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How the alliance pie is split: Value appropriation by each partner in cross-border technology transfer alliances

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ABSTRACT

Almost no academic papers treat a crucial aspect of alliances – the determinants of the *division* of alliance value over the partners. Analyzing a sample of cross-border alliances, technology providing partners increase their share of total alliance returns when accepting riskier forms of compensation. Returns to a partner, and the risk they assume, are shown to be correlated through minimum sales or minimum royalty agreement clauses. Firms with stronger technical capabilities gain more from technology alliances. The bargaining power wielded by each party, while negotiating the structure of an alliance, influences each partner's share of overall alliance benefits.

1. Introduction

Within the large literature on alliance management, how alliances *create* value has been a commonly examined subject, with financial performance, partner satisfaction, or goal attainment as frequently used measures of overall alliance performance (e.g., Jiang & Li, 2008; Merchant, 2005; Geringer & Hebert, 1991; Lunnan & Haugland, 2008; Makino & Delios, 1996; Saxton, 1997). However, there is relatively little published work about how the value created is *divided* among the partners, with the notable exceptions of papers by Adegbesan and Higgins (2010) and Dyer, Singh, and Kale (2008). Also, Luo's (2009) paper on procedural justice in international joint ventures (JVs) found that asymmetries in equity shares produced larger gaps in perceptions of fairness of outcomes between Chinese and foreign partners. Similarly, the notion of "fairness" in alliance relationships has been evoked by Poppo and Zhou (2014), Ariño and Ring (2010) and Luo (2008) in its procedural, interpersonal, and information sharing aspects. But, these address what makes for a fair or healthy alliance relationship, as opposed to the ultimate question about fairness, which is the share of the alliance benefits "pie" that accrues to each partner. Almost no other academic papers explore the crucial subject of relative value appropriation by alliance partners, especially the way we do, by analyzing agreement clauses and other channels of inter-partner compensation flows besides equity shares, such as licensing royalties and lumpsum fees.

The paucity of attention to the *division* of value created through alliances among the partners is surprising because firms enter into alliances not just to create value, but also to appropriate an acceptable fraction of any value created. To examine the determinants of the *division* among the partners of value created through alliances, our research setting is cross-border knowledge transfer alliances, where a multinational firm (we call the "technology supplying partner") has developed a technology whose transfer to a "local partner" in another country creates incremental value in the foreign location (Ozcan & Eisenhardt, 2009). We apply a "Risk-Return" lens to alliance agreement provisions that determine how returns and risks are distributed over the two partners. This, in turn, determines the relative shares captured by the two allies. We define "risk" in finance terms as meaning volatility and uncertainty of benefits accruing to each partner – both up-side and downside. As a general hypothesis, from each partner's viewpoint, accepting a higher share of risk or volatility (of compensation or payments) leads to a desire to appropriate a greater share of alliance value. Some risks borne by each partner depend on factors internal to the alliance, such as the behavior of other partner(s) and agreement provisions that shift risk from one ally to the other (Hsieh, Rodrigues, & Child, 2010). These we can call endogenous risks. For other variables, the share captured by each ally depends on the types of compensation built into the agreement and how the alliance performs in the market for its final product (Hagigi & Sivakumar, 2009; Das & Teng, 1999).

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1.1. How do partners divide up alliance returns between themselves?

A useful lens with which to view how partners appropriate shares of total alliance returns is the bargaining power of each alliance partner, with the hypothesis that greater relative bargaining power will translate into a larger share of alliance value that is appropriated by them. Bargaining power at the time of initial negotiations to form the alliance is a function of the value of the technology supplied by one of the partners in the target market. Bargaining power will also be brought to the negotiating table by the local partner (or "technology receiving partner") aided by their government in some cases, or their own technological capacity, or their own minimum expectations. The relative bargaining power of the negotiating allies will be reflected in the final agreement provisions that may include different compensation channels, such as equity shares and royalties. Different compensation channels have different return/risk profiles, as our Appendix shows. Some agreements have minimum payment provisions which further alter the risk/return profile for each partner. Of course, *ex post*, i.e. once the alliance is under way, both parties often experience changes in their relative bargaining power (Hsieh et al., 2010). The technology receiver (local partner) gains bargaining strength at the expense of the technology provider once they have received the knowledge and capability (Oxley & Wada, 2009; Inkpen & Beamish, 1997). But this is not part of the *initial* alliance formation negotiation – except to the extent that the fear of possible future opportunism may affect the structure of the initial alliance by introducing contractual clauses that restrain the potentially errant party or create a "mutual hostage" situation (Das, 2005; Nooteboom, Berger, & Noorderhaven, 1997; Williamson, 1983). At the outset, let us observe that this study focuses on just the initial alliance agreement, and not on future renegotiation, if any.

Although seldom examined in academic studies, the terms written into an alliance agreement, including the formulae with which each ally will draw its returns, are critical determinants of relative value appropriation (Mellewigt & Das, 2010). A properly conceived agreement incorporates in its provisions the contributions of each party, anticipations of each partner as to compensation or payments to be made, as well as possible risks, future contingencies and possible behavioral choices by the partners. Broadly speaking, there are two types of risk or uncertainty: partner risk and the risk that the market for the final product made by the alliance may differ from initial estimates.

"Partner risk" may be described as changes in partner preferences, resources, capabilities, knowledge, and learning over the course of the relationship. *The anticipation of* these future changes in partner behavior – at the initial negotiations stage – influences alliance governance choices and outcomes (Contractor & Ra, 2002; Hoang & Rothaermel, 2008; Kale & Singh, 2007; Kim & Inkpen, 2005; O'Dwyer & O'Flynn, 2005). We classify risks from partner misbehavior as endogenous risk in the sense that this type of risk relates to internal factors such as choice of partner. We will describe how other agreement provisions shift risk from one ally to the other, depending on compensation formulae and minimum payment terms.

"Market risk" may be described as anticipated or unanticipated changes in the size or value of the market for the final product made by the alliance; the market may turn out to be smaller as or larger than expected. This has important ramifications regarding the relative shares appropriated by the two partners since the compensation drawn by each ally may have different formulae as per their agreement. Returns on equity (generally a share of JV bottom-line profits) and licensing type returns (generally a percentage of revenue) exhibit very different volatilities (or risk in finance theory terms) as a function of actually realized sales of the final output of the alliance (See Appendix).

The same alliance agreement or understanding often results in a markedly different "Return Appropriation-Control-Risk" bundle for each party, depending on future market conditions and partner behavior. While there is an extensive literature on risks in alliances, (e.g., Das, 2005; Li, Eden, Hitt, & Ireland, 2008; Luo, 2007), and papers have focused mainly on performance or mainly on control (e.g., Child & Yan, 1999), negotiators need to take a holistic view by managing risk, return and control simultaneously in how they structure alliances, much as financial professionals do when structuring asset portfolios (Markowitz, 1952).

2. Value appropriation in cross-border technology transfer alliances

The remainder of this paper develops and tests hypotheses about the determinants of the share of alliance value captured by technology providers in cross-border technology alliances, as explained by (1) technology and partner characteristics, (2) host nation mandates, (3) alliance structure and (4) other agreement provisions.

We group variables into four categories (see Fig. 1):

2.1. Technology and partner characteristics

The complexity and tacitness of the knowledge, as well as the technical capabilities of the technology receiving partner, determine the effectiveness of the technology transfer and its value in the assigned marketplace. Weak technical capabilities can reduce the knowledge receiving partner's rent appropriation capacity (Li & Zhou, 2008). On the other hand, a capable partner with strong technical capabilities is also a potentially threatening partner that may engage in a learning race with the original technology supplying partner. Envisaging such a future possibility, during the initial negotiation, a negotiator may seek to structure the agreement by including asset protection strategies and provisions (Hamel, 1991; Lorange & Roos, 1992).

2.2. Host nation mandates

Many governments, such as China, continue to augment the bargaining power of local companies by (implicit or explicit) mandates requiring the sharing of latest technology or by limiting the equity share held by a foreign partner. All else being equal, we hypothesize that local government mandates augment the share of alliance value appropriated by the local partner.

2.3. Alliance structure

The overall value creation as well as its division over the partners will depend on whether the alliance is contractual and/or equity-based, and on any royalty rates agreed upon and the equity shares assigned to each partner (Luo, Shenkar, & Nyaw, 2001; Makhija & Ganesh, 1997; Yan & Gray, 1994).

2.4. Other agreement provisions

The powers and limitations of each ally are also determined by provisions written into agreements. This is not just for non-equity alliances. A little recognized fact, not appreciated until recently in academic literature, is that in almost all equity Joint Ventures (JVs) there is an auxiliary side agreement describing the obligations, limitations, and formulae for revenue and cost streams of the partners *beyond what the simple equity percentage shares held by each side would suggest* (Reuer & Ariño, 2007). In their study of

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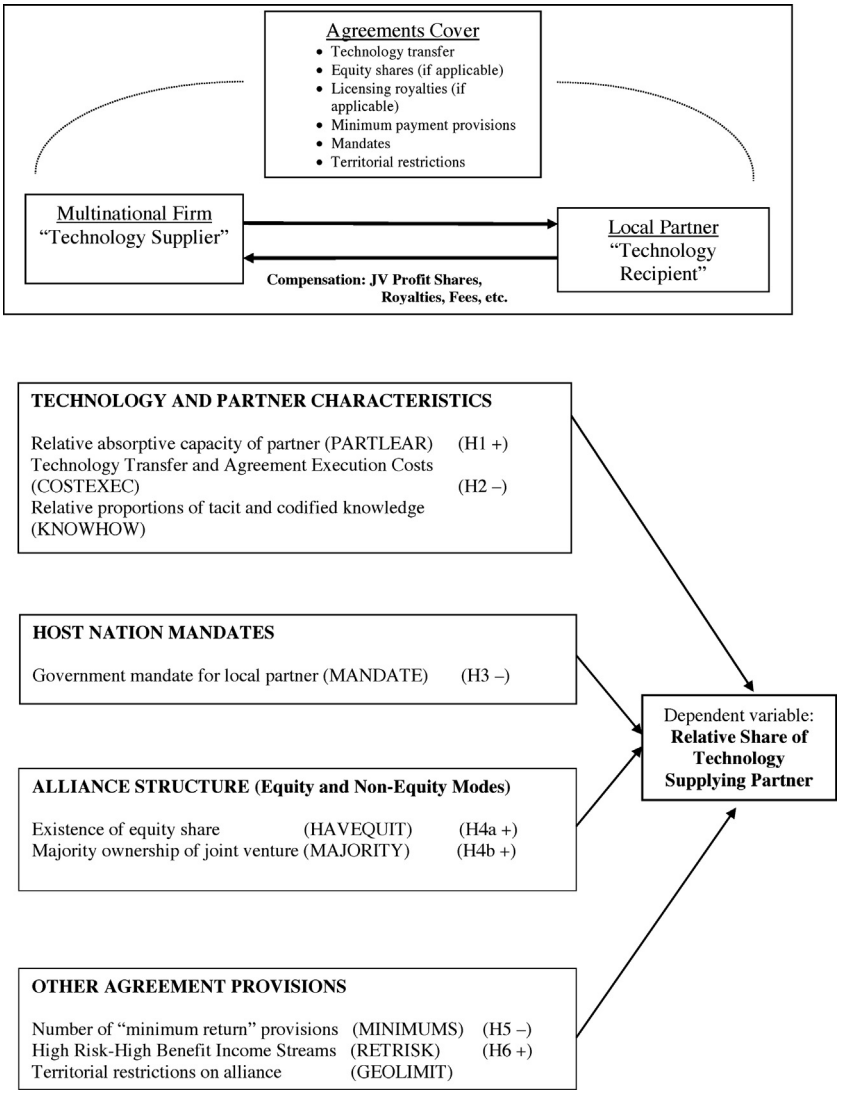

Fig. 1. Model summary (with hypothesized signs for coefficients).

telecommunications industry alliance agreements, Reuer, Ariño, and Mellewigt (2006) found clauses or provisions covering an average of between five and six distinct strategic and operational areas. These auxiliary provisions in the alliance contract can include minimum return guarantees as compensation to the technology supplying partner, or territorial restrictions on the markets/countries in which the alliance is permitted to sell. In general, the distinction between equity and non-equity alliance modes is too neat a dichotomy. Alliances are best understood as hybrid forms that comprise contractual as well as relationship-governed bundles of control, limitation, risk, and compensation elements that are not necessarily allocated evenly across the partners.

3. Hypotheses

3.1. Technology and partner characteristics

The value of knowledge transferred from one location (country) to another is a function of its use in the foreign market which, in turn, significantly depends on the ability of the recipient ally to recognize, digest, assimilate, and integrate the new technology into local operations (Kim & Inkpen, 2005). In Adegbesan and Higgins' (2010) study of pharma-biotech alliances, pharmaceutical partners that have superior absorptive capacity realized a larger percentage of control rights and appropriation of alliance value. Overall, the literature clearly supports the hypothesis that, *ceteris paribus*, the partner with the stronger absorptive capacity (Cohen & Levinthal, 1990), or ability to learn, seems likely to gain more than its partners from a technology alliance. The partner with a stronger learning capacity (Inkpen & Beamish, 1997) can "*...appropriate a higher percentage of the subsequent relational rents...*" (Dyer et al., 2008, p. 140). On the other hand, a poorer absorptive capacity on the part of the technology receiving partner will be reflected in lower bargaining power in the negotiations leading up to the agreement. As Barnhizer (2005) or Yan and Gray (1994) observe, bargaining power is also a function of the alternatives each party can turn to in case the existing negotiations fail. A technology recipient, or local firm that seeks technology, whose absorptive capacity is low also has fewer alternatives, including the alternative of developing a similar technology themselves. Hence they cannot drive as hard a bargain. Setting this down as a hypothesis:

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Hypothesis 1 (H1). *The poorer the technology recipient partner's relative technical capabilities, compared to the technology providing partner, the greater will be the share of alliance value appropriated by the technology providing partner. (Note: The expected sign of the coefficient is positive because of the way the variable is constructed.)*

Regardless of the technology receiving partner's absorptive capacity, all else being equal, some technologies are more complex and hence harder to transfer, and entail high resource costs for the technology supplier. This was indicated in Teece's (1977) dissertation which showed that technology transfer was by no means costless and could entail large costs borne by the technology provider in training their partner, in negotiations and other costs related to the transfer of knowledge. The share of net alliance value appropriated by the technology supplying partner will likely be lower if they have to incur large initial and ongoing transfer costs (which are not necessarily separately compensated, as is the case in our sample). Hence the hypothesis that

Hypothesis 2 (H2). *There will be a negative relationship between the technology transfer and agreement execution costs borne by the technology provider and the share of net alliance value appropriated by them.*

3.2. Control variable: relative proportions of tacit versus codified knowledge

As part of the technology and partner characteristics group we introduce a control variable. How does the *mix* of tacit versus codified knowledge influence the share of total alliance returns realized by the partner supplying the knowledge bundle to the alliance? A firm's resources, such as proprietary knowledge or technology, influences its potential to earn economic rents (Grant, 1991), the more so if the resources are valuable, rare, and difficult to substitute or imitate (Barney, 1991). Corporate knowledge is typically a mix of tacit and codified expertise (Kogut & Zander, 1993). Tacit or "unregistered" knowledge – often called "know-how" – is expertise embedded in the minds of engineers and managers, or in organizational routines and experience. By contrast, patents or other registered intellectual property is, by definition, codified and explicit. The codified portion of the knowledge bundle is much more observable and more easily transferrable to an alliance partner than knowhow. Moreover, knowhow or embedded knowledge is more likely to be both valuable and difficult to imitate or appropriate, without the training and instruction of an alliance partner. Dyer et al. (2008) state that the "*. . .firm in an alliance/network which brings the more critical (i.e., valuable, rare, inimitable) resources to the relationship will appropriate a higher percentage of total relational rents generated from an alliance relationship*" (page 140).

Mellewigt and Das (2010) showed that German telecommunications firms were more likely to select richer and more involved means of technology transfer via equity joint ventures when knowledge resources were tacit or a critical alliance input. These findings reinforce similar results in Kale, Singh, and Perlmutter (2000) as well as Oxley and Wada (2009), who also detail other aspects of equity versus non-equity alliances which we will discuss later.

In sum, one possibility is that tacit or embedded knowledge enhances the bargaining power of the partner supplying technology to the alliance and the greater the proportion of 'knowhow' in the knowledge mix, the technology providing firm will capture a larger share of the overall benefits from the alliance. However, a counter-argument is also plausible, that intellectual property such as patents if transferred to an alliance can sometimes be highly desirable and that therefore it is the codified portion of the technology bundle that confers on the technology supplier the greater bargaining power. Given these opposing views, this is treated as a control variable, with no formal hypothesis stated.

3.3. Host nation mandates favoring the local partner

Despite a general liberalization of investment regimes, government mandates favoring a local alliance partner's negotiation position continue to exist. These can take the form of explicitly stated requirements to share technology with a local partner, or subtle insinuations that the alliance would not receive government orders unless the foreign partner released intellectual property rights to the alliance and/or trained local personnel (Murphy, 2009). Equity investment in certain key sectors where the government wishes to build up local technical capability – for example solar cell or wind turbine technology in China – continues to be restricted in emerging nations, with the result that fully-owned investments are forbidden and a local JV partner is mandated as a condition of entry into the country's market (Lewis, 2007). *Ceteris paribus*, the mandated participation of a local partner strengthens the bargaining power of the local partner. Profits that might otherwise go overseas remain inside national boundaries, and inward technology transfer is expected, lowering the subsequent bargaining power of the foreign ally. Mandated partnerships with national firms are likely to reduce the share of total alliance returns accruing to foreign-based technology providing firms, *ceteris paribus*.

Of course, a local alliance partner always exerts a claim on managerial attention of the foreign partner, and makes a claim on a portion of alliance profits or cash flows – a situation that would not exist in the case of a fully-owned, or unconstrained foreign direct investment. But our sample includes only alliances. We are going to distinguish between alliances where a local partner mandate was *present*, versus where such an external (governmental) mandate was *absent*.[1] This is a more stringent test, since our hypothesis in effect implies that the *presence* of a government mandate confers additional bargaining power on the prospective local partner, compared to an alliance formed in the *absence* of a local partner mandate. Our hypothesis is that

Hypothesis 3 (H3). The *presence of a government mandate, that foreign firms must accept a local partner, will have a negative effect on the share of overall returns from alliances accruing to technology providing firms based outside such nations.*

3.4. Alliance structure

In much of the literature on choosing between equity joint ventures and contractual alliances, alliance structure has been a categorical dependent variable. Such studies have endeavored to predict whether an equity joint venture or a contractual alliance is actually chosen. In this study, we use the presence of equity participation by the technology supplying partner as an explanation for the *share* of alliance value appropriated by them. Similar to Reuer and Ariño (2007) or Adegbesan and Higgins (2010), in our study participation by the technology supplier in an equity joint venture with the technology receiving firm triggers a dummy = 1 (H4a). In a stronger version of the hypothesis (in H4b), the dummy = 1 only if the equity share of the technology supplier is in majority.

[1] MANDATE will be a dummy variable (=1 when a local partner mandate is present, or =0 when the alliance was formed in the absence of any such mandate).

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Compared with contractual alliances involving flat or percentage royalty payments and greater interorganizational distance between the partners, equity JVs are said to afford the investing partner greater interaction, control and participation in the alliance. JVs are supposed also to provide greater commitment and better "incentive alignment" on the part of both allies (compared with non-equity arrangements) – on the assumption that both equity owners have made significant investments and both wish to maximize joint profits (Oxley & Wada, 2009). But this is by no means always the case as illustrated in the Appendix. What the appendix shows is that while equity JVs do generally (if not always) provide higher returns than a technology provider can earn through a contractual agreement, the volatility (i.e., risk) of JV returns is also greater than the more steady and sure returns as licensor. Moreover an equity investment often entails additional capital investment (at risk) which a mere licensor would not have to make. A non-equity licensing type of alliance is more passive and less involved for the technology supplier, compared to an equity JV. On that argument alone – namely assuming a higher risk (volatility of returns) and a larger capital investment that then expects a higher return – one can hypothesize that when equity investment is undertaken by the technology supplying partner, they will seek to appropriate a higher share of alliance value than in the case of a contractual alliance.

Hypothesis 4a (H4a). *When investing in an alliance as an equity partner, the technology providing firm will receive a larger share of returns generated through the alliance, all else being equal.*

The above hypothesis can also be supported by another argument. Unlike a more distant licensing or non-equity arrangement, especially in a *majority*-owned JV, the personnel of the multinational firm (technology supplier) will be deputed to the local alliance organization as engineers, managers and accountants, to help guide and support the technology-receiving partner. They will also act as monitors and watchdogs to constrain the opportunistic proclivities of the local partner. The physical presence of the technology supplying partner's personnel also helps in their appropriation of value.

But is the mere fact of equity participation (operationalized as a dummy = 1 if equity is present) a sufficient indicator of rent appropriation by a technology supplying partner? After all, a minority equity stake may not wield much influence on the decision making of the other ally nor induce sending personnel to the foreign location to co-manage the joint venture. Appendix Fig. B1 suggests that the optimum market penetration or expansion desired by a licensor is axiomatically higher than that of an equity investor.[2] With a minority equity position, where the technology supplier stands to draw the bulk of their overall returns from licensing royalties, the technology supplier (acting as licensor plus minority equity holder) may not be able to force their local technology recipient equity partner to expand the market to the former's optimum level. The local partner may resist because squeezing margins to gain more market share could be suboptimal for them. In such as case, a minority equity stake with an inability to influence the local partner who is in charge, can limit the foreign technology supplier's full appropriability or share of value captured. It is only with a majority equity stake that the technology supplier is more assured of being in charge. Hence a stronger form of Hypothesis 4 would state:

Hypothesis 4b (H4b). When the technology providing firm has a majority equity stake in the alliance, they will receive a larger share of returns generated through the alliance, all else being equal.

3.5. Other agreement provisions

Recent alliance literature, such as Reuer and Ariño (2007), has recognized that insufficient attention was being paid to the details of agreement provisions in alliance contracts, and also that equity joint ventures themselves are typically accompanied by an auxiliary agreement between the JV partners covering issues such as territorial limits, compensation minimums and technology sharing.[3]

A number of alliance agreements include minimum payment clauses (Bhattacharya & Lafontaine, 1995; Contractor, 1986). In our research setting this would mean cases where a minimum return, or floor compensation (in the form of minimum sales requirements or minimum royalties), is assured to the multinational partner supplying technology to the alliance. In effect, this amounts to partial risk-shifting between the allies: contractual minimum guarantees on returns earned by the technology providing partner lead, *ipso facto*, to the technology recipient ally accepting greater payment risk, while lowering the compensation risk of the technology supplier. An analogy can be made from the finance field. Holders of debt instruments or bonds are content to accept a lower rate of return, compared to equity investments, because bond interest is a more assured income stream compared with returns on equity. Equity investors expect – and generally get – higher returns than from bonds because of greater volatility, and uncertainty of returns (including much greater downside risk). This can be seen in the Appendix where the returns from JV investments can be higher, but also lower, than from licensing royalties and lumpsum fees.

Just as the bond holder is content to accept a lower but more assured return than the equity investor, if the usual tradeoff between return and risk also holds in the case of agreement provisions that assure a minimum compensation, or floor return, then a reduction of uncertainty or risk for the technology provider should correlate with a lower return for them, and a lower share in alliance value, *ceteris paribus*. Hence our hypothesis that

Hypothesis 5 (H5). *The presence in the alliance agreement of contractual minimum compensation or returns for the technology providing firm will lead to a lower overall share of alliance value appropriated by the technology providing firm.*

Our survey responses allow us to identify the different types of compensation streams available to the technology provider. For example, we gathered information about the share of alliance benefits technology providing partners received through lump sum payments, royalties, dividends, markups on sales to and from an alliance, and future technology improvements. Using this information, we introduce an *Index of Overall Volatility of the combined compensation* streams earned by the technology provider, to test the hypothesis that for the technology providing partner, greater volatility in their *overall* compensation package (as written into the agreement during the negotiations) the larger will be their share of alliance value. Several studies, including Hsieh et al.

[2] In simple terms this is because royalties are linked to sales revenue (which are greater with greater market penetration) as opposed to a share of the bottom line of the JV's profit. Which is just to say that sales maximization is not the same as profit maximization.

[3] In part, this was because the details of alliance agreements are confidential and such agreement-specific data hard to obtain. Most empirical work in the alliance field has drawn from publicly available synopses compiled from news announcements by agencies like SDC Corporation or Bureau Van Dijk, which necessarily lack the fine detail about agreement provisions. We were not able to scrutinize agreements directly in this study, but our survey asked questions about agreement provisions.

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(2010) confirm that an equity stake in a Joint Venture (JV) is the least certain return on investment in an alliance because returns are drawn from bottom-line profits, if any, earned by the JV. But an equity stake is also potentially the most rewarding in terms of up-side market growth – as illustrated in the modeling shown in the Appendix. By contrast, if the technology supplier earns returns in the form of royalties, or lump-sum fees, their return is less volatile, but also typically lower than the total earning from an equity stake – as illustrated in the Appendix. We hypothesize that acceptance of higher compensation risk by the technology supplier will correlate with a higher share of alliance value captured by them.

Hypothesis 6 (H6). *A higher risk (i.e.: more volatile) 'portfolio' of compensation streams for the technology providing firm (as written into the agreement) will lead to a higher overall share of alliance value appropriated by the technology providing firm.*

3.6. Control variable: territorial restrictions on alliance

The recent more detailed examinations of alliance agreement provisions have revealed that each alliance is a bundle of rights, obligations, as well as contractual limitations (e.g., Ariño and Ring, 2010, or Kale & Singh, 2009, or Ariño & Reuer, 2004). In cross-border alliances, a common limitation is to restrict the territory, or countries, in which the alliance (or the local partner) is allowed to sell – in short, a geographic limit on sales or operations as stated in the agreement. How the presence of territorial limits affects the *share* of alliance value captured by the technology provider has no empirical antecedents in the literature. Based on *a priori* reasoning, following the theory of the discriminating monopolist (e.g., Wright, 1965) we can see that a technology owner maximizes worldwide returns on their technology by dividing the world into many discrete markets not subject to arbitrage, with each territory tightly assigned to each ally. But, here we are not treating worldwide income of the technology rights holder, instead focusing on the share it appropriates in each individual alliance arrangement. *A priori* reasoning offers alternative views. On the one hand, restricting the territory of the technology receiving partner lowers their potential earnings, and consequently what they can share out of that with the multinational technology provider. At the same time, the fact that such a limitation was agreed to by the recipient suggests strong bargaining power on the part of the technology provider and significant anticipated value for the technology by end-product market customers in the assigned country which, *ceteris paribus*, should positively correlate with the technology provider appropriating a larger share of alliance value. Thus, the presence or absence of territorial restrictions has been incorporated only as a control variable in the analysis that follows.

4. Methodology

4.1. Sample and data

The sample consists of US-based partners supplying manufacturing technology to foreign alliance partners under various arrangements including licensing agreements, and in some cases also including supply chain relationships and/or an equity joint venture. We excluded alliances focused solely on joint R&D and alliances focused solely on marketing. Technology that had already been commercialized, or was close to that goal, was the focus of the data collection efforts. A six page questionnaire went through three rounds of pre-testing and revisions before the final version was sent to the US technology provider partners who had shared their technology with foreign allies. The 'respondents' to our questionnaire were executives, engineers, or other personnel who had been an intimate part of the negotiations that led to the formation of the alliance. Our questionnaire specifically asked respondents to focus on structural issues at the time of the initial negotiation that set up the alliance agreement.

Out of 141 responses, many were eliminated because the respondents did not choose an international alliance or, despite our instructions, did not respond with a manufacturing technology alliance. Finally, because of the conservative approach of 'listwise' deletion of cases with missing values the sample size was reduced to 105 cases for all statistical analyses in this paper.

There are a variety of alliance types, ranging from pure licensing deals, to supply chain relationships, and equity joint ventures. All alliances in the sample, including those with supply chain relationships and joint ventures, have an auxiliary licensing agreement between the parties. However, it is important to recognize that, in the case of equity joint ventures, especially majority JVs, the licensing portion of the alliance link can become minor and subordinate to the equity investment, as the data does clearly indicate.[4] Some joint venture alliances also include trade (buying or selling components or finished products) between the partners, earning profit markups on each trade. Such multiple or hybrid arrangements are common in practice. Checks for internal consistency inserted into the questionnaire showed that respondent accuracy was consistent in over 98% of all cases[5] (Tables 1 and 2).

4.2. Variables and measures

The dependent variable (DIVBEN) was measured through a question asking survey respondents to estimate the total *share* of all alliance value or profit generated that was expected to accrue to the technology providing firm, as opposed to their alliance partner (the technology recipient firm). Responses were coded as integers that represented proportional values, with end points of 0 (meaning 0% or nothing went to the technology providing firm) and 100 (meaning 100% or all value or profit generated went to the technology providing firm).[6]

KNOWHOW measures the percentage of the technology bundle supplied to the alliance that was tacit, as opposed to codified or registered intellectual property. The relative technical capabilities of the partners (PARTLEAR) was measured on a 5-item Likert scale, with a value of 1 signaling stronger technical capabilities for the local alliance partner than for the technology providing firm, 3 signaling a partner with comparable technical capabilities to the technology providing firm, and 5 signaling a partner with weaker technical capabilities than the technology providing firm.

COSTEXEC was measured by asking respondents in the multinational company to rate the percentage of total agreement implementation costs accounted for by agreement execution, such as the cost of training their alliance partner, expenses related to negotiations, travel expenses, legal fees, and other costs directly related to the alliance or licensing agreement. We can describe these as the costs incurred by the technology supplying partner to

[4] In equity joint ventures (JVs) auxiliary licensing contracts are commonly undertaken and provide a significant (and lower-volatility) additional revenue element for the technology provider.

[5] By asking for the same information in another part of the questionnaire, in a different manner, one can cross-check responses to help gauge respondent care and accuracy in answering questions.

[6] While not a precise measure of the division of benefits across the partners, better data are simply not available. A criticism of many empirical studies in the entire alliance field has been that similar data were not gathered from respondents in the partner firms. But this is usually not feasible, except in case studies, and the alliance field has nevertheless been advanced by numerous studies that rely on responses from one partner.

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Table 1
Variables and their measures.

Variable	Measurement scale
DIVBEN (dependent)	The proportion of total benefits generated through a specific cross-border alliance that accrued to the technology providing alliance partner
COSTEXEC	Percentage of implementation costs accounted for by agreement execution costs. Examples include negotiations, travel, legal fees, subsequent training, and other costs directly related to the alliance/license agreement
GEOLIMIT	If there were territorial restrictions on where the alliance could operate, or where the technology *receiving* firm could use the acquired technology, then GEOLIMIT = 1; otherwise, GEOLIMIT = 0
MAJORITY	If the equity share of the technology providing firm is greater than 50%, then MAJORITY = 1; otherwise, MAJORITY = 0
MANDATE	Respondents ranked 11 possible motivations for entering into a specific alliance. If "Local partner mandated by the host nation" was responded to with a score of 3 or higher, on a scale of 0–5, with a coding of "5" meaning "most important motivation", then MANDATE = 1; otherwise MANDATE = 0
HAVEQUIT	If the technology providing firm has an equity share of greater than zero, then HAVEQUIT = 1; otherwise HAVEQUIT = 0
KNOWHOW	Percentage of technology value accounted for by unregistered knowledge and expertise, as opposed to registered intellectual property. For example, KNOWHOW = 0 means that registered intellectual property was the only knowledge-related component of technology transfer. KNOWHOW = 100 means that unregistered knowledge and expertise accounted for all knowledge-related value shared with the alliance partner
PARTLEAR	PARTLEAR = 1 signals higher technical capability for the alliance partner than the technology providing firm;PARTLEAR = 3 signals rough equality in technical capability;PARTLEAR = 5 signals a partner with poorer technical capability than the technology providing firm
RETRISK	If [BENDIV + BENMARK + BENTECH]–[BENROY + BENLUMP] > 0, then RETRISK = 1; otherwise RETRISK = 0
Elements of RETRISK	The elements of RETRISK measure the proportion of returns from the alliance realized by the technology providing firm, accounted for by each of dividends (BENDIV), mark-ups on trade between the alliance and the technology provider (BENMARK), lump sum payments (BENLUMP), improvements in technology (BENTECH), and royalties (BENROY)
MINIMUMS	MINIMUMS = MINROY + MINSALES
Elements of MINIMUMS	If minimum royalties are payable to the technology providing firm, then MINROY = 1; otherwise, MINROY = 0.If minimum sales requirements exist, then MINSALES = 1; otherwise, MINSALES = 0.

establish the alliance at the initial stage (as opposed to subsequent opportunity or consequential costs such as lost sales from creating a competitor or vacating a market because of partner competition). In short, COSTEXEC measures the unavoidable costs incurred by the technology provider which occur mainly at the inception of an alliance and are relatively easy to anticipate.

MANDATE is a dummy variable that assumes the value of 1 if the host nation mandate to accept a local partner was an important driving factor. HAVEQUIT assumes the value of 1 if the technology provider participated in the equity of the alliance company as a shareholder. (Note that this encompasses both a small minority stake, as well as a majority JV equity stake). MAJORITY takes a value of 1 when the technology providing firm has a greater than 50% share of equity, and it is coded as 0 for all other cases.

MINIMUMS measures the sum total of "minimum return" requirements written into the alliance agreement, with minimum sales (MINSALES) and minimum royalties (MINROY) as the two potential "minimum return" requirements which survey respondents were asked about. Thus, MINIMUMS will have a value of "0" when neither minimum sales nor minimum royalties are present, a value of "1" when either minimum sales or minimum royalties exist, and a value of "2" when both minimum sales and minimum royalties are part of the alliance agreement. GEOLIMIT = 1 when there are territorial restrictions on where the alliance can operate or where the technology recipient partner can use technology contributed through the alliance; GEOLIMIT = 0 when such territorial restrictions do not exist.

Finally, we constructed an *Index of Overall Compensation Volatility and Uncertainty* for the multinational firm acting as technology supplier to the alliance. One of the key hypotheses of this study is that higher compensation volatility correlates with a higher share of alliance value. RETRISK serves as an index of the combined overall volatility of different forms of compensation received by the technology supplier. Allies that provide knowledge or technology to a partner seek compensation or benefits from five sources: (i) technology improvements made by the alliance or partner and fed back to the original technology developer (this is relatively infrequent and very uncertain), (ii) dividends and returns on an equity stake (if applicable), (iii) supply chain markups or incremental profit margins earned on trade (of finished product or intermediate inputs) with the partner or alliance, (iv) royalties earned on product sales of the alliance, and (v) lumpsum payments contractually paid to the technology provider by the technology recipient.

Notice that compensation elements (i) through (v) above are rank-ordered in descending order of uncertainty and volatility. Dividends and return on equity, as well as future technology improvements are the most volatile, and least certain, compensation

Table 2
Pearson correlations and descriptive statistics.

	Min	Max	Mean	SD	1	2	3	4	5	6	7	8	9	10
1 – DIVBEN	0	100	36.16	25.25	1									
2 – PARTLEAR	1	5	3.34	1.055	0.20*	1								
3 – COSTEXEC	1	100	58.63	35.15	−0.26*	0.03	1							
4 – KNOWHOW	0	100	45.65	30.95	0.05	0.15	0.07	1						
5 – MANDATE	0	1	0.27	0.44	−0.06	0.11	0.01	0.33*	1					
6 – HAVEQUIT	0	1	0.47	0.50	0.33*	0.08	−0.15	0.28*	0.26*	1				
7 – MAJORITY	0	1	0.13	0.34	0.30*	0.17	0.13	0.17	0.14	0.42*	1			
8 – MINIMUMS	0	2	0.51	0.77	−0.29*	0.04	0.06	−0.21*	−0.07	−0.45*	−0.23*	1		
9 – GEOLIMIT	0	1	0.66	0.48	0.29*	0.12	−0.01	0.12	0.12	0.08	0.05	0.12	1	
10 – RETRISK	0	1	0.39	0.49	0.39*	0.07	−0.18	0.23*	0.22*	0.54*	0.26*	−0.23*	0.09	1

$N = 105$.
* Correlation is significant at the .05 level or better (two-tailed).
[&]Spearman's RHO was also carried out. Results for both the Pearson and Spearman tests are highly consistent, with no correlation shifting from being statistically significant to insignificant, or vice versa, and with all significant correlations retaining the same sign for both methods of calculating correlations.

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Table 3
Summary of regression results^.

	Sources of risk or volatility of returns to technology providing partner	Hypothesis	Model 1 ß (*t*)	Model 2[@] ß (*t*) all variables
Constant			32.57 (5.25)***	24.61 (2.98)**
PARTLEAR	Relative Partner Technical Capabilities	H1 (+) → Yes	##	0.16 (1.99)*
COSTEXEC	Complexity of Technology Transfer	H2 (−) → Yes	−0.25 (−2.90)**	−0.22 (−2.64)**
KNOWHOW	Tacit versus Explicit Knowledge	Control variable	0.08 (0.17)	−0.08 (−0.94)
MANDATE	Exogenous (Government Mandates)	H3 (−) → Yes	−0.18 (−1.99)*	−0.19 (−2.25)*
HAVEQUIT	Returns on equity investment exhibit greatest volatility compared with other types of compensation (see Appendix)	H4a (+) → No	0.22 (2.20)*	−0.00 (−0.01)
MAJORITY		H4b (+) → Yes	0.25 (2.68)**	0.20 (2.26)*
MINIMUMS	Agreement Provisions/Risk Shifting	H5 (−) → Yes	##	−0.24 (−2.66)**
GEOLIMIT	Agreement Provision Limiting Territory	Control variable	0.29 (3.37)**	0.30 (3.71)***
RETRISK	Mix of Compensation Types in Agreement/Risk Shifting	H6 (+) → Yes	##	0.27 (2.86)**
F-value			7.28***	7.64***
Adj. R-squared value			0.27	0.37

N=105; †$p < 0.10$.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.
All significance levels are based on two-tailed tests.
^Standardized coefficients are given for all variables, except for "Constant".
Variable not included in Model 1.
@ Results from dropping HAVEQUIT out of Model 2, and re-running regressions, are essentially identical to those reported here, both for the model as a whole and for individual variables.

elements. Profit margins earned from intra-partner component or product trade are also uncertain as unit prices and quantities are subject to frequent renegotiation and are rarely specified in the alliance agreement (because designs change over time and supply chain volume fluctuates depending on final market demand). By contrast, royalty rates are specified for the duration of the alliance agreement and are axiomatically less volatile than equity dividends (as detailed in the Appendix). A lumpsum is the least volatile type of compensation because a lumpsum payment is usually contractually due to be paid at the inception of an agreement.

RETRISK is an index of overall volatility of returns or benefits accruing to the technology supplying partner, consisting of five benefit streams, each with different volatility or uncertainty. These are grouped into two categories: relatively *high* volatility benefit streams (BENDIV, BENMARK and BENTECH) and relatively *low* volatility benefit streams (BENROY) and (BENLUMP). Each of the "BEN____" variables is a percentage (*all five adding up to 100%*) as a response to the question, "*Please estimate the value of your company's overall expected returns or benefits from the alliance agreement*...". That is to say, the respondent estimated the percentage of overall benefits received from (i) dividends, (ii) supply chain markups, (iii) feedback of technical improvements, (iv) royalties and (v) lumpsum payments.

RETRISK hence is an index of high or low volatility (or uncertainty) of returns and benefits earned by the technology providing partner and is calculated as [(BENDIV + BENMARK + BENTECH)]–[BENROY + BENLUMP]. The higher the value for RETRISK, the greater the overall volatility and uncertainty of returns for the technology provider.[7] Finally, RETRISK was coded as a dummy variable equal to "1" when the raw index value was greater than zero, and "0" otherwise.

[7] This is an exploratory study that introduces a novel index of compensation volatility that depicts the amount of risk being taken on board by each partner. Several alternate specifications were tried for this index, as detailed in the discussion. Moreover, RETRISK functions better statistically than any of its five subcomponents loaded individually which reinforces our a priori thinking in constructing the index. RETRISK serves quite well as an index of overall volatility in compensation streams.

5. Findings and discussion

Table 3 presents multiple linear regression results for DIVBEN for two different models. Model 1 includes several variables which have been used in prior alliance literature. Model 2 adds three more variables that have no or almost no prior empirical record; PARTLEAR, MINIMUMS, and RETRISK were not included in Model 1 because of their relative novelty and also to see what explanatory power they would add in Model 2. Two of these (MINIMUMS and RETRISK) specifically focus on the shifting of risk from one partner to another. Moreover, these two variables also add considerable explanatory power. We will elaborate on this later.

Both models are robust in their significance, with *F* values significant at lower than 0.001, plus there is a notable degree of consistency in the findings for individual variables used in both models. Results for individual variables are mostly stable in their significance and sign across both models tested, except for two variables that will be discussed further below. Variance inflation factors (VIFs) did not rise above 1.96 for any coefficient in either model for which results are reported, which suggests that multicollinearity was not likely to have influenced the findings. With a higher adjusted *R* squared value and a higher *F* value, Model 2 seems better than Model 1 at predicting values of the dependent variable (DIVBEN).

Hypothesis 1, that the poorer the technology-receiving partner's technical capabilities (relative to the technology supplying ally), the greater will be the share of alliance value appropriated by the technology supplying partner, was supported at the 0.05 level in Model 2 by the findings for PARTLEAR. (The expected sign of the coefficient is positive only because of the way the variable is constructed.) This finding is consistent with a proposition in the theory paper by Dyer et al. (2008) and echoes the empirical finding by Adegbesan and Higgins (2010) that the partner with superior absorptive capacity got to exercise greater control in the alliance and enjoyed a higher appropriation of benefits. The results for PARTLEAR also indirectly reinforce Hamel (1991) that the partner with better developed absorptive capacity wins the "learning race".

Hypothesis 2 has the expected significance and negative sign in both models (for COSTEXEC), supporting the idea that technology

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transfers can entail substantial resource costs for the technology provider (Teece, 1977) and that, other things being equal, the higher the transfer costs borne by the technology supplier,[8] the lower their share in net benefits appropriated from the alliance.

The KNOWHOW variable was not significant. An *ex post* explanation for the lack of significance for this variable could be that KNOWHOW was measured here as the *proportion* of tacit and uncodified knowledge in the technology bundle supplied to the alliance – versus codified and registered intellectual property. However, with continued improvements in the enforcement of intellectual property (IP) laws worldwide and the increasing codification of corporate knowledge that is taking place, the value of IP and codified knowledge in international technology transfers is increasing. If both codified and tacit knowledge are becoming roughly equal in value to an ally, or are unpredictable in their relative value, then their relative proportion will not be a significant explanation for the capture of value by the technology providing partner.

MANDATE has the expected sign (negative) and is significant in both models (at $p \leq 0.05$). Thus, government mandates, as anticipated, seem to increase the bargaining power of potential local partners by forcing inter-partner technology transfer, and lead to a smaller share of total alliance returns accruing to a foreign-based technology providing alliance partner. Thus, findings for MANDATE suggest the efficacy of a specific source of bargaining power, i.e., governments that favor a local partner, which works against foreign firms owning technology.

The weak form of the hypothesis for equity participation (namely Hypothesis 4a) using HAVEQUIT as a variable only finds significance in Model 1, and is non-significant in Model 2. Recall that HAVEQUIT is a dummy variable that signals the presence or absence of equity investment by the technology supplier. But their equity participation could be small, merely a minority stake, an investment in the alliance that is often more symbolic than operationally significant.

While HAVEQUIT signals the presence of both a minority as well as majority equity stake, the variable MAJORITY is explicitly triggered only when the technology provider holds a majority stake. This stronger form of the hypothesis (4b) is supported in both models. The contrast between results for HAVEQUIT and MAJORITY suggest that it is only with a majority equity stake that the technology provider appropriates a higher share of alliance value. This finding affirms prior literature (e.g., Oxley & Wada, 2009) that a higher appropriation is expected when an ally makes a significant (as opposed to symbolic or minority) equity investment, commits additional resources such as managers and engineers on an ongoing basis, assumes greater control of the alliance, and (as detailed in the algebraic Appendix) accepts higher risk or volatility in expected returns.

Incidentally, since both HAVEQUIT and MAJORITY deal with equity investment in a JV alliance, there may be reason to fear multicollinearity between the two, and other explanatory variables. But, multicollinearity was not a problem. The variance inflation factor for HAVEQUIT increases from 1.40 for Model 1 to 1.96 for Model 2, which suggests an increase in the amount of collinearity between HAVEQUIT and other variables. Still, the increase of VIF from Model 1 to Model 2 was not particularly large and VIFs are not usually considered problematic until they are higher than 10 (Kennedy, 1991).[9]

Model 1 in Table 3 excludes novel variables that have not been tested in past studies: MINIMUMS, RETRISK and PARTLEAR which mainly relate to endogenous risk, in the sense that they relate to considerations internal to the alliance, such as partner behavior, learning and agreement provisions that shift risk (volatility of returns) from one ally to the other. We wished to see what explanatory power these variables would add in Model 2. (Indeed, the adjusted *R*-squared value rises by 0.1.) We know from past alliance studies such as Bhattacharya and Lafontaine (1995) that minimum payment clauses are not uncommon in agreements. But they did not test its effect. The findings here support Hypothesis 5, with the coefficient for MINIMUMS having the expected negative sign and level of significance in Model 2 ($p = 0.01$). With a minimum assured return to the technology provider, their risk in the alliance is reduced. Just as a bondholder is content to accept a lower rate of return compared to equity investors who expect a higher return, agreement provisions that give greater assurance of a minimum guaranteed return to the technology supplier then make them content to accept a lower compensation share. By the same token, the local partner's risk is then increased because they have made a contractual commitment to pay compensation even if local market conditions do not make the alliance product profitable. *Ceteris paribus*, in such cases their expected share of alliance value would be greater.

Finally, the coefficients for GEOLIMIT are positive and strongly significant, suggesting that the presence of territorial limits on the alliance's operations is accompanied by a higher share appropriated by the technology provider. It goes without saying that, during the negotiations process, the prospective local partner is reluctant to have their possible sales territories restricted. However, technology owners who have highly valuable technology, with worldwide application, will often follow the dictum of Discriminating Monopolist Theory (Wright, 1965) that worldwide sales and profits are maximized by segmenting country markets into many discrete units that are not subject to arbitrage. Hence the tentative conclusion that the existence of a clause restricting the technology recipient's territory in the alliance agreement signals high bargaining power on the part of the technology provider, a power that translates into a higher appropriation of net value.

RETRISK is a categorical dummy variable or index of the expected *overall volatility and uncertainty* of compensation streams accruing to the technology provider as structured in the agreement. With the coefficient for RETRISK having the expected sign (positive) and level of significance in Model 2 ($p = 0.01$), this finding suggests that technology providing firms receive a larger share of the alliance value when the bulk of the benefits they receive from the alliance accrue through relatively high volatility or "higher risk" channels. Taken together, findings for both RETRISK and MINIMUMS are consistent with the oft-repeated axiom from financial theory that greater returns go with accepting greater risk. This also echoes the algebraic models in the Appendix that show that while returns from equity investment in a JV are typically higher, they are also more volatile than compensation elements such as royalties that are linked to output volume or sales.

5.1. Robustness tests

To test the degree to which results were robust, a number of steps were undertaken. To begin, regressions were re-done after censoring cases with values of DIVBEN that were 5% or lower (four cases withheld, $N = 101$), and then re-done (again) after re-inserting cases with low DIVBEN values and censoring cases with values of DIVBEN of 95% or higher (10 cases withheld, $N = 95$). The overall results were very similar for Models 1 and 2 in all cases. (The only noteworthy exception is that MANDATE became

[8] These are costs not separately reimbursed to the technology supplier.

[9] In other modeling not reported here HAVEQUIT was sensitive to model specification, and not statistically significant. By contrast, all other variables are highly stable across the various models tested, including RETRISK, MINIMUMS, and even MAJORITY, with which HAVEQUIT seems most collinear.

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insignificant in some regressions that were re-run with extremely low or high DIVBEN values removed from the analysis.) The results were still congruent with the hypothesis but the *p*-values for the coefficients for MANDATE were somewhat above the usual 0.05 cutoff value.

As a further test of the reliability of the results, and to test one of the measures of risk/return tradeoffs (RETRISK), the same regressions given in Model 2 were run, except that the raw, unadjusted total generated by carrying out the calculation for "BENDIV + BENMARK + BENTECH–BENROY–BENLUMP" was substituted in place of RETRISK. Results for the "raw", unaltered calculation used to derive RETRISK were very similar to the reported results for Model 2, with the proviso that the *p*-value for the coefficient for PARTLEAR shifts to just over the other side of statistical significance, into non-significance. Given the 0.90 Pearson correlation coefficient between RETRISK and the "raw" result of the calculation used to determine RETRISK, the similarity in regression results is not surprising.

In addition, the five individual elements of RETRISK were entered in place of RETRISK and tested one after another (BENDIV, BENMARK, ...), with two noteworthy results. First, the overall model results and results for variables other than RETRISK were highly similar when each of the elements of RETRISK was used as a replacement for RETRISK. And yet, RETRISK produced more robust statistical results than any of the elements of RETRISK used as a replacement for RETRISK; overall, the statistical results for these substitutions for RETRISK suggest that RETRISK may be a better measure of risk/return tradeoffs agreed to by the partners than its constituent elements. The same testing was done for the elements of MINIMUMS, with the same result that MINIMUMS produced more robust statistical results than either of the two measures (MINROY, MINSALES) used to derive MINIMUMS. In addition to providing further support for the validity of findings being reported here, findings for alternative measures of risk/return tradeoffs are interesting in their own right, for both practical and theoretical reasons; possible meanings of these results are explored in greater detail in Section 6.

The key inference to draw from tests of the robustness of the reported findings is that on an overall basis results are quite stable, even when data are withheld and when alternative measures and model specifications are tested, for key independent variables.

6. Conclusions, future research directions and managerial relevance

The key question this paper examines is the determinants of the *division* of alliance value among the partners. This is an important and frequently discussed issue, and yet it remains an empirically seldom examined question. Findings presented here for MAJORITY and MANDATE suggest that bargaining power (at the initial alliance formation negotiation[10]) exercises an important influence on partner shares of alliance returns, which is as expected. Our use of the term "bargaining power" refers only to the alliance agreement when it was initially negotiated and formed. Local mandates supported by the local government augment the bargaining power of the local partner and reduce the share of value appropriated by the foreign technology supplying partner, while majority share ownership in JVs confers control on the foreign partner that enables it to appropriate a higher share. Also, when a technology recipient partner has inferior technical capabilities to the technology provider, the technology provider captures a larger share of value created through the alliance. Findings for COSTEXEC suggest that more complex technologies require greater technology transfer costs borne by the technology provider. These higher, unreimbursed costs act as a larger set-off against the compensation received by the technology supplier, and thus reduce the total share of value generated through the alliance appropriated by the technology provider.

As well, the findings suggest that negotiators make tradeoffs between risk and return in how they structure the overall compensation each partner receives. The appendix shows how joint ventures entail equity capital investment at risk (unlike licensing where no investment is made by the licensor). In addition, especially in majority JVs, there is a large capital investment and human resource commitment, with the multinational company's expatriate and other personnel deputed to run the venture. Finally, we see from the appendices that JV profits are axiomatically more volatile and uncertain compared with contractually more assured royalties. Moreover, the formula linking royalty payments to sales achieved is not subject to a recurring joint decision between allies, being contractually specified in the agreement – unlike dividend versus retained earnings decisions which have to be mutually discussed for each of the future years of the venture. Since all the individual and aggregated measures of risk/return tradeoffs in this study were strongly and consistently statistically significant, with the signs of coefficients as expected, we conclude that alliance negotiators are aware of the relative levels of risk associated with different compensation streams when designing alliance agreement provisions.

Thus, the findings suggest that alliance negotiators think holistically in terms of bargaining power, and risk (volatility) versus return terms when structuring alliance agreements. The bargaining power measures used in this study (MAJORITY, MANDATE) and measures of risk/return tradeoffs (RETRISK, MINIMUMS) have four out of the five highest standardized coefficients in Model 2 (seen in Table 3); only GEOLIMIT has a higher standardized coefficient.[11] And, the standardized coefficients for each of these two types of variables suggest that risk/return tradeoffs and bargaining power exercise a broadly similar level of influence on the share of alliance returns accruing to each partner.

This study's findings reinforce the small amount of recent research that has dissected contractual terms in alliances (Reuer & Ariño, 2007; Faems, Janssens, Madhok, & Looy, 2008) which have a strong influence on risk and return. Since side contracts routinely exist in alliances (even those which some academics have labeled as pure JVs), a study of contractual terms can only lead to a more robust and more practically relevant research literature about alliances.

This study's focus on the *division* of alliance value over the partners has been empirically investigated in only one previous study (Adegbesan & Higgins, 2010), which is surprising since the objective of any alliance is to not only create synergistic value, but for each partner to extract a reasonable share thereof for themselves. We also introduced new independent variables that address important and under-researched issues. The findings are stable and consistent across numerous model specifications.

[10] Given that variables are often measured on different scales, standardizing coefficients makes comparisons of their relative influence on a dependent variable much easier to carry out.

[11] A local government mandate that forces or cajoles the foreign firm to work with a local partner (MANDATE) is a variable that can clearly be classified as exogenous, in the sense that it is a condition imposed from outside. Recall that MANDATE is a dummy variable, signifying the *presence* (=1) versus *absence* (=0) of local government mandates. In this paper we posit that the *presence* of a local partner mandates confers additional bargaining power on the local partner and reduces the share of alliance value captured by the foreign technology provider – compared to situations where an alliance was formed in the *absence* of a local partner mandate. The results in both models confirm this hypothesis.

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6.1. Future research directions

Some possible "next steps" could be to further refine key measures used in this study, to broaden the samples for which testing is done to different kinds of alliances, and to more deeply explore potential contextual influences on partner shares of total alliance returns, such as culture, country risk, technology-specific trends, and industry-specific considerations. The nuances of the finding that inferior technical capability of a partner reduces their share of value captured needs further investigation. In such a case is the capability for opportunism on the part of the technology receiving partner lower, do they have a lower ability to leverage the received technology for other endeavors, or are they more dependent on continuing future help from the technology supplying partner? Or are they merely a local partner with less power at the negotiating table? As another suggestion for further investigation, it would be desirable to study the relationship between exogenous or market risks, later renegotiated changes to the terms of alliance agreements, and the influence of such changes on value appropriation by the partners.[12]

6.2. Managerial relevance

Alliances are "hybrids." Not only do they entail inter-organizational cooperation, but the agreement, or "structure", of each alliance is a mix of disparate elements that have to be negotiated: royalty rates, equity shares in JVs, territorial or geographic limits, minimum payment guarantees for the partner supplying technology, how to incorporate any relevant host government mandates, technology transfer, etc. At the negotiating table, over all of these issues hangs the big unknown of how the product quantity or output of the alliance will fare in the marketplace.

What this paper has tried to show, to both academics and practitioners, is that the share of alliance value earned by a partner – in this case our focus is on the technology supplier partner – depends on the clauses negotiated into the agreement; each of the above clauses has a distinct expected return/cost/risk (volatility) profile, depending on the market performance of the alliance in its product or output market. Thus, the choice of equity joint venture versus non-equity structure for an alliance is about more than control, or governance; it is also a key mechanism through which alliance returns and risk are distributed over the partners.[13]

During negotiations to form an alliance, these different return/cost/risk profiles require a holistic rather than clause-by-clause approach, since each of the variables can be traded off against each other in complex ways. For example, the technology providing partner can tradeoff between drawing their gains either through royalties or through dividends from an equity joint venture. However, while royalties are a more assured channel of returns in the sense that some non-zero royalty revenue is assured as long as the alliance makes sales, royalty earnings are also usually lower than joint venture dividend shares, given reasonable or great market sales performance. If things go well in the marketplace for the alliance's final product, then equity returns are decidedly higher (see Appendix). But, if they do not, equity returns can also go below zero. Moreover, equity involvement requires an initial investment, unlike a license provision.

Since many alliances (and most JVs) involve multiple compensation streams earned by the partner supplying technology, alliance negotiators would benefit from adopting a 'portfolio' approach.[14] In portfolio management, investments are typically spread over both bonds and equities. Bonds typically yield a lower but more assured return. Stocks usually yield a higher return (especially if market performance is as anticipated or better). But, unlike bonds, stock prices can also collapse with poor market performance. Given certain anticipations of market performance, the negotiator needs to target a judicious mix of royalties and dividends, cognizant of their different volatilities (risk) depending on market performance. Risk-averse technology suppliers will tradeoff (or forego) equity investment in return for higher royalty rates (Contractor & Ra, 2000). Conversely, our results for the RETRISK variable suggest that a willingness to accept higher uncertainty or volatility through more equity involvement translates, on average, into a capture of a larger share of alliance value.

Another tradeoff discernible in our results is that between MINIMUMS and share of value captured. In our sample of agreements, when the agreement included a minimum compensation clause for the technology supplier, their overall share is lower – implying a negotiation wherein assurances of a minimum return are accompanied by a willingness to accept a lower participation in overall success or value captured.

We also see in the GEOLIMIT results that the presence of territorial limits on where the alliance can sell its output is positively correlated with a larger share appropriated by the technology provider. As an *ex post* hypothesis, this suggests that when the technology supplier has sufficient bargaining power to be able to impose territorial limits on the other partner (who otherwise would obviously prefer not to be so constrained), they are also able to command a larger share of value from the alliance.

In terms of technology transfer, our results suggest to the technology provider negotiator that selecting a partner with a lower technical capability (i.e., the PARTLEAR variable) is beneficial both in terms of capturing a larger share of value, as well as lowering the risk of partner opportunism in later years of the alliance.

A more complex or difficult to transfer technology will entail higher transfer and teaching costs to the technology supplier (COSTEXEC) and these higher costs borne by them will lower their share of value captured.

Finally, other things being equal, in nations where there is a government MANDATE to have a local partner, the share of value captured by a prospective technology supplier will be lower.

We trust this paper illustrates for both academics and practitioners the complex and interdependent nature of the tradeoffs involved in alliance agreements. While a few academic papers have begun to pay more attention to the mix of clauses in alliances and their impact on overall performance of the alliance, as well as to the division of value over its partners (Mellewigt & Das, 2010; Reuer & Ariño, 2007; Reuer et al., 2006), this remains a line of inquiry ripe for further study.

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Appendix A. Appendix

Differences between equity returns and licensing returns

In how returns, cost, and risk are distributed across each partner

Let P = unit price and Q = quantity sold in the market for the final product sold by the alliance.v = unit variable cost; F = fixed

[12] Academic studies where JV equity is merely operationalized as a categorical or dummy variable, without taking into account other contract provisions, may oversimplify matters because they do not assess the tradeoffs that exist between the various compensation types.

[13] Most joint ventures also have a side agreement whereby the JV also pays royalties to the technology supplying partner in a second compensation channel, auxiliary to the division of dividends.

[14] Most joint ventures also have a side agreement whereby the JV also pays royalties to the technology supplying partner in a second compensation channel, auxiliary to the division of dividends.

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costs; π = alliance company profit; α = equity share of technology supplying partner seeking equity compensation in technology sharing alliance; r = royalty rate paid as compensation to technology-supplying partner.

A.1. Assume P is constant but market size varies with quantity Q sold

JV equity return for partner providing technology = $\alpha\pi = \alpha(PQ - vQ - F)$. Differentiating wrt Q we get

$$\frac{d(\alpha\pi)}{dQ} = \alpha(P - v)$$

Royalty return for partner providing technology $R = rPQ$. Differentiating wrt Q we get

$$\frac{d(R)}{dQ} = rP$$

Generally $\alpha(P - v) > rP$, so that the volatility (slope) of the JV equity return is much greater than the volatility (slope) of the royalty return as illustrated in Fig. A1 below. Moreover, joint venture $\alpha\pi$ can be negative (i.e., a loss) but Royalties = rPQ can never be negative.

The example below illustrates a case where JV equity share α = 50% and Royalty r = 5%. However the general conclusion from the above analysis applies to all cases – that returns on equity investment are axiomatically more volatile than the returns earned from royalties. Beyond a certain level of market success Q, returns on equity are decidedly superior to returns from a licensing formula. However, equity returns can also be negative, whereas royalty returns, by formula, never go below zero.

Assume P and Q are linked by a demand curve expressed as: $P = a - bQ$

a. JV equity return for partner providing technology = $\alpha\pi = \alpha(PQ - vQ - F) = \alpha(aQ - bQ^2 - vQ - F)$. Differentiating wrt Q and putting $\frac{d(\alpha\pi)}{dQ} = \alpha(a - 2bQ - v) = 0$ we get optimum $Q_{Equity} = (a - v)/(2b)$
b. Royalty Return R for partner providing technology = $rPQ = r(aQ - bQ^2)$. Differentiating wrt Q and putting $\frac{d(R)}{dQ} = r(a - 2bQ) = 0$ we get optimum $Q_{Licensing} = a/2b$

Hence it is always true that [optimum Q_{Equity}] < [optimum $Q_{Licensing}$] since always $[(a - v)/(2b)] < [a/2b]$. This is illustrated in

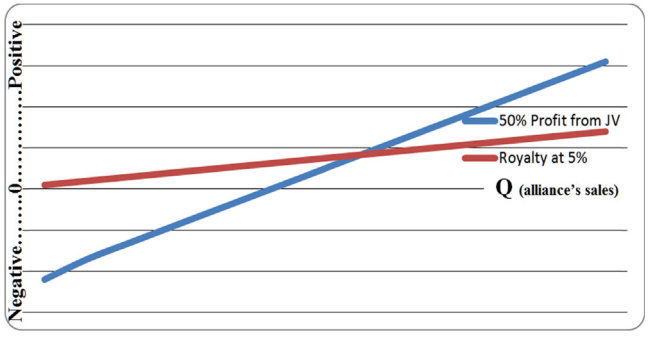

Fig. A1. Volatility of JV equity returns versus licensing royalty returns for technology supplying partner under market size variation.

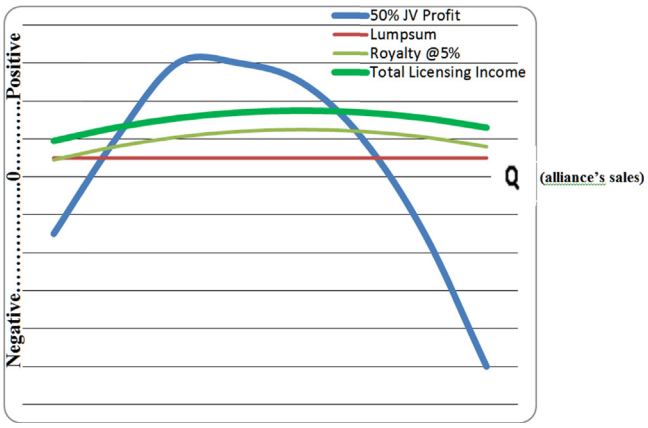

Fig. B1. Optimum Q for JV equity returns is always lower than the optimum Q for licensing royalty returns.

Fig. B1 below. This means that the inclusion of royalty returns in an alliance agreement will induce a desire from a licensor for a larger market size Q than would be preferred by the technology recipient partner who only holds equity – that is to say a potentially built-in conflict of interest between the partners.

In both scenarios above, the inclusion of a lumpsum provision in the alliance agreement simply ensures that licensing returns will never approach zero. This reduces the technology supplier's risk acting in the capacity of a licensor, but increases the risk of the alliance or alliance partner acting as licensee – in the event that sales fall below expectation in the alliance product market.

The example below illustrates a case where JV equity share α = 50% and Royalty r = 5%. However the general conclusions from the above analysis apply to all cases – that returns on equity investment are axiomatically more volatile than the returns earned from royalties. Over a considerable normal range of market success Q, returns on equity are decidedly superior to returns from a licensing formula. However, equity returns can also be negative, whereas licensing returns, by formula, can never go below zero.

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