner commitment (Kalaignanam et al. 2007), investors' reactions may be favorable in the short term. The third condition is high alliance concentration, that is, having fewer partners but more intense and frequent interactions among engineers and managers; investors may perceive that firms with highly concentrated alliances have the necessary skills to manage their specific partners and expropriate their know-how (Dyer and Singh 1998). The fourth condition is capabilities asymmetry, in which investors

may view innovation skills as favoring alliance partners (c.f., Wu et al. 2015), because value generation depends on developing new products that rely on "so many different critical technologies that most companies can no longer maintain cutting-edge sophistication in all of them" (Ohmae 1989, p. 145). Finally, prior experience with partners facilitates learning and signals the existence of shared rules and responsibilities (Gulati et al. 2009; Zaheer et al. 2010), such that in the short term, investors may favorably evaluate international codevelopment alliances with partners with which firms have prior experience.

However, in the long term, these effects can differ. The development of proprietary technologies and collaboration in a broader scope (i.e., number of functional areas and for multiple products) may lock partners into codevelopment relationships, giving rise to opportunism and the need for safeguarding and making firms reluctant to relinquish control of technologies (Weiss and Heide 1993). At the same time, proprietary knowledge obtained by a few partners may be more valuable than the amount each of the multiple partners might have obtained (Ho and Ganesan 2013), thereby increasing the extent and likelihood of know-how leakage over time. Therefore, the more frequent and close firms' interactions with their alliances, the more permeable their organizational boundaries (Kale et al. 2000). Furthermore, if firms cannot match their partners' superior innovation capabilities (i.e., capability asymmetry), the partners can seem irreplaceable (Weiss and Heide 1993), locking firms in to specific codevelopment relationships. Similarly, many alliance benefits attained through experience over time are inherently partner-specific in that they cannot be applied to other alliances. As partner-specific benefits accumulate over the long term, partner lock-in escalates; investors may react less favorably over time to alliances characterized by proprietary technologies, broader scope, higher concentration, and alliance partners that have asymmetrically superior capabilities and prior experience. Thus:

H1: Short-term abnormal returns to international codevelopment alliance announcements are higher for alliances that have:

(a) more proprietary technologies than fewer proprietary technologies;
(b) broader alliance scope than narrower alliance scope;
(c) higher alliance concentration than lower alliance concentration;
(d) greater capabilities asymmetry than lesser capabilities asymmetry; and
(e) prior partner experience rather than no prior partner experience.

H2: Abnormal returns to international codevelopment alliance announcements decrease over time for alliances that have:
(a) more proprietary technologies than fewer proprietary technologies;
(b) broader alliance scope than narrower alliance scope;
(c) higher alliance concentration than lower alliance concentration;
(d) greater capabilities asymmetry than lesser capabilities asymmetry; and
(e) prior partner experience rather than prior partner experience.

Moderating effects of location of codevelopment activity

International codevelopment alliance partners may perform new product development tasks onshore (i.e., within the boundaries of the country in which a firm operates) or offshore. Given the risks associated with offshore partners, we contend that these theorized relationships weaken short-term returns and strengthen long-term decreases in returns. Our underlying logic is that risks become more pronounced in relationships in which activities are conducted offshore; they result from operating in unfamiliar environments and receiving differential treatment from foreign countries (Zaheer 1995). In foreign markets, firms may face greater difficulty in implementing safeguards against transaction hazards because of cultural, political, and legal distance between partners (Chakravarty et al. 2014). Lack of understanding of local cultures and institutions contributes to greater psychological distance (Zaheer, Hernandez and Banerjee 2010), which can create difficulties in assessing the capabilities of international partners and escalate appropriation hazards (Oxley 1997). For example, differences between GM and Toyota in cultures and routines prevented GM managers from transferring and implementing Toyota's lean manufacturing system (Inkpen 2005). The implementation of codevelopment activities offshore may entail higher coordination, monitoring and adaptation costs, which may impede resource integration (Boeh and Beamish 2012). Hence, we expect the location of codevelopment activity (i.e., offshore

versus onshore) to negatively moderate the link between abnormal returns to international codevelopment alliance announcements and exchange conditions. We hypothesize:

H3: When codevelopment activities are conducted offshore (rather than onshore), short-term abnormal returns are lower for alliances that have:
(a) more proprietary technologies than fewer proprietary technologies;
(b) broader alliance scope than narrower alliance scope;
(c) higher alliance concentration than lower alliance concentration;
(d) greater capabilities asymmetry than lesser capabilities asymmetry; and
(e) prior partner experience rather than no prior partner experience.

H4: When codevelopment activities are conducted offshore (rather than onshore), the long-term decrease in abnormal returns is greater for alliances that have:
(a) more proprietary technologies than fewer proprietary technologies;
(b) broader alliance scope than narrower alliance scope;
(c) higher alliance concentration than lower alliance concentration;
(d) greater capabilities asymmetry than lesser capabilities asymmetry; and
(e) prior partner experience rather than no prior partner experience.

Moderating effects of market updates

Positive market updates about codeveloped products and/or codevelopment relationships signal that firms have both expanded their innovation know-how and managed their alliances via norms (Carson and John 2013). Positive market updates signal that partners have learned to coordinate the exchange of complementary knowledge and asymmetrical capabilities (Anand and Khanna 2000; Cui and O'Connor 2012); they indicate shared rules and responsibilities and constrained opportunism (Jap and Anderson 2007). Thus, they reflect relationship management skills learned over time. By indicating partners' abilities to reduce uncertainty and enhance the predictability of outcomes, positive updates reduce investors' concerns about transaction hazards, thereby stimulating favorable market reactions. Thus:

H5: When partner firms provide positive market updates, the long-term decrease in the abnormal returns is lower for alliances that have:
(a) more proprietary technologies than fewer proprietary technologies;
(b) broader alliance scope than narrower alliance scope;
(c) higher alliance concentration than lower alliance concentration;
(d) greater capabilities asymmetry than lesser capabilities asymmetry; and
(e) prior partner experience rather than no prior partner experience.

Method

Sample data

International new product codevelopment alliances are non–equity-based collaborative relationships between two or more firms from at least two countries to develop new products or services (see Appendix A for examples). In this study, we examined announcements of non-equity R&D alliance agreements of U.S. and non-U.S. companies from the SDC Platinum Database. We focused on the period from 1993 to 2008 for two reasons: (1) the SDC database does not incorporate all deals prior to 1993 because of inadequate corporate reporting requirements (Kalaignanam et al. 2007), and (2) we aimed to avoid the strategic implications of the recession triggered by the 2009 financial crisis. Our initial search yielded 4,796 announcements. We excluded R&D alliances that (1) did not involve one firm with a public U.S. parent company (n = 2217) and (2) did not involve at least one foreign partner (n = 1690). To ensure that our sample unequivocally reflected international codevelopment alliances for new products, we reviewed each announcement and focused on R&D announcements that involved the development and/or commercialization of innovations (e.g., products with new marketing benefits, improved technology). We excluded 264 announcements that did not fit our definition. We screened our sample using keywords such as “joint,” “co-develop,” “collaborate,” “cooperate,” “share,” “combine expertise,” “integrated plan,” “equal shared costs,” and “work together.” Two phrases frequently used in announcements were: “signed a letter of intent” and “a strategic investment opportunity both for the partners to leverage.” We excluded announcements that contained the former phrase (because the partners identified in these announcements did not eventually engage in codevelopment activities) but retained those that contained the latter.

Two researchers screened the announcements and coded the independent variables. Inter-rater reliability was 96%. To test our model more precisely, we did not include alliances with multiple partners (n = 100) (cf. Kalaignanam et al. 2007). Following McWilliams and

Siegel's (1997) guidelines for controlling for confounding events, we eliminated agreements if any partner disclosed significant announcements surrounding the five-day event window from two days prior to two days after the announcements (n = 36). The resulting sample satisfied the "unanticipated events" assumption of the efficient market hypothesis.[2] This process resulted in a sample of 270 announcements.

The agreements pertained to 27 countries and 18 industries at the three-digit standard industrial classification (SIC) level. Appendix Table A contains the summary statistics for our sample. No significant differences were revealed, as assessed by t-tests, in abnormal returns according to country, industry, or whether the announcement had a pre-specified duration.

Operationalization of the dependent variable

We used event study methodology to measure short-term stock returns. We obtained stock prices from the Center for Research in Security Prices database. The methodology examines the statistical significance of the average abnormal returns around an event date for a sample of firms experiencing the same type of firm-specific event. Cumulative abnormal returns (CARs) indicate investors' beliefs about the firm's market value as a result of an event announcement. Positive CARs show that most investors estimate significant future cash flows associated with the event, whereas negative CARs represent pessimistic views.

Web Appendix provides an explanation of our calibration of short- and long-term market returns from international codevelopment alliance announcements. We employed Brown and Warner's (1985) market model per firm to estimate short-term returns and used the long-horizon event study methodology—based on the buy-and-hold procedure—to calibrate long-term returns. Next, we estimated abnormal returns in both time horizons to the

[2] The market efficiency hypothesis suggests that the promises of an event are immediately reflected in stock prices (Fama and French 2015; McWilliams and Siegel 1997; Srinivasan and Bharadwaj 2004), given that the event is "unanticipated" by the market and there are no other confounding events around the event date.

event using the Fama-French-Carhart six-factor model (Carhart 1997; Fama and French 2015).

Measurement of independent variables

Table 2 presents the correlations among our variables.

**** Place Table 2 about here ****

We operationalized proprietary technologies according to whether the asset included in an alliance was a (1) licensed and patented technology and (2) a proprietary innovation developed by a partner firm(s) (specific name disclosed in the announcement text) and thus not readily resold or redeployed (as indicated in Lexis-Nexis Press Releases and the SDC Platinum Database). We coded these two categories with dummy variables, equal to 1 if they involved proprietary technologies and 0 otherwise.

We operationalized alliance scope according to two indicators. First, we used the number of products to be developed within the alliance by analyzing the announcement text in the SDC Platinum Database and/or Lexis-Nexis Press Releases. We coded a binary variable as 0 if the alliance agreement involved one technology/service to be jointly produced and 1 if it entailed more than one technology/service. Next, we calibrated the number of functional areas in which partners cooperate, which reflects the degree to which a partner firm influences a focal firm's innovation designs and predevelopment decisions. We coded four binary variables as 1 if an announcement mentioned R&D, exploration, manufacturing, and/or commercialization activities and 0 otherwise, according to the announcement's text in the SDC Platinum Database (Kalaignanam et al. 2007; Oxley and Sampson 2004).

Consistent with Kalaignanam et al. (2007), we operationalized alliance concentration as the quantity produced by the division of 1 by the number of alliances in which a firm was involved from the beginning of 1993 until (excluding) the focal alliance. The lower the total number of alliances, the higher the alliance concentration. We recorded the number of

alliances (obtained from R&D announcements in Lexis-Nexis Press Releases and the SDC Platinum Database) through which the firm acquired components or developed innovations.

Consistent with Fang et al. (2015), we operationalized prior experience with the alliance partner as the existence of prior relationships between the codevelopment alliance partners in the previous ten years. Using the Lexis-Nexis Press Releases, we assigned a value of 1 if any prior relationship existed and 0 if no prior relationship existed.

We calibrated capabilities asymmetry using the difference score between the patents developed by a focal firm and a partner firm. We used the citation-weighted number of patents developed by a firm, registered in all patent offices around the world including United States Patent and Trademark Office (USPTO), International Patent Documentation Centre (INPADOC), the European Patent Office (EPO), World Intellectual Property Organization (WIPO) and Derwent World Patents Index (DWPI); we included patents in the five-year period prior to the focal alliance date (from the Thomson Innovation Database) (Hall, Jaffe and Trajtenberg 2000).

Consistent with Borah and Tellis (2014), we coded the location of activity according to whether an announcement indicated that the codevelopment was going to occur in a foreign market (1) or domestic market (0). If the information provided in an announcement text available in the SDC Platinum Database was not specific to this issue, we collected further information from Lexis-Nexis Press Releases.

Consistent with Sorescu et al. (2007), we collected market update data that alliance firms provided to the market within the five-year period after initial announcements, using Lexis-Nexis Press Releases. In our sample, 108 of the 270 firms provided updates. Company updates were either product related (FDA (dis)approvals, product launches, malfunctions) or alliance related (dissolution of the relationship, extension of the duration, broadening of the scope, merger of the partners, acquisition of one of the partners). Two researchers evaluated

all announcements according to whether they entailed positive updates (e.g., FDA approvals, product launch, extension of relationship, broadening of scope) or negative updates (e.g., FDA disapprovals, product malfunctions, dissolution of relationship, relational conflicts resulting in court cases or partner acquisition). To test the market update hypotheses, we assigned firms in the sample to three groups, according to the valence of the announcement content: -1 to the negative update group, 0 to the group with no updates, and 1 to the positive update group. We included the number of market updates per year provided by the firms in our model.

Control variables

In line with literature on alliance announcements of firm value, we included several control variables. First, cultural distance can hamper firms' operations, due to a lack of understanding of the norms, values, and institutions that affect social exchange in distant markets (Kogut and Singh 1988). We operationalized cultural distance using Kogut and Singh's (1988) index, which is based on the deviations of countries from the United States along five of Hofstede's (2001) cultural dimensions (i.e., power distance, individualism, masculinity, uncertainty avoidance, and long-term orientation). We corrected differences between countries for the variance of each dimension:

$$Cd_j = \sum_{i=1}^{5} \{(I_{ij} - I_{iu})^2 / V_i\} / 5, \quad (9)$$

where Cd_j = the cultural distance between the home country (i.e., U.S.) and the host country; I_{ij} = the index value for cultural dimension i of country j; V_i = the variance of the index of dimension I; and u = home country (i.e., U.S.).

Second, we formed an index by capturing technological uncertainty with two measures: (1) number of standards for each of the corresponding announcement years registered in each industry at the American National Standards Institute and (2) total factor productivity growth

for each industry. Relying on Schilling and Steensma's (2001) measure of technological change, we acquired total factor productivity growth for each industry from the Bartelsman-Gray Database. This index is based on a five-factor production function (production work hours, capital, non-production workers, non-energy materials, and energy); it represents the difference between the growth rate of output (real shipments) and the revenue share–weighted average of the growth rate of each function. Because the two technological uncertainty dimensions were highly correlated, we combined them with a principal components analysis and used the factor score to avoid multicollinearity.

Third, we included firm resources, which influence firm performance and therefore affect alliance performance. We operationalized firm resources in line with Dutta et al. (1999) and Swaminathan and Moorman (2009), using data from Compustat on four measures, 10 years preceding the announcement: (1) installed base of customers (i.e., firm sales), (2) firm resources used for building customer relationships (i.e., firm receivables), (3) marketing expenditures (i.e., firm selling, general, and administrative expenses), and (4) firm advertising expenditures. We weighted the data using a Koyck lag function[3] by testing various weights and empirically determining the smoothing constant that minimized prediction errors. We included a combination of these measures in our model because they were highly correlated.

Fourth, we included prior research, which examines horizontal and vertical collaboration effects on performance benefits and relational risks. Compared with vertical relationships, firms in horizontal relationships face redundant knowledge and lack motivation to share information (Rindfleisch and Moorman 2001). Horizontal alliances generate greater returns (Chan et al. 1997), as do relationships in which a firm's product mirrors that of its alliance partner (Kale et al. 2000). We captured partner type using a binary variable coded as

[3] For example, CUSTBASE= $\sum_{k=1}^{k=t} \delta^{t-k} \mathrm{SALES_k}$, where t = 1, 2, …, 10 years.

1 if the business description and the industry code of a partner firm were the same as those of the focal firm and 0 if different. We obtained information from the SDC Platinum Database.

Fifth, we included innovation type, which signifies the degree of innovativeness of new products. Differing innovation types pose differing risks, with radical innovations presenting greater knowledge-sharing and control challenges than incremental innovations (Oxley and Sampson 2004). Therefore, innovation type signifies the degree of innovativeness of new products with regard to two dimensions: marketing benefits and product technology (Chandy and Tellis 1998; Sorescu et al. 2007). We assigned a value of 1 if an announcement indicated the development of a new technology with new marketing benefits and 0 if it entailed an improved technology only (indicated by Factiva Press Releases and SDC Platinum Database).

Sixth, we operationalized the domain of alliance activity as the relatedness of the technology in the alliance to the firm. Consistent with relatedness of the investment (Koh and Venkatraman 1991) and resource diversity (Cui 2013) measures, we coded a binary variable as 1 if the business description and the first two digits of the SIC industry code of the alliance function were the same as those of the focal firm and 0 if they were different; we obtained the information from the SDC Platinum Database.

Analytical approach: latent growth analysis

We employed a latent growth modeling (LGM) approach to examine short-term investor reactions and assess how they change over time (Bollen and Curran 2006); LGM allows researchers to observe more accurately how the effects of particular performance variables manifest in the long term (Bolander, Duggan and Jones 2017). In addition, the LGM approach can isolate and test latent growth constructs that arise due to an underlying developmental phenomenon in longitudinal data and capture intraindividual change over time by fitting individual-level growth trajectories. These trajectories are described by at least two latent factors: intercept and slope. Predictors of the latent intercept and slope explain intraindividual

differences between individual growth trajectories. The intercept term accounts for the effect of a predictor variable on the initial level of the dependent variable, whereas the slope term captures the effect of a predictor variable on its growth or decline.

To test our hypotheses, we estimated an LGM for abnormal returns by modeling the initial level (β_0) and slope parameter (β_1) as latent constructs (Singer and Willet 2003). The intercept parameter reflects the initial level of abnormal returns within the short-term window, and the slope parameter represents the change in the abnormal returns over the five data points (including the short-term window and the four long-term event windows). To analyze the longitudinal effects of the exchange conditions on the abnormal returns from international codevelopment alliances, we regressed the intercept and slope parameters on the exchange condition variables measured at the time of the original public announcement. We allowed the residuals of repeated growth measures to covary within each time period, following common practice in LGM (Haumann et al. 2014; Palmatier et al. 2013). We estimated our model with *Mplus 6.11*, using a maximum likelihood estimator with robust standard errors (Muthén and Muthén 2012). In addition to the exchange conditions, we included the previously discussed set of time-invariant control variables in the model estimation.

Results

Analysis of abnormal stock returns

Table 3a displays the CARs for five different windows: (1) a two-day post period from the event date to one day after, (2) a three-day event period from one day prior to one day after, (3) a three-day post-event period from the announcement date to two days later, (4) a four-day event period from one day prior to two days later, and (5) a five-day event period from two days prior to two days later. Table 3b reports the buy-and-hold returns for four windows: (1) first one-year window from the day starting the end of the short-term event window and covering 252 trading days (+3, +254), (2) second one-year window from Day 255 to Day 506,

(3) third one-year window from Day 507 to Day 758, and (4) fourth one-year window from Day 759 to Day 1010. We employed various test statistics to examine abnormal stock returns and ensure that our results were not driven by event-induced volatility, including (1) the traditional time-series standard deviation test (Brown and Warner 1985), (2) Patell's (1976) test statistic (which is robust to potential bias caused by stocks with large standard deviations in returns), and (3) Boehmer, Musumeci, and Poulsen's (1991) standardized cross-sectional test (which is robust to event-induced changes in variance and useful for detecting abnormalities in the presence of autocorrelation, event clustering and event-induced heteroskedasticity). For further robustness checks, we used different estimation methods (ordinary least squares [OLS] and generalized autoregressive conditionally heteroscedastic [GARCH]), weighted schemes (equal and value weighting index), and estimation periods (500 and 100 days). All produced materially similar results.

*** *Place Tables 3a and 3b about here* ***

We estimated abnormal stock returns using the Fama-French-Carhart six-factor model described in Equation 1. Our findings show significant positive short-term stock returns to international codevelopment announcements within the four-day event period from one day prior to two days after (1.61%; $p < .01$). Buy-and-hold abnormal stock returns are negative and significant for Year 1 (-29.84%, $p < .05$), Year 2 (-29.53%, $p < .05$), Year 3 (-33.04%, $p < .05$), and Year 4 (-25.22%, $p < .05$) suggesting that market returns decrease over the long run. For robustness, we employed the Wilcoxon sign-rank test to test the null hypothesis that the observed returns were symmetrically distributed around 0. The results rejected the null hypothesis, indicating that stock returns to the announcements were significantly positive in the short term and significantly negative in the long term. Thus, we chose these event windows as the dependent variable in the overall model.

Effects of exchange conditions Table 4 reports the parameter estimates (γ). The global fit indices indicate that the model fits the data reasonably well (comparative fit index [CFI] = .980, Tucker–Lewis index [TLI] = .957, root mean square error of approximation [RMSEA] = .034, standardized root mean square residual [SRMR] = .020, χ^2/d.f. = 5.39). Appendix B provides an explanation of our robustness checks for the presence of outliers, heteroskedasticity, autocorrelation, and multicollinearity. Appendix C describes how we handled potential endogeneity, unobserved heterogeneity, and self-selection biases.

*** *Place Table 4 about here* ***

The mean of the initial level stock return (β_0 = .018, t = 2.565) and the mean of the slope (β_1= -.135, t = -4.263) are both significant. Hypotheses 1a–1e suggest that exchange conditions have positive short-term effects on stock returns. The results indicate that proprietary technology ($\gamma_{proprietary,i}$ = .086, p < .01), alliance scope ($\gamma_{scope,i}$ = .024, p < .05), alliance concentration ($\gamma_{concentration,i}$ = .063, p < .01), capabilities asymmetry ($\gamma_{asymmetry,i}$ = .005, p < .01), and prior experience ($\gamma_{experience,i}$ = .056, p < .01) have significant positive effects on the latent intercept factor of stock returns, in support of H1a, H1b, H1c, H1d, and H1e.

Hypotheses 2a–2e theorize that the effect of exchange conditions on stock returns decreases over time. Latent growth model results show that alliance scope ($\gamma_{scope,s}$ = -.073, p < .05), alliance concentration ($\gamma_{concentration,s}$ = -.250, p < .01), capabilities asymmetry ($\gamma_{asymmetry,s}$ = -.165, p < .01), and prior experience ($\gamma_{experience,s}$ = -.152, p < .01) have significant negative effects on the latent slope factor of stock returns, but proprietary technology exerts a positive influence ($\gamma_{proprietary,s}$ = .146, p < .01). H2b, H2c, H2d and H2e are supported, but H2a is not.

Among the effects of the control variables, technological uncertainty only exerted negative effects on short- and long-term market returns. Firm resources and domain of the alliance activity exerted positive effects on the decrease of long-term market returns.

Analysis of location of codevelopment activity[4] The main effects of the decision to engage in offshore codevelopment activity is positive for short-term returns ($\gamma_{location,i}$ = .102, p < .01) and negative for long-term returns ($\gamma_{location,s}$ = -.175, p < .10). In the short term, the interaction effects of the decision to engage in offshore codevelopment activity with proprietary technology ($\gamma_{proprietary*location,i}$ = -.064, p < .01), alliance scope ($\gamma_{scope*location,i}$ = -.054, p < .01), alliance concentration ($\gamma_{concentration*location,i}$ = -.044, p < .05), capabilities asymmetry ($\gamma_{asymmetry*location,i}$ = -.004, p < .01), and prior experience ($\gamma_{experience*location,i}$ = -.024, p < .05) are negative and significant, in support of H3a, H3b, H3c, H3d, and H3e.

Consistent with our theorization in H4b and H4d, alliance scope ($\gamma_{scope*location,s}$ = -.245, p < .01) and capabilities asymmetry ($\gamma_{asymmetry*location,s}$ = -.416, p < .01) exert negative interaction effects with location on long-term market returns. The interaction effects of location with proprietary technology ($\gamma_{proprietary*location,s}$ = .500, p < .01) and prior experience ($\gamma_{experience*location,s}$ = .292, p < .01) are significant and positive over time. The interaction effect with alliance concentration is non-significant ($\gamma_{concentration*location,s}$ = .037, n.s.). Thus, H4a, H4c, and H4e are not supported. The positive interaction effects of location of codevelopment activity with the exchange conditions on the slope parameter indicate that the negative effects of the exchange conditions on long-term stock returns become weaker over time when the activities are conducted offshore (versus onshore).

Analysis of update announcements

We checked whether firms' updates to the market influenced long-term returns. We assigned the firms in the sample to two groups (updated versus not updated) and estimated the long-term abnormal returns (using the Fama-French-Carhart six-factor model) for each portfolio. Long-term abnormal returns were more negative in the non-updated portfolio compared with

[4] We also coded two variables to measure the location of the codevelopment activity: (1) differentiating North American locations (e.g., Canada) from all other locations and (2) contrasting Anglo-Saxon countries and others. The results remained consistent when we employed these variables in our model estimation.

the updated portfolio (mean difference over the five-year period [18.25%; $p < .01$]), suggesting a positive influence of updating on long-term market returns.

Hypotheses 5a–5e theorize that positive updates positively moderate and weaken the negative relationship between exchange conditions and stock returns in the long term. We specified the moderating impact of the valence of the update announcements on the slope parameter only, because the updates were announced after the short-term window (i.e., initial starting period of data collection). Alliance scope ($\gamma_{scope*update,s} = .225$, $p < .01$), alliance concentration ($\gamma_{concentration*update,s} = .252$, $p < .01$), and capabilities asymmetry ($\gamma_{asymmetry*update,s} = .345$, $p < .01$) are significant and positive, indicating that such updates weaken the negative long-term effects of these exchange variables, in support of H5b, H5c, and H5d. Proprietary technology ($\gamma_{proprietary*update,s} = -.034$, n.s.) and prior experience ($\gamma_{experience*update,s} = -.117$, n.s.) do not exert significant interaction effects. Therefore, H5a and H5e are not supported.

Discussion

This work examines four questions: (1) Under which conditions do investors reward (or punish) firms for engaging in international codevelopment alliances? (2) Do investors react differently over time? (3) Do market updates drive firms' long-term value? (4) How do offshore (as opposed to onshore) codevelopment activities influence the extent of value claimed and created? Our results answer these, as well as the following questions: (5) Why do longitudinal returns to proprietary technologies increase over time? (6) Why are our findings about the short- versus long-term effects important?

Addressing the research questions

Under what conditions do investors reward (or punish) firms for engaging in international codevelopment alliances?

We demonstrate that various exchange conditions explain investors' reactions. Firms will be rewarded if their governance decisions are aligned according to theoretical premises. Building

on work by Nordberg et al. (1996) and Carson and John (2013), we hold the governance form (i.e., international codevelopment alliance) constant and thus can examine whether investors reward (or punish) firms for engaging in international codevelopment alliances under varying exchange conditions. Our findings extend research on interorganizational alliances.

The contrast of our findings with extant governance alignment literature (e.g., Mooi and Ghosh 2010) may derive from differences between firms' anticipated performance and realized performance (Katsikeas et al. 2016). Most literature measures performance according to aspects such as sales or satisfaction with exchange relationships (e.g., Geyskens et al. 2006), whereas we examine market returns, consistent with alliance literature (e.g., Fang et al. 2015; Mani and Luo 2015). Our findings demonstrate the limitations of short-term event studies for capturing the influence of additional information that becomes available to the public with regard to the codevelopment relationship or innovations developed. A longitudinal approach is needed to capture realized performance outcomes, because alliance relationships are process oriented and have long-term firm performance implications, and their outcomes are unveiled over time by market updates.

In the short term, investors reward international codevelopment alliances characterized by proprietary technologies, broader scope, higher concentration, prior partner experience, and superior partner capabilities. The explanation may lie in literature that argues that resources "extend beyond the firm's boundaries" (Dyer and Singh 1998, p. 660). In codevelopment alliances, partners gain access to technologies, transfer tacit knowledge and skills, and share risks required for innovation. Our results with regard to the short term may reflect the argument that firms have incentives to engage in international codevelopment alliances to develop multiple value-generating innovations, economize relational assets, and increase adaptability; in the short term, investors focus on the value creation opportunities of

international codevelopment alliances, expecting that sharing resources will generate sustainable competitive advantages for the alliance firms.

We theorize that investor evaluations of international codevelopment alliances with greater transaction hazards decrease over time, as investors' concerns over value claiming risks increase. When we compare long-term market reactions with our update sample, our results indicate subtle nuances; because of rational learning, firms for which new information becomes available suffer less decline in long-term returns, because such information allows investors to improve their understanding of structural relationships. Over time, learning relationships built on relational norms minimize the risks associated with partner lock-in. These findings extend the previous finding that as relationships develop, information exchange norms evolve (Dwyer et al. 1987; Jap and Anderson 2007).

Do investors react differently over time?

Our results also extend work on the effects of alliance announcements (e.g., Fang et al. 2015), by providing a longitudinal perspective that reveals the impact of strategic decisions, or at a least how investors react as information is revealed. Prior research has neglected a process perspective in analyses of market returns from alliances. Contrasts between short- and long-term market returns suggest there are differences in the market's ability to account for performance effects from strategic decisions. We find that in both the short and long term, significant abnormal returns accrue as a result of international codevelopment decisions. We believe this finding is important, because international codevelopment alliance decisions are long-term and strategic. In turn, we posit that strategic decisions require longitudinal analyses of market returns, because such decisions entail a process in which the outcome is uncertain and only gradually revealed.

Do market updates drive a firm's long-term value?

Our finding that positive market updates mitigate the negative effects of exchange conditions on market returns over time suggests that investors interpret them as evidence that alliances are operating effectively. Investors pay close attention to the indicators of effective operation and perceive positive market updates as indications of firm learning. The impact of positive market updates on long-term value is indicative of the gains that firms extract from specific codevelopment alliances. Market updates inform investors of how partners build mutual trust, avoid lock-in, and/or resolve arising conflicts. Over time, alliance partners can learn to manage their relationships, thereby decreasing coordination costs, avoiding opportunism, and mitigating transaction hazards. Relationship management skills learned over time—as reflected by positive updates—contribute to partners' abilities to reduce uncertainty and enhance the predictability of alliance outcomes. Therefore, positive updates increase investor confidence in alliances' abilities to codevelop value-generating innovations and cash flow.

Our findings of non-significant longitudinal impacts of updates on returns from proprietary technologies and prior partner experience suggest that continuous interaction between partners diminishes the risks associated with proprietary technologies and prior arrangements. Over time, exchanges between partners allow firms to overcome relational impediments to enhance codevelopment outcomes. Hence, investors may have greater expectations of partners that are equipped with proprietary technologies and prior experience; such partners likely have spent more time identifying workable managerial practices and establishing effective information exchanges. Investors may presume that the partners in alliances supported by proprietary technologies or with prior experience are aware of potential partnering hazards and how to avoid them. With these higher expectations, market updates on codevelopment relationships with proprietary technologies or a past experience do not provide further benefits.

How do offshore (as opposed to onshore) codevelopment activities influence the extent of value claimed and created?

Conducting codevelopment activities offshore negatively moderates our model relationships in the short term. This finding reflects the increased monitoring costs associated with foreign codevelopment activities and the uncertainty associated with the treatment of foreign firms in host markets. The offshoring of codevelopment may increase the difficulty of coordinating codevelopment activities and decrease operational efficiency and effectiveness, thereby preventing the achievement of project goals. Such difficulties hinder the development of trust and reciprocity between partners and threaten alliances' performance. Alternatively, when alliance activities are located onshore (i.e., domestically, in proximity to a U.S. partner), investors may perceive greater monitoring and less need to safeguard against lock-in hazards.

We theorize that when codevelopment activities are conducted offshore, investors perceive greater transaction hazards over time. Our results with regard to alliance scope and capabilities asymmetry suggest that continuous interaction with skilled partners, for a greater number of codevelopment activities conducted offshore, increases the risk of asymmetrical appropriation of gains. Broader alliance scope may create greater partner lock-in as the number of jointly implemented activities increases. Partners with superior skills have more influence on innovation decisions over time, so firms may lose both their innovation capabilities and their abilities to assess partner performance, threatening their own future performance. Such unfavorable circumstances are particularly threatening to international codevelopment alliances, because partners entrust commercial secrets to each other, and there is a high potential for know-how leakage. These threats may be even more pronounced in the offshore context because of differences in legal and cultural approaches to IP protection.

The long-term, positive interaction effects of proprietary technologies and prior experience with location suggest the ability of the market over time to "trust" in international codevelopment arrangements supported by relational and technological assets. Investors may trade off the costs of decreased value-claiming rights in offshore locations and place greater

weight on potential value-creating benefits (e.g., access to the offshore partners' resources). Moreover, specific technologies and prior relational assets may signal the existence of continuous learning relationships, in which partners work to minimize the long-term risks associated with partner lock-in.

Why do longitudinal returns to proprietary technologies increase over time?

Options theory suggests that firms' boundaries are partly determined by the threat of market failure (Steensma and Corley 2001). Managers link risky decisions (e.g., development of a new product) to poor outcomes. The greater the perceived threat of market failure, the better off firms are in remaining flexible. The proprietary nature of codeveloped products makes ventures riskier and provides partners with the incentive to maintain their codevelopment relationships until the value of their investments is recouped (Jap and Ganesan 2000). Rokkan et al. (2003) argue that because partner firms may accrue returns from proprietary technology investments, they make every effort to avoid relationship termination. High returns from proprietary technologies may "bond" partners to firms, thereby discouraging opportunism.

An alternative explanation for increasing returns may be the increased legitimacy that codevelopment alliances provide for proprietary technologies. Alliances likely receive high payoffs when firms are in vulnerable strategic positions, such as when they undertake risky strategies. Innovative technologies often require long times and substantial resources to become commercially viable. Therefore, alliance partners may provide both concrete (e.g., financial resources) and abstract (e.g., market legitimacy) benefits to firms that seek to develop proprietary technologies and in turn improve firms' strategic market positions. Occasionally, political or social factors may determine the success of new technologies; Steensma and Corley (2001) refer to the example of VHS technology, which gained market power over Betamax for non-technical reasons, including interorganizational alliances. By

linking other offshore partner firms to proprietary technology, codevelopment alliances help firms gain and increase investor-perceived legitimacy.

Why are our findings about short- versus long-term effects important?

The effects of strategic decisions have been examined primarily with event studies. Our findings are consistent with the argument that the longitudinal, strategic nature of international codevelopment alliance decisions aligns with the logic of rational learning literature. The process-based, longitudinal nature of international codevelopment alliance decisions is very difficult for the market to integrate fully in the short term. Contrasts between short- and long-term market returns suggest differences in the abilities of investors to account for performance effects from process-related decisions. The difficulty of predicting market returns in the short term may also help explain the inconsistencies with regard to short-term results in prior research. Our findings suggest the short-term "trust" of the market and the long-term inability to gauge value created by international codevelopment alliances. We posit that strategic decisions call for the adoption of a longitudinal perspective, because such decisions entail a process in which the outcome is uncertain and only gradually revealed. This point is important, because international codevelopment alliances are strategic decisions of firms that ultimately lead to long-term value creation and claiming.

The implication is that in addition to short-term evaluations, authors should consider longitudinal market return analysis as an appropriate perspective for assessing strategic marketing decisions. We acknowledge that many tactical decisions and actions are expected to have short-term market return implications and can be examined appropriately through short-term event analysis. For example, Wiles and Danielova (2009) study the financial impact of product placement activities with a short-term event study, and Agrawal and Kamakura (1995) examine short-term abnormal stock returns from celebrity endorsements.

However, we recommend that researchers employ longitudinal assessments to determine the financial market implications of strategic, process-oriented decisions and actions.

Managerial implications

Managerially, the results indicate that investors' reactions to international codevelopment alliances differ over time, depending on whether alliance activities are conducted onshore or offshore. As such, these relationships should be managed differently over time and according to the location of alliances. For example, investors perceive that announcements of international codevelopment alliances in which codevelopment activities are conducted offshore entail higher transaction hazards. Therefore, in their announcements, managers should make greater effort to communicate to investors their firms' specific actions to mitigate partner lock-in. For example, GM's exposure of its hybrid electric propulsion system to Honda could raise substantial uncertainty in the investor marketplace, especially if GM does not communicate which actions are in place to protect it from potential transaction hazards. However, we recognize that there is a risk to making such statements; they may heighten investor concerns.

Alternatively, firms could provide alliance-related updates to the market as quickly as possible. Our results show a significant update effect; investors adjust their perceptions of transaction hazards and their potential effects on longitudinal firm value. Although we find that investors react unfavorably to international codevelopment alliances in the long term, our analysis suggests that positive updates can reverse the long-term negative effects of transaction hazards on investors' evaluations. For example, soon after making an announcement, GM could provide an update to the market about the progress of its alliance relationship. By providing such an update, GM could increase the information available to investors, thereby decreasing their uncertainty about the company's international codevelopment alliance.

Limitations and further research

Although this study provides a number of new insights, it is subject to limitations. First, we restricted our data to announcements of international codevelopment alliances. Although these alliances are important for firm performance (Rubera and Kirca 2012), researchers note differential effects according to alliance type. For example, Das, Sen, and Sengupta (1998) demonstrate significant performance differences between technology alliances and marketing alliances. Therefore, scholars could explore the longitudinal market return effects of a broader array of alliance types.

Second, our findings of contrasts between market returns in the short and long terms call into question the risks associated with these returns. Firms can create value by increasing stock returns or decreasing stock return risks. Increasingly, scholars treat investor risk as a key performance outcome. Mounting evidence reveals differences in the market return risks of variations in product alliances (Mani 2016), R&D investments (McAlister, Srinivasan and Kim 2007), and innovation levels (Sorescu and Spanjol 2008). The decay of positive short-term market returns over time signals that exchange conditions present long-term risks. Further research could examine how relying on international partners for new product development affects market return risks over time.

Third, investors react to marketing decisions by observing financial accounting statements, firms' product–market performance, and customer behavior (Katsikeas, et al. 2016). To enrich our understanding of how new product development alliances create value, researchers could study how alliance activities affect other product market outcomes (e.g., customer evaluations) and/or accounting performance outcomes (e.g., revenues and cash flow levels). The examination of other intervening mechanisms (e.g., number of technologies developed and/or learning effectiveness through patent and citation counts) by which characteristics of codevelopment alliances are linked to firms' market value outcomes through

product–market and/or accounting performance outcomes (e.g., consumer acceptance and/or new product advantage) would be an intriguing avenue of future investigation.

Finally, because this study explores only U.S. stock market effects, our findings cannot be generalized beyond the United States without further consideration. Some relationships related to international codevelopment alliances could vary across national markets. For example, with regard to the evaluation of risk, investors in more long-term–oriented cultures, such as Japan, may more consistently incorporate information into short-term stock returns by taking a longitudinal perspective. With regard to the acceptance of uncertainty, investors from cultures that are higher in uncertainty avoidance, such as Belgium, may react more strongly to initial announcements than investors from cultures lower in uncertainty avoidance, such as the United States. Accordingly, researchers could take a broader investor perspective.

References

Agrawal, J., & Kamakura, W. A. (1995). The economic worth of celebrity endorsers: An event study analysis. *Journal of Marketing, 59*(3), 56-62.

Anand, B. N., & Khanna, T. (2000). Do firms learn to create value? The case of alliances. *Strategic Management Journal, 21*(3), 295-315.

Barber, B. M., & Lyon, J. D. (1997). Detecting long-run abnormal stock returns: The empirical power and specification of test statistics. *Journal of Financial Economics, 43*(3), 341-372.

Bello, D. C., Katsikeas, C. S., & Robson, M. J. (2010). Does accommodating a self-serving partner in an international marketing alliance pay off? *Journal of Marketing, 74*(6), 77-93.

Boeh, K. K., & Beamish, P. W. (2012). Travel time and the liability of distance in foreign direct investment: Location choice and entry mode. *Journal of International Business Studies, 43*(5), 525-535.

Boehmer, E., Masumeci, J., & Poulsen, A. B. (1991). Event-study methodology under conditions of event-induced variance. *Journal of Financial Economics, 30*(2), 253-272.

Bolander, W., Dugan, R., & Jones, E. (2017). Time, change, and longitudinally emergent conditions: Understanding and applying longitudinal growth modeling in sales research. *Journal of Personal Selling & Sales Management, 37*(2), 153-159.

Bollen, K. A., & Curran, P. J. (2006). *Latent curve models: a structural equation perspective.* Hoboken, NJ: Wiley.

Borah, A., & Tellis, G. J. (2014). Make, buy, or ally? Choice of and payoff from announcements of alternate strategies for innovations. *Marketing Science, 33*(1), 114-133.

Brav, A., & Heaton, J. B. (2002). Competing theories of financial anomalies. *The Review of Financial Studies, 15*(2), 575-606.

Brown, S. J., & Warner, J. B. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics, 14*(1), 3-31.

Buvik, A. & John, G. (2000). When does vertical coordination improve industrial purchasing relationships?. *Journal of Marketing*, 64 (4), 52-64.

Carhart, M. M. (1997). On persistence in mutual fund performance. *Journal of Finance, 52*(1), 57–82.

Carson, S. J., & John, G. (2013). A theoretical and empirical investigation of property rights sharing in outsourced research, development, and engineering relationships. *Strategic Management Journal, 34*(9), 1065-1085.

Chakravarty, A., Kumar, A. & Grewal (2014). Customer Orientation Structure for Internet-Based Business-toBusiness Platform Firms. *Journal of Marketing, 78* (5), 1–23.

Chan, S. H., Kensinger, J. W., Keown, A. J., & Martin, J. D. (1997). Do strategic alliances create value? *Journal of Financial Economics, 46*(2), 199-221.

Chandy, R. K., & Tellis, G. J. (1998). Organizing for radical product innovation: The overlooked role of willingness to cannibalize. *Journal of Marketing Research, 35*(4), 474-487.

Chen, Y., Ganesan, S. & Liu, Y. (2009). Does a firm's product-recall strategy affect its financial value? An examination of strategic alternatives during product-harm crises. *Journal of Marketing, 73*(6), 214-226.

Choudhury, V., & Sabherwal, R. (2003). Portfolios of control in outsourced software development projects. *Information Systems Research, 14*(3), 291-314.

Cui, A. S. (2013). Portfolio dynamics and alliance termination: The contingent role of resource dissimilarity. *Journal of Marketing, 77*(3), 15-32.

Cui, A. S., & O'Connor, G. (2012). Alliance portfolio resource diversity and firm innovation. *Journal of Marketing, 76*(4), 24-43.

Das, S., Sen, P. K., & Sengupta, S. (1998). Impact of strategic alliances on firm valuation. *Academy of Management Journal, 41*(1), 27-41.

Das, T. K., & Teng, B. S. (2000). A resource-based theory of strategic alliances. *Journal of Management, 26*(1), 31-61.

Dutta, S., Narasimhan, O., & Rajiv, S. (1999). Success in high-technology markets: Is marketing capability critical? *Marketing Science, 18*(4), 547-568.

Dwyer, F. R., Schurr, P. H., & Oh, S. (1987). Developing buyer-seller relationships. *Journal of Marketing, 51*(2), 11-27.

Dyer, J. H., & Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review, 23*(4), 660-679.

Engardio, P., & Einhorn, B. (2005). Outsourcing Innovation. *Business Week*, March 21 2005.

Fama, E.F., & French, K.R. (2015). A five-factor asset pricing model. *Journal of Financial Economics, 116* (1), 1–22.

Fang, E., Lee, J., & Yang, Z. (2015). The timing of codevelopment alliances in new product development processes: Returns for upstream and downstream partners. *Journal of Marketing, 79*(1), 64-82.

Francis, J., Lafond, R., Olsson, P., & Schipper, K. (2007). Information uncertainty and post-earnings announcement drift. *Journal of Business Finance & Accounting, 34*(3&4), 403-433.

Frazier, G. L., Maltz, E., Antia, K. D., & Rindfleisch, A. (2009). Distributor sharing of strategic information with suppliers. *Journal of Marketing, 73*(4), 31-43.

Friedman, B. M. (1980). Survey evidence on the 'rationality' of interest rate expectations. *Journal of Monetary Economics*, *6*(4), 453-465.
Ganesan, S., Malter, A.J., & Rindfleisch, A. (2005). Does distance still matter? Geographic proximity and new product development. *Journal of Marketing, 69*(4), 44-60.

Geyskens, I., Steenkamp, J. B. E. M., & Kumar, N. (2006). Make, buy, or ally: A transaction cost theory meta-analysis. *Academy of Management Journal*, *49*(3), 519-543.

Gooner, R. A., Morgan, N. A., & Perreault Jr., W. D. (2011). Is retail category management worth the effort (and does a category captain help or hinder)? *Journal of Marketing*, *75*(5), 18-33.

Gulati, R., Lavie, D., & Singh, H. (2009). The nature of partnering experience and gains from alliances. *Strategic Management Journal*, *30*(11), 1213-1233.

Hall, B. H., Jaffe, A. B., & Trajtenberg, M. (2000). Market value and patent citations: A first look. *Rand Journal of Economics, 36*(1), 16-38.

Hanssens, D. M., Rust, R. T., & Srivastava, R. K. (2009). Marketing strategy and Wall Street: Nailing down marketing's impact. *Journal of Marketing, 73(6), 115-118.*

Hanvanich, S., & Çavuşgil, S. T. (2001). Stock market reactions to international joint venture announcement: An event analysis. *International Business Review*, *10*(2), 139-154.

Haumann, T., Quaiser, B., Wieseke, J., & Rese, M. (2014). Footprints in the sands of time: A comparative analysis of the effectiveness of customer satisfaction and customer–company identification over time. *Journal of Marketing, 78*(6), 78-102.

Heide, J. B., & John, G. (1988). The role of dependence balancing in safeguarding transaction-specific assets in conventional channels. *Journal of Marketing, 52*(1), 20-35.

Ho, H. D., & Ganesan, S. (2013). Does knowledge base compatibility help or hurt knowledge sharing between suppliers in coopetition? The role of customer participation. *Journal of Marketing, 77*(November), 91-107.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations*. Thosand Oaks, California: Sage Publications, Inc.

Jap, S. D., & Anderson, E. (2007). Testing a life-cycle theory of cooperative interorganizational relationships: Movement across stages and performance. *Management Science, 53*(2), 260-275.

Jap, S. D., & Ganesan, S. (2000). Control mechanisms and the relationship life cycle: Implications for safeguarding specific investments and developing commitment. *Journal of Marketing Research*, *37*(2), 227-245.

Inkpen, A. C. (2005). Learning through alliances: General Motors and NUMMI. *California Management Review, 47*(4), 114-136.

Kalaignanam, K., Shankar, V., & Varadarajan, R. (2007). Asymmetric new product development alliances: Win-win or win-lose partnerships? *Management Science, 53*(3), 357-374.

Kale, P., Singh, H., & Perlmutter, H. (2000). Learning and protection of proprietary assets in strategic alliances: Building relational capital. *Strategic Management Journal, 21*(3), 217-37.

Katsikeas, C. S., Morgan, N. A., Leonidou, L. C., & Hult, G. T. M. (2016). Assessing performance outcomes in marketing. *Journal of Marketing, 80*(2), 1-20.

Kogut, B., & Singh, H. (1988). The effect of national culture on the choice of entry mode. *Journal of International Business Studies, 19*(3), 411-432.

Koh, J., & Venkatraman, N. (1991). Joint venture formations and stock market reactions: An assessment in the information technology sector. *Academy of Management Journal, 34*(4), 869-892.

Kothari, S. P., & Warner, J. B. (1997). Measuring long-horizon security price performance. *Journal of Financial Economics, 43*(3), 301-339.

KPMG (2016). Now or never: 2016 Global CEO Outlook, KPMG International

KPMG (2017). Strategic alliances: a real alternative to M&A?, KPMG International

Kurz, M. (1994). On rational belief equilibria. *Economic Theory, 4*(6), 859-876.

Lewellen, J., & Shanken, J. (2002). Learning, asset-pricing tests, and market efficiency. *Journal of Finance, 57*(3), 1113-1145.

Li, D., Eden, L., Hitt, M. A., Ireland, R. D., & Garrett, R. P. (2012). Governance in multilateral R&D alliances. *Organization Scie*nce, *23*(4), 1191-1210.

Lin, Z., Yang, H., & Demirkan, I. (2007). The performance consequences of ambidexterity in strategic alliance formations: Empirical investigation and computational theorizing. *Management Science, 53*(10), 1645-1658.

Liu, D., Pu, X., & Schramm, M. E. (2016). Stock market response to strategic technical alliances between drug and biotechnology firms. *Journal of Product Innovation Management, 33*(5), 549-569.

Lyon, J. D., Barber, B. M., & Tsai, C. L. (1999). Improved methods for tests of long-run abnormal stock returns. *Journal of Finance, 54*(1), 165-201.

Mani, S. (2016). Linking new product alliances to stock returns and risk. *Journal of Strategic Marketing, 24*(2), 131-143

Mani, S., & Luo, X. (2015). Product alliances, alliance networks, and shareholder value: Evidence from the biopharmaceutical industry. *International Journal of Research in Marketing, 32*(1), 9-22.

McAlister, L., Srinivasan, R., & Kim, M. (2007). Advertising, research and development, and systematic risk of the firm. *Journal of Marketing, 71*(1), 35-48.

McWilliams, A., & Siegel, D. (1997). Event studies in management research: Theoretical and empirical issues. *The Academy of Management Journal, 40*(3), 626-657.

Mooi, E. A. & Ghosh, M. (2010). Contract Specificity and Its Performance Implications. *Journal of Marketing, 74* (2), 105–120.

Muthén, L. K., & Muthén, B. O. (2012). *Mplus Version 7 user's guide*. Los Angeles, CA: Muthén & Muthén.

Nordberg, M., Campbell, A. J., & Verbeke, A. (1996). Can market-based contracts substitute for alliances in high technology markets? *Journal of International Business Studies*, *27*(5), 963-980.

Ohmae, K. (1989). The global logic of strategic alliances. *Harvard Business Review, 67*(2), 143-154.

Oxley, J. E. (1997). Appropriability hazards and governance in strategic alliances: A transaction cost approach. *Journal of Law, Economics and Organization*, 13(2), 387-409.

Oxley, J. E., & Sampson, R. C. (2004). The scope and governance of international R&D alliances. *Strategic Management Journal, 25*(8&9), 723-749.

Oxley, J. E., Sampson, R. C., & Silverman, B.S. (2009). Arms race or de´tente? How interfirm alliance announcements change the stock market valuation of rivals. *Management Science, 55*(8), 1321–1337.

Palmatier, R. W., Houston, M. B., Dant, R. P., & Grewal, D. (2013). Relationship velocity: Toward a theory of relationship dynamics. *Journal of Marketing, 77*(1), 13-30.

Park, N. K., Mezias, J. M., & Song, J. (2004). A resource-based view of strategic alliances and firm value in the electronic marketplace. *Journal of Management, 30*(1), 7-27.

Patell, J. M. (1976). Corporate forecasts of earnings per share and stock price behavior: Empirical test. *Journal of Accounting Research, 14*(2), 246-276.

Raassens, N., Wuyts, S., & Geyskens, I. (2012). The market valuation of outsourcing new product development. *Journal of Marketing Research, 49*(5), 682-695.

Reuer, J. J., Zollo, M., & Singh, H. (2002). Post-formation dynamics in strategic alliances. *Strategic Management Journal, 23*(2), 135-151.

Rindfleisch, A., & Moorman, C. (2001). The acquisition and utilization of information in new product alliances: A strength-of-ties perspective. *Journal of Marketing, 65*(2), 1-18.

Rokkan, A. I., Heide, J. B., & Wathne, K. H. (2003). Specific investments in marketing relationships: Expropriation and bonding effects. *Journal of Marketing Research, 40*(2), 210-224.

Rubera, G., & Kirca, A. H. (2012). Firm innovativeness and its performance outcomes: A meta-analytic review and theoretical integration. *Journal of Marketing*, *76*(3), 130-147.

Sargan, J. D. (1958). The estimation of economic relationships using instrumental variables. *Econometrica, 26*(3), 393–415.

Schilling, M. A., & Steensma, H. K. (2001). The use of modular organizational forms: An industry-level analysis. *The Academy of Management Journal*, *44*(6), 1149-1168.

Singer, J.D., & Willet, J.B. (2003). *Applied Longitudinal Data Analysis*. New York, NY: Oxford University Press.

Sivakumar, K., Roy, S., Zhu, J., & Hanvanich, S. (2011). Global innovation generation and financial performance in business-to-business relationships: The case of cross-border alliances in the pharmaceutical industry. *Journal of the Academy of Marketing Science, 39*(5), 757-776.

Sood, A., & Tellis, G. J. (2009). Do innovations really pay off? Total stock market returns to innovation. *Marketing Science, 28*(3), 442-456.

Sorescu, A., Shankar, V., & Kushwaha, T. (2007). New product preannouncements and shareholder value: Don't make promises you can't keep. *Journal of Marketing Research, 44*(3), 468-489.

Sorescu, A. B., & Spanjol, J. (2008). Innovation's effect on firm value and risk: Insights from consumer packaged goods. *Journal of Marketing, 72*(2), 114-132.

Srinivasan, R., & Bharadwaj, S. (2004). Event studies in marketing research. In Moorman, Christine and Donald R. Lehmann (eds.), *Assessing Marketing Strategy Performance.* Cambridge, Mass: Marketing Science Institute, 9–28.

Srinivasan, S., & Hassens, D. M. (2009). Marketing and firm value: Metrics, methods, findings, and future directions. *Journal of Marketing Research*, *46*(3), 293-312.

Steensma, H. K., & Corley K. G. (2001). Organizational context as a moderator of theories on firm boundaries for technology sourcing. *Academy of Management Journal, 44*(2), 271-291.

Stremersch, S., Weiss, A. M., Dellaert, B. G., & Frambach, R. T. (2003). Buying modular systems in technology-intensive markets. *Journal of Marketing Research*, *40*(3), 335-350.

Swaminathan, V., & Moorman, C. (2009). Marketing alliances, firm networks, and firm value creation. *Journal of Marketing, 73*(5), 52-69.

Wang, Q., Bradford, K., Xu, J., & Weitz, B. (2008). Creativity in buyer–seller relationships: The role of governance. *International Journal of Research in Marketing*, *25*(2), 109-118.

Weiss, A. M., & Heide, J. B. (1993). The nature of organizational search in high technology markets. *Journal of Marketing Research, 30*(2), 220-233.

Whitler, K. A. (2014). *Why strategic alliances fail: New CMO Council report*. http://www.forbes.com/sites/kimberlywhitler/2014/10/24/why-strategicalliances-fail-new-cmo-council-report

Wiles, M. A., & Danielova, A. (2009). The worth of product placement in successful films: An event study analysis. *Journal of Marketing*, *73*(4), 44–63.

Wu, Q., Luo, X., Slotegraaf, R. J., & Aspara, J. (2015). Sleeping with competitors: The impact of NPD phases on stock market reactions to horizontal collaboration. *Journal of the Academy of Marketing Science*, *43*(4), 490-511.

Zaheer, A., Hernandez, E., & Banerjee, S. (2010). Prior alliances with targets and acquisition performance in knowledge-intensive industries. *Organization Science, 21*(5), 1072- 1091.

Zaheer, S. (1995). Overcoming the liability of foreignness. *Academy of Management Journal*, *38*(2), 341-363.

Figure 1. Hypothesized International Codevelopment Alliance Model

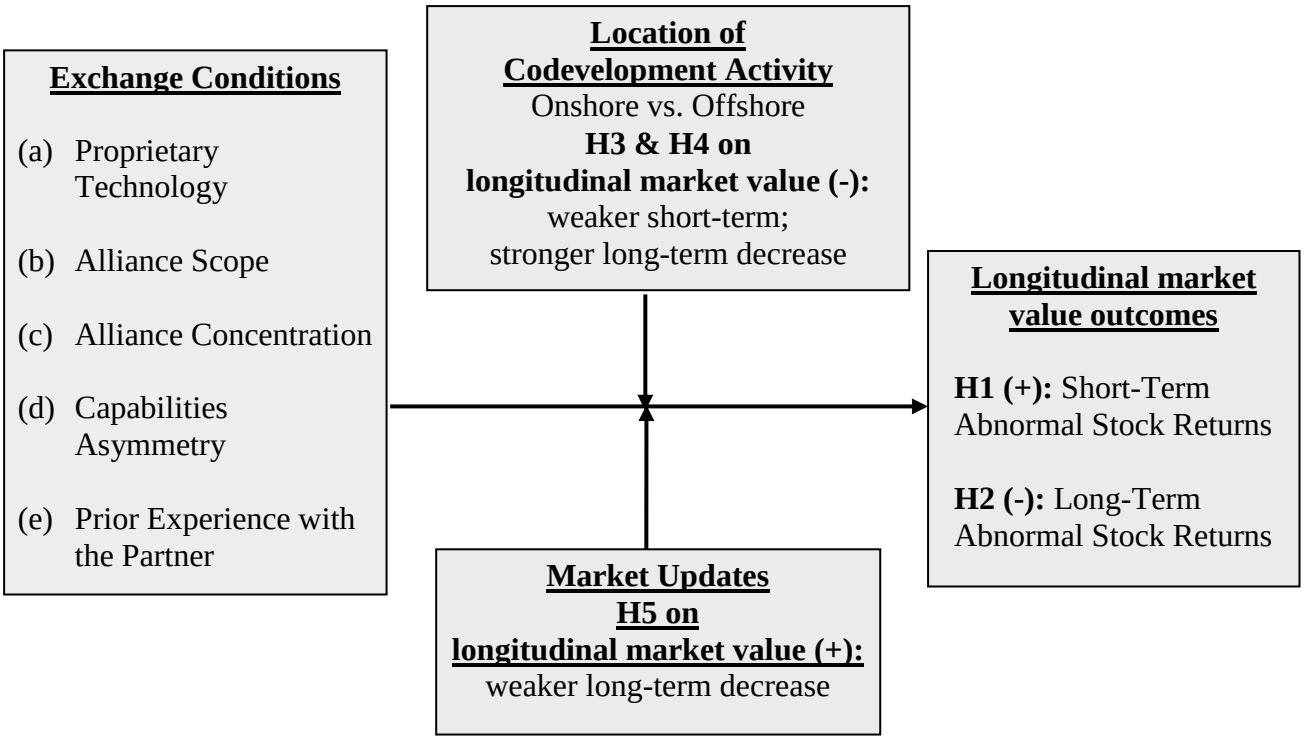

Table 1. Sample of Research on R&D, Product, and Marketing Alliances

Authors (year)	Event	Independent Variable	Outcome Variable	Theory	Analysis on Updates	Time Horizon	Sample Focus	Major Results	Alignment of Results with Current Paper
Das, Sen, and Sengupta (1998)	Technological Alliance	Alliance Type, Firm Size	CAR	Relational View; TCE; Resource Dependency	No	Short-Term	U.S .sample of 119 alliances (18 industries)	+	Short-Term: Aligned
Park, Mezias, and Song (2004)	Technological Alliance	Alliance Type, Partner Type	CAR	Relational View; Resource-based View	No	Short-Term	U.S. sample of 272 alliances (of e-commerce firms)	ns	Short-Term: Not Aligned
Kalaignanam, Shankar, and Varadarajan (2007)	New Product Development Alliance	Firm Alliance Experience, Alliance Scope, Alliance Type, Partner Alliance Experience, Partner Reputation, Partner Innovativeness	CAR	Relational View	No	Short-Term	U.S. sample of 222 alliances (of IT and telecom firms)	+	Short-Term: Aligned
Sood and Tellis (2009)	Innovation Alliance	Stage of NPD	CAR	Innovation Theory	No	Short-Term	U.S. sample of IT innovations	+	Short-Term: Aligned
Swaminathan and Moorman (2009)	Marketing Alliance with Product Development	Network Centrality, Network Efficiency, Network Density, Network Reputation, Marketing Alliance Capability	CAR	Relational View; Social Network Theory	No	Short-Term	U.S. sample of 230 alliances (computer software firms)	ns	Short-Term: Not Aligned
Oxley, Sampson and, Silverman (2009)	Research and Development Alliance	Horizontal Alliance, Cross-Border Alliance, Joint Venture, Marketing or Manufacturing Activity, Multilateral Alliance	CAR	Industrial Organization Theory	No	Short-Term	U.S. sample of 241 alliances (electronic and telecom firms)	+	Short-Term: Aligned
Sivakumar, Roy, Zhu, and Hanvanich (2011)	Cross-Border Alliances for Innovation Generation	Alliance Experience, Diversity of Partners, Horizontal vs. Vertical Alliances, Joint Ventures vs. Others	CAR	TCA and RBV	No	Short-Term	U.S. sample of 353 alliances (pharmaceutical firms)	ns	Short-Term: Not Aligned
Raassens, Wuyts, and Geyskens (2012)	New Product Development Outsourcing	Minority Equity Participation, Prior Tie Selection, Technological Uncertainty, Cultural Uncertainty	CAR	Relational View; Governance Research	No	Short-Term	Cross-national sample of 100 NPD outsourcing relationships	+	Short-Term: Aligned

Table 1 (cont'd). Sample of Research on R&D, Product, and Marketing Alliances

Authors (year)	Event	Independent variable	Outcome Variable	Theory	Analysis on Updates	Time Horizon	Sample Focus	Major Results	Alignment of Results with Current Paper
Raassens, Wuyts, and Geyskens (2012)	New Product Development Outsourcing	Minority Equity Participation, Prior Tie Selection, Technological Uncertainty, Cultural Uncertainty	CAR	Relational View; Governance Research	No	Short-Term	Cross-national sample of 100 NPD outsourcing relationships	+	Short-Term: Aligned
Borah and Tellis (2014)	Innovation Alliance (Ally)	Payoff from Prior Ally, Number of Commercializations	CAR	Innovation Theory	No	Short-Term	Cross-national sample of 192 firms (cross-industry)	+	Short-Term: Aligned
Mani and Luo (2015)	Product Alliance Activity	Product Alliance Activity, Network Closeness Centrality, Network Density	Annual Stock Return; Idiosyncratic & Systematic Risk	Relational View; Agency theory	No	Long-Term	U.S. sample of 1381 biopharmaceutical alliances	-	Long-Term: Aligned
Fang, Lee, and Yang (2015)	Codevelopment Alliance	Equity Governance, Technological Capability, Market Competitiveness	CAR	Relational View; TCE	No	Short-Term	U.S. sample of 276 alliances (biotech & pharmaceutical firms)	ns (early stage codevelopment)	Short-Term: Not Aligned
Wu, Luo, Slotegraaf, and Aspara (2015)	Horizontal NPD Collaboration	Product Innovativeness, Competitor's Relative Market Power, Competitor's Relative Technological Power	CAR	Relational View; TCE	No	Short-Term	Chinese sample of 831 alliances (cross-industry)	+ (initiation); ns (development & launch)	Short-Term: Aligned
Liu, Pu, and Schramm (2016)	Technical Alliances	R&D Intensity, New Product Pipeline, Firm Revenue, Firm Size, Leverage, Stock's Equity Return	CAR	Relational View; Organizational Learning Theory	No	Short-Term	U.S. sample of 843 alliances (pharmaceutical and biotechnology firms)	+	Short-Term: Aligned

Table 2. Correlation Matrix

		Mean	Frequency (if Mean NA) or Standard Deviation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Short-term Returns	0.02	.08																
2	Long-term Returns$_{year1}$	295.91	2.04	-.062															
3	Long-term Returns$_{year2}$	629.24	2.33	-.004	.674**														
4	Long-term Returns$_{year3}$	1036.59	2.13	-.023	.514**	.762**													
5	Long-term Returns$_{year4}$	1888.44	2.25	-.017	.362**	.537**	.705**												
6	Proprietary Technology	NA	Licensed: 73 alliances (27.04%); Specific name disclosed: 141 alliances (52.22%)	.137*	-.101	-.103	-.111	-.108											
7	Alliance Scope	NA	Multiple products: 174 alliances (64%); >1 activity: 88 alliances (32.59%)	.004	.084	.033	.075	.101	-.323**										
8	Alliance Concentration	0.34	.36	.086	-.026	-.003	-.034	.043	.012	.069									
9	Capabilities Asymmetry	2527.19	4343.21	-.072	-.051	-.010	-.002	-.040	.041	-.032	.015								
10	Prior Partner Experience	NA	With experience: 44 alliances (16%)	.105	.100	.051	.014	-.034	.010	.014	-.052	-.163**							
11	Location of Alliance	NA	Offshore location: 97 alliance (36%)	-.104	.005	-.047	.026	-.061	.064	-.020	.047	.185**	.054						
12	Cultural Distance	1.41	1.26	-.013	.027	-.021	.019	-.002	-.051	.052	.154*	.085	-.031	.041					
13	Technological Uncertainty	4.92	9.71	-.022	-.069	-.098	-.069	-.062	.000	.043	.018	.037	-.012	-.062	.203**				
14	Firm Resources	26640.6	81979.05	-.050	-.045	-.002	-.029	-.008	-.083	.036	-.062	-.050	.193**	.037	.045	.081			
15	Type of Partner	NA	Partner outside the focal firm's industry: 148 alliances (54.8%)	.073	.027	-.040	-.033	.039	.072	-.006	-.055	-.022	.179**	-.087	-.021	-.068	-.030		
16	Type of Innovation	NA	Radical Innovation: 58 alliances (21.48%)	-.087	.015	.013	-.030	-.114	.088	-.101	.058	.091	.087	.193**	.125*	.077	.102	-.105	
17	Domain of the Alliance	NA	Outside the domain of the focal partner: 222 (82.2%)	.030	.033	-.001	-.063	-.002	.073	-.019	.058	.020	.110	.302**	.015	-.001	-.003	.033	-.031

NOTE: * indicates significance at 0.05 level and ** 0.01 level.

Table 3a. Event-Study Analysis of Short-Term Abnormal Returns for International Codevelopment Announcements (n = 270)

Event Windows	Mean Return	Positive: Negative	Portfolio Time Series t	Z-statistic
(0,+1)	0.49%	124:140	1.694*	-0.344
(-1,+1)	1.41%	141:123	3.999***	1.750*
(0,+2)	0.69%	129:135	1.958*	0.272
(-1,+2)	1.61%	147:117	3.961***	2.489**
(-2,+2)	1.59%	142:122	3.500***	1.873*

Table 3b. Event-Study Analysis Of Long-Term (Buy-and-Hold) Abnormal Returns for International Codevelopment Announcements (n = 270)

Event Windows	Mean Return	Positive: Negative	Portfolio Time Series t	Z-statistic
(+3,+254)	-29.84%	105:159	-9.121***	-2.681**
(+255,+506)	-29.53%	116:139	-9.009***	-0.808
(+507,+758)	-33.04%	101:143	-10.077***	-2.071*
(+759,+1010)	-25.22%	96:125	-7.694***	-1.362
Updated Sample				
(+3,+254)	-24.98%	40:66	-5.529***	-1.716
(+255,+506)	-23.61%	45:59	-5.216***	-0.231
(+507,+758)	-28.88%	37:64	-6.381***	-0.767
(+759,+1010)	-30.73%	42:48	-6.791***	-1.543
Not Updated Sample				
(+3,+254)	-37.10%	65:93	-7.767***	-2.137*
(+255,+506)	-38.14%	71:80	-7.970***	-0.987
(+507,+758)	-38.92%	64:79	-8.133***	-2.307*
(+759,+1010)	-17.20%	54:77	-3.595***	-0.273

Table 4. Latent Growth Analysis of Short-Term and Long-Term Abnormal Returns (Estimates, Significance Levels, And Conclusion)

	Dependent Variable = Intercept				**Dependent Variable = Slope**			
Exchange Conditions	Beta	t-value	p-value	Conclusion	Beta	t-value	p-value	Conclusion
Proprietary Technology	0.086	4.207	0.000	+; sup	0.146	3.245	0.001	+; rej
Alliance Scope	0.024	2.317	0.021	+; sup	-0.073	-2.216	0.027	-; sup
Alliance Concentration	0.063	2.995	0.003	+; sup	-0.250	-4.221	0.000	-; sup
Capabilities Asymmetry	0.005	5.056	0.000	+; sup	-0.165	-3.447	0.001	-; sup
Prior Experience with Partner	0.056	3.226	0.001	+; sup	-0.152	-1.867	0.062	-; sup
Moderation by Location								
Location of Alliance (Offshore)	0.102	7.575	0.000	+	-0.175	-1.845	0.065	-; sup
Location * Proprietary Technology	-0.064	-3.778	0.000	-; sup	0.500	8.584	0.000	+; rej
Location * Alliance Scope	-0.054	-6.804	0.000	-; sup	-0.245	-4.890	0.000	-; sup
Location * Alliance Concentration	-0.044	-2.251	0.024	-; sup	0.037	0.785	0.432	ns
Location * Capabilities Asymmetry	-0.004	-4.483	0.000	-; sup	-0.416	-5.677	0.000	-; sup
Location * Prior Experience	-0.024	-2.069	0.039	-; sup	0.292	6.068	0.000	+; rej
Moderation by Updates								
Positive Updates					0.171	2.009	0.045	+; sup
Positive Updates * Proprietary Technology					-0.034	-0.642	0.521	ns
Positive Updates * Alliance Scope					0.225	5.009	0.000	+; sup
Positive Updates * Alliance Concentration					0.252	5.026	0.000	+; sup
Positive Updates * Capabilities Asymmetry					0.345	4.472	0.000	+; sup
Positive Updates * Prior Experience					-0.117	-1.572	0.116	ns
Control Variables								
Cultural Distance	-0.001	-0.169	0.866	ns	0.055	1.624	0.104	ns
Technological Uncertainty	-0.001	-2.530	0.011	-	-0.185	-5.397	0.000	-
Firm Resources	-0.004	-1.359	0.174	ns	0.383	8.137	0.000	+
Type of Partner	0.003	0.269	0.788	ns	0.012	0.364	0.716	ns
Type of Innovation	-0.014	-1.339	0.180	ns	0.023	0.619	0.536	ns
Domain of the Activity	-0.001	-0.093	0.926	ns	0.145	4.266	0.000	+
Updates Year1					0.239	5.270	0.000	+
Updates Year2					-0.210	-4.103	0.000	-
Updates Year3					-0.077	-2.146	0.032	-
Updates Year4					-0.059	-1.773	0.076	-

NOTE: ns indicates non-significance; sup. indicates supported; rej. indicates rejected.

Appendix A. Sample International Codevelopment Alliance Announcements

"Toshiba Corp (TC) and Sandisk Corp (SD) planned to form a strategic alliance to provide research and development services for 90 nanometer process technology that was to lead to overall increase of supply and improvement in competitiveness of NAND flash memory in Japan. TC's advanced expertise in NAND flash process technology and the multi-level cell technology pioneered by SD was to accelerate the joint development of 90nm process technology and contribute to the early launch of 2Gb and 4Gb MLC NAND flash memory. These chips were to be produced for TC and SD in TC's advanced fabrication production facility at Yokkaichi, Japan under the supervision of FlashVision, a joint venture between TC and SD." [proprietary technology (specific technology name: 1) (licensed technology: 0) (radical innovation: 1)]; [alliance scope (partner involvement: 1/5) (multiple products: 1)] [location (offshore: 1)]

"Abbott Laboratories (AL) and Domantis Ltd. (DL) planned to form a strategic alliance to provide research and development of multiple therapeutic products in the United States and United Kingdom. DL and AL were to collaborate on the identification and optimization of DL's antibodies to the first two undisclosed AL therapeutic targets. The alliance was to provide AL with non-exclusive access to DL's Domain Antibody Technology for use with additional therapeutic targets. Under terms of the agreement, DL was to receive funding for collaborative research or AL's use of the Domain Antibody Technology, and DL was to also receive license fees and development milestones as well as royalties on commercial sales." [proprietary technology (specific technology name: 0) (licensed technology: 1) (radical innovation: 0)]; [alliance scope (partner involvement: 2/5) (multiple products: 1)] [location (offshore; 0)]

Appendix B. Robustness Checks for the Analysis of Abnormal Stock Returns

We conducted several robustness checks. We tested for the presence of outliers, heteroskedasticity, autocorrelation, and multicollinearity. We checked for multivariate outliers by analyzing the Mahalanobis distance and Cook's distance coefficients, the leverage statistic, and studentized residuals. We considered an observation an outlier if the corresponding Mahalanobis distance was more than 31.26 (at 0.001 alpha level, df = 11, where df is the number of independent variables) and/ or Cook's distance was greater than 0.029 (i.e., 4/ [n - k – 1]), where n is the number of cases and k is the number of independent variables. Furthermore, if a case had a leverage statistic over 0.5, we determined that the case had undue leverage and we therefore identified it as an outlier. Outliers were observations with +/- 3.3 standardized residuals (corresponds to 0.001 alpha level). When we repeated the regression after removing observations with large residuals (outliers with potentially undue influence and/or high leverage on the results), the results did not change materially. The White test for heteroskedasticity was not significant (at the 0.05 alpha-level) after we removed outliers, indicating lack of potential heteroskedasticity of residuals. We also examined the plots of the residuals versus fitted values for any patterns of increasing residuals and found no such patterns. We tested for the presence of autocorrelation of errors using the Durbin-Watson statistic and failed to reject the null hypothesis of no autocorrelation in the errors.

Appendix C. Checks for Endogeneity, Unobserved Heterogeneity and Self-Selection Bias

To test for potential endogeneity, we followed the procedure outlined by Raassens et al. (2012). The location of the codevelopment activity reflects the degree of control the focal firm relinquished to its alliance partner. It is possible that firms will design their codevelopment alliances and determine the location of the activity according to the characteristics of the market environment, the partner, or the firm itself. Therefore, we tested for potential endogeneity of this variable. In a first-stage model, we regressed the potentially endogenous variable (i.e., location of the codevelopment activity) on the other variables in our model (i.e., proprietary technology, alliance scope, capabilities asymmetry, prior partner experience, technological uncertainty, cultural distance, alliance concentration, firm resources, type of partner, and type of innovation). As instrumental variables, we used domain of the codevelopment activity,[5] equity participation of partners, geographic distance[6] between the partners, and labor costs in the country in which codevelopment takes place. We then assessed the instruments' relevance. We found support for the validity of our instruments using Sargan's (1958) test ($\chi^2 = 3.881$, $\chi^2 = .227$, both *p*s > .05; respectively for the short-term and long-term returns equations). Durbin-Wu-Hausman tests indicated that endogeneity of the location variable is not an issue in our study ($\chi 2 = 1.139$, $\chi 2 = .314$, both *p*s > .05).

Furthermore, we checked for potential unobserved heterogeneity and self-selection bias (as well as endogeneity) using the Heckman two-step estimation approach (Chen et al. 2009). We collected an additional sample of firm announcements in which the division of labor is

[5] We operationalized domain of the alliance activity as the relatedness of the technology in the alliance to the firm. Consistent with the "relatedness of the investment" (e.g., Koh and Venkatraman 1991) and "resource diversity" (e.g., Cui 2013) measures, we coded a binary variable as 1 if the business description and the first two digits of the SIC industry code of the alliance function were the same as those of the focal firm and 0 if different, with information obtained from the *SDC Platinum Database*.

[6] Ganesan et al. (2005) note that geographic distance influences a firm's mode of communication and therefore the firm's ability to monitor its partner. Given that the focal firms were U.S.-based, we measured geographic distance using a standardized distance score between the capitals of the countries-of-origin of the alliance firms (obtained from http://www.wcrl.ars.usda.gov/cec/java/lat-long.htm).

clear (i.e., one partner is responsible for a set of activities and the other partner is accountable for a complementary set of activities) (Reuer, Zollo and Singh 2002). It is possible that forward-looking firms organize their international codevelopment alliances and decide on the division of the activities, depending on the characteristics of their firms and the country-of-origin of partner firms, for the sake of future returns. In the first stage of the Heckman estimation approach, we estimated a probit model on the choice of division of labor. The inverse Mills ratio λ in the Heckman model serves as the self-selection correction parameter and its significance is indicative of the existence of self-selection bias. We found a non-significant inverse Mills ratio for both the short-term and long-term returns equations (λ = -.265 and λ = -139.1, both *p*s > .05; respectively), indicating that self-selection bias is not a concern. The second stage includes ordinary least squares (OLS) regressions of abnormal returns on the explanatory variables and λ. In the model estimation, we included geographic distance and the labor costs in the partner's country, because these factors may influence a firm's decision to jointly (versus separately) implement development activities. The only variable that influenced the firm's (co)development decision was geographic distance; it exerted a negative effect. This suggests that if partners are remotely located, they choose to conduct development activities independently (as opposed to jointly) by making divisions of labor clear. It is particularly interesting that labor cost (hourly wage compensation) is not a significant determinant of (co)development choice. Therefore, based on our overall Heckman results, we did not find any other unobserved heterogeneity that is not accounted for in our model. Our model yields an unbiased estimate of the effect of international codevelopment on firm value.

Appendix Table A. Summary Statistics

Variable	Categories/ Descriptions	Value
Number of Nations Partner (Parent) Firms are Located		27 countries
Number of Industries of the Alliance		18 industries
	Biotechnology	196 alliances (72.57%)
	Information technology	40 alliances (14.6%)
	Pharmaceuticals	23 alliances (8.5%)
	Telecommunications	11 alliances (4.1%)
Focal Firm Patents	Mean (*)	2376.80 citation-weighted patents
Partner Firm Patents	Mean (*)	1749.09 citation-weighted patents
Firm Receivables	Mean (*)	7140.12 (million $)
Firm Sales	Mean (*)	14549.73 (million $)
Firm Advertising Expenditures	Mean (*)	301.49 (million $)
Firm R&D investments	Mean (*)	1184.22 (million $)
Firm Selling, General, and Administrative Expenses	Mean (*)	3935.05 (million $)
Termination Date	Undisclosed	263 alliances (97.4%)

NOTE: (*) present 10-year average preceding announcement.