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Abstract

Environmental risk (ER) has become increasingly crucial in international business, and firms endeavor to integrate environmental risk management (ERM) into business strategies. Examining a sample of cross-border mergers and acquisitions (M&As) and alliances conducted by US firms from 39 host countries over the last two decades, we show that US firms tend to prefer to choose cross-border M&As over alliances when the ER of foreign partners is high, consistent with the prediction of a mean-variance utility model. The propensity towards M&As is amplified by US firms' corporate governance quality, financial flexibility, and adherence to the host-country's sustainability disclosure reforms. Further, US firms experience high announcement abnormal returns when they select M&A deals rather than alliances to manage high ER from foreign partners. Overall, our study provides novel insights into ERM in firms' decision-making around international expansion.

Keywords: Cross-border mergers and acquisitions; strategic alliances; corporate social responsibility; environmental risk

1. Introduction

Sustainable development has gained prominence in international business, with investors increasingly focusing on firms' nonfinancial performance, particularly environmental sustainability. Companies are integrating environmental risk management (ERM) into their strategies to reduce costs and litigation risks associated with environmental non-compliance. This has led to environmental risk (ER) becoming a significant factor in corporate decision-making, especially concerning cross-border mergers and acquisitions (M&As) versus strategic alliances. When faced with high ER in a target country, firms are more likely to choose M&As over alliances to gain greater control and mitigate environmental risks. This trend highlights the importance of ERM in reducing the cost of capital and enhancing firm value.

The study examines a sample of 8,137 cross-border deals and finds a positive correlation between a foreign partner's ER and the preference for M&As over alliances. The research further explores how corporate governance, financial constraints, and environmental regulations influence these decisions. Well-governed firms and those with financial flexibility are more likely to opt for M&As in high ER environments. Additionally, the study shows that sustainability disclosure regulations can shift firms' preferences from M&As to alliances. The findings underscore the role of ERM in international expansion strategies and provide insights for corporate management and policymakers on how to navigate environmental risks in cross-border transactions.

2. Hypothesis Development

Firms face a crucial decision between alliances and mergers and acquisitions (M&As) when expanding internationally, as these choices are central to corporate boundary theory.

The decision hinges on managing various risks in the host country, such as information asymmetry, partner opportunism, and governmental expropriation. While alliances are often favored when integration issues or high costs are present, M&As are preferred for gaining control over a partner's operations, especially in environments with high environmental risk (ER). Firms with effective environmental risk management (ERM) are more inclined to choose M&As to mitigate the adverse impacts of a partner's environmental shortcomings, aligning with the broader goals of sustainability and corporate governance improvement. Conversely, when ER is low, firms are more likely to opt for alliances, as the need for stringent control through M&As diminishes.

Hypothesis 1: Firms prefer to choose cross-border M&As over alliances when the partner has high ER.

Corporate governance significantly influences firms' decisions between mergers and acquisitions (M&As) and alliances. M&As often lead to improvements in the target firms' corporate governance by adopting the acquirers' practices, whereas alliances typically lack strong governance incentives, especially when partners' objectives differ. Well-governed firms tend to prefer M&As over alliances, particularly to manage partners with high environmental risk (ER). However, financial constraints also play a crucial role; firms with limited financial resources are less likely to pursue M&As, opting for alliances instead due to the lower capital requirements and the ability to share resources and diversify risks.

Hypothesis 2: Firms' propensities toward cross-border M&As over alliances are amplified by corporate governance and financial flexibility.

3. Data and Methodology

3.1 Sample Selection

Will be available upon request.

3.2 Variable Definition

Will be available upon request.

3.3 Summary Statistics

Will be available upon request.

4. Main Results

4.1 ER and Deal Selection

Will be available upon request.

4.3 Further Analysis

Will be available upon request.

5. Theoretical Framework

In this section, we present an analytical model to illustrate the effect of ER on the choices between M&As and alliances. Specifically, we assume that the production function has the following technology:

$$Q = A \times \text{Invested Capital, where } A > 0 \text{ is a constant.} \quad (1)$$

We assume a single-period model with two dates: $\boldsymbol{t = 0}$ and $\boldsymbol{t = 1}$. The investment cost of a representative firm is $\frac{cI^2}{2}$, $\mathbf{with\ 0 < c < 1}$ being a constant, which implies an increasing marginal cost of investment. Firms have an opportunity to combine their operations to reduce their marginal cost by a constant amount $\boldsymbol{s}$ $(\mathbf{0 < s < c})$. They can realize this cost saving either by acquiring or allying. Prices are normalized to unity.

To manage the country-specific ER, multinational US firm 1 (target firm 2) must pay a random lump-sum upfront with realization at $\boldsymbol{t = 1}$, i.e., $\widetilde{F_1}$ $(\widetilde{F_2})$, defined in the source

country's currency units (USD).1 Given the total capital investment ($\boldsymbol{I}$) in the joint venture from the two participant firms, the total terminal (uncertain) net income under alliances is

$$\widetilde{y^{JV}} = I\left(A - \frac{c-s}{2}I - \tau - (\widetilde{F_1} + \widetilde{F_2})\right). \quad (3)$$

$\widetilde{\boldsymbol{F_1}}$ represents the ER in the source country, subsumed under the random upfront cost that firm 1 (located in the source country) has to bear to continue operating. The ER in the host country is captured by the uncertain upfront cost $\widetilde{\boldsymbol{F_2}}$, which firm 2 in the host country needs to pay for continuing operation. $\boldsymbol{\tau > 0}$ is the transaction cost from any deal (M&A or alliance) with the partner firm, capturing the asymmetric information between the two firms.

When the US firm's foreign target is ultimately acquired, the US firm only bears an $\boldsymbol{\alpha \in (0,1)}$ share of the uncertain upfront cost for the target firm's country-specific ER, as the target firm's environmental performance would be improved due to the governed ER after acquisition.

The total net earnings under M&As are

$$\widetilde{y^{MA}} = I\left\{A - \frac{(c-s)I}{2} - \tau - \left(\widetilde{F_1} + \alpha\widetilde{F_2}\right) - \gamma\right\}; 0 < \alpha < 1 \quad (4)$$

where $\boldsymbol{\gamma}$ is the governance cost related to the environmental performance improvement of the target firm owing to an acquisition.

The acquirer incurs a minimum sunk governance cost upfront ($\boldsymbol{\theta}$) to govern the target firm. If $\widetilde{\boldsymbol{F_2}}$ is greater than a threshold value $\boldsymbol{\delta}$, the effective governance cost that the acquirer needs to pay becomes $\boldsymbol{\theta + \beta\left(\widetilde{F_2} - \delta\right)}$, with $\boldsymbol{\beta > 0, \delta > 0}$. Also, we assume that the minimum sunk governance upfront cost $\boldsymbol{\theta}$, that the acquirer has to incur, is higher than the threshold valuation of the ER that the acquirer must face in the host country, namely $\boldsymbol{\theta > \beta\delta}$. In other words, the minimum sunk governance upfront cost not only mitigates the threshold

[1] We denote all random variables by a tilde (~), while their realisations are not denoted as such.

ER that the acquirer needs to take care of in the host country, but also accounts for any additional cost of monitoring under the threshold ER in that country.

However, an increase of ER in the foreign partner above this threshold $\boldsymbol{\delta}$ implies that the acquirer's effective governance cost is assumed to be higher than the minimum sunk governance cost ($\boldsymbol{\theta}$). For a foreign country with relatively corrupt legal and institutional structures, the cost of governing the environmental performance of the target firm is typically higher. Hence, for such a partner country under consideration, we can safely presume that $\boldsymbol{\beta > 0}$.

If $\boldsymbol{\widetilde{F_2} \leq \delta}$ and $\boldsymbol{\beta = 0}$, it would be sufficient for the acquirer to pay only $\boldsymbol{\theta}$ as the effective governance cost for $\boldsymbol{\widetilde{F_2} \leq \delta}$. Collectively, the governance cost ($\boldsymbol{\gamma}$) is

$$\gamma = \theta + \beta\left(\widetilde{F_2} - \delta\right), \text{ if } \delta < \widetilde{F_2};$$

$$= \theta, \qquad \text{if } \widetilde{F_2} \leq \delta.$$

Note that, therefore, the US firm's net earnings under M&As are

$$\widetilde{y^{MA}} = I\left\{A - \frac{(c-s)I}{2} - \tau - \widetilde{F_1} - \widetilde{F_2}(\alpha + \beta) - \theta + \beta\delta\right\}, \text{if } \theta < \widetilde{F_2};$$

$$= I\left\{A - \frac{(c-s)I}{2} - \tau - \left(\widetilde{F_1} + \alpha\widetilde{F_2}\right) - \theta\right\}, \qquad \text{if } \widetilde{F_2} \leq \theta. \tag{4.1}$$

We define the efficiency gain (loss) of M&As relative to alliances under uncertain upfront costs in the foreign countries as

$$\widetilde{D} = \widetilde{y^{MA}} - \widetilde{y^{JV}}. \tag{5}$$

Case 1: $\boldsymbol{\delta < \widetilde{F_2}}$: the threshold that the governance cost paid by the acquirer is less than the effective uncertain upfront fixed cost.

$$\widetilde{D} = I\left[\beta\delta - \theta - \widetilde{F_2}\{(\alpha+\beta)-1\}\right]$$

Hence, the mean of $\widetilde{\boldsymbol{D}}$ is

$$\mu_D = I\left[\mu_{F_2}\{1-(\alpha+\beta)\} - (\theta-\beta\delta)\right]. \quad (6)$$

Similarly, the variance of $\widetilde{\boldsymbol{D}}$ is

$$v_D = I^2 v_{F_2}[1-(\alpha+\beta)]^2. \quad (7)$$

The vector of the appropriate parameters (other than the primary decision (endogenous) variable, $\boldsymbol{I}$) for our model is

$\boldsymbol{\Theta} = \left(\mu_{F_2}, v_{F_2}, \theta, \delta, \alpha, \beta\right).$

We define the marginal rate of substitution (MRS) between risk and return as:

$$S\left(v_D(I,\boldsymbol{\Theta}), \mu_D(I,\boldsymbol{\Theta})\right) = -\frac{U_v\left(v_D(I,\boldsymbol{\Theta}), \mu_D(I,\boldsymbol{\Theta})\right)}{U_\mu\left(v_D(I,\boldsymbol{\Theta}), \mu_D(I,\boldsymbol{\Theta})\right)} > 0, \text{for risk aversion.}$$

$\boldsymbol{S > 0}$ is the two-parameter, analogous to the Arrow-Pratt measure (Arrow, 1965; Pratt, 1964) of absolute risk aversion.[2] We solve the following problem,

$$\max_{I^*>0} U(v_D, \mu_D).$$

$$\text{s.t. (6), (7), and } \widetilde{D^*} > 0$$

For the interior solution of the decision problem, the first-order condition for maximization yields

$$\frac{\left[\mu_{F_2}\{1-(\alpha+\beta)\} - (\theta-\beta\delta)\right]}{2I^* v_{F_2}[(\alpha+\beta)-1]^2} = S(I^*, \boldsymbol{\Theta}). \quad (8)$$

[2] $U(v_D, \mu_D)$ satisfies the following conditions: (1) $U_\mu(v_D, \mu_D) > 0, U_{\mu\mu} < 0, \forall(v_D, \mu_D)$; (2) $U_v(v_D, \mu_D) < 0, U_{vv} < 0\ \forall(v_D, \mu_D)$; (3) $U(v_D, \mu_D)$ is strictly quasi-concave in (v_D, μ_D), with $U_{\mu v} = U_{v\mu} > 0$. Conditions (1) and (2) are the non-satiation property and risk aversion, respectively. Conditions (2) and (3) imply that the indifference curves are upward sloping.

The RHS is the slope of the "indifference curve" in the $(\boldsymbol{v_D}, \boldsymbol{\mu_D})$-space, and the LHS is the slope of the "efficiency frontier" (the set of $(\boldsymbol{v_D}, \boldsymbol{\mu_D})$-pairs that can be attained by changes in $\boldsymbol{I}$), with the optimal $\boldsymbol{I}^*$ corresponding to the interior solution of Eq. (8).3 For risk aversion, the numerator of slope of the "efficiency frontier" in Eq. (8) must be positive, implying $\mathbf{1} - (\boldsymbol{\theta} - \boldsymbol{\beta\delta})/\boldsymbol{\mu_{F_2}} > (\boldsymbol{\alpha} + \boldsymbol{\beta})$. With $\boldsymbol{\theta} > \boldsymbol{\beta\delta}$, this must imply $(\boldsymbol{\alpha} + \boldsymbol{\beta}) < \mathbf{1}$.

Using the optimal investment ($\boldsymbol{I}^*$), obtained from Eq. (8) in the MV Utility function, we obtain the Indirect Utility Function:

$$U^* = U\big(v_D(I^*), \mu_D(I^*)\big) \tag{9}$$

Maximizing (9) w.r.t. $\boldsymbol{\alpha}$ and applying envelope theorem, we obtain

$$\partial U^*(.)/\partial \alpha U_{\mu_D} I^* = \underbrace{-\mu_{F_2}}_{[1]} \underbrace{+2I^* S(v_D^*, \mu_D^*) v_{F_2}(1 - \alpha - \beta)}_{[2]} = 0. \tag{10}$$

Eq. (10) characterizes the relative welfare implication of signing an M&A as opposed to the alliance deal. The term [1] is negative and represents the wealth effect of signing an M&A deal. Increasing $\boldsymbol{\alpha}$, ceteris paribus, reduces the mean post-deal income due to higher acquisition costs. With $(\boldsymbol{\alpha} + \boldsymbol{\beta}) < \mathbf{1}$, term [2] is positive, denoting the risk effect or substitution effect of an increase in $\boldsymbol{\alpha}$. This effect is therefore positive for a risk-averse source country firm, namely with $\boldsymbol{S(v_D^*, \mu_D^*)} > \mathbf{0}$. Solving Eq. (10), we can obtain the optimal value of $\boldsymbol{\alpha}$ ($\boldsymbol{\alpha}^*$) with respect to the optimal $\boldsymbol{I}^*$.

We examine under what conditions we have $\boldsymbol{\partial \alpha^*/\partial \mu_{F_2}} \leq \mathbf{0}$. If the optimal $\boldsymbol{\alpha}$ decreases when $\boldsymbol{\mu_{F_2}}$ is high, it means that the acquirer bears a lesser burden of the partner country's ER under the M&A, compared to under an alliance. That is, under the higher

[3] See, for example, Eichner (2008) and Mukherjee et al. (2021). The second-order condition of $\frac{\partial \varphi(I^*, \boldsymbol{\Theta})}{\partial I} < 0$ is satisfied under the following sufficiency conditions: (1) the quasi-concavity of $U\big(v_D(I^*, \boldsymbol{\theta}), \mu_D(I^*, \boldsymbol{\Theta})\big)$; (2) the risk aversion behaviour of the source country firm; (3) the convexity of $(\partial v_D(I^*, \boldsymbol{\theta})/\partial I)$ in I.

expected ER in the partner country, the acquirer is more likely to choose the M&As over alliances.

Implicitly differentiating Eq. (10) w.r.t. $\boldsymbol{\mu_{F_2}}$,

$$\partial\alpha^*/\partial\mu_{F_2} = \left[\underbrace{-1}_{\text{Wealth Effect}} \quad \underbrace{+2S^*_{\mu_D}v^*_D}_{\text{Risk Effect}}\right] \leq 0. \tag{11}$$

The wealth effect is negative, indicating that as $\boldsymbol{\mu_{F_2}}$ increases, ceteris paribus, the US firm, being risk averse, would like to opt for a higher risk-premium, so it responds by further reducing the optimal $\boldsymbol{\alpha}$. Hence, $\boldsymbol{\partial\alpha^*/\partial\mu_{F_2} \leq 0}$, if and only if $\boldsymbol{S^*_{\mu_D} \leq (1/2v^*_D)}$. Although this sufficiency condition comprises the possibility of having an increasing absolute risk preference (IARA) (i.e., the likelihood of lower risk-taking, or, equivalently, higher risk aversion, signified by $\boldsymbol{S^*_{\mu_D} > 0}$), it does not preclude the possibility of having a DARA preference structure (the likelihood of higher risk-taking, or, equivalently, lower risk aversion, signified by $\boldsymbol{S^*_{\mu_D} < 0}$) with the possibility of higher expected return and thereby, a positive risk effect and a negative wealth effect.

Given that we are considering a rational and well-behaved US firm averting to any additional ER from the host country (when the firm's risk aversion is characterized by "properness"), having a strictly quasi-concave mean-variance utility function necessitates a DARA preference pattern (Eichner and Wagener, 2009) of the source country firm ($\boldsymbol{S^*_{\mu_D} < 0}$).

Case – 2: $\boldsymbol{\delta \geq \widetilde{F_2}}$; the threshold that the governance cost paid by the acquirer is greater than or equal to the effective uncertain upfront fixed cost. Deriving the first-order condition of Case 2 is similar to that of Case 1. We again show the sufficient condition for $\boldsymbol{\partial\alpha^*/\partial\mu_{F_2} \leq 0}$ if and only if $\boldsymbol{S^*_{\mu_D}(.) \leq (1/2v^*_D)}$.[4] Overall, US firms with a DARA preference structure are

[4] Internet Appendix Model provides the details for the first-order conditions.

more likely to choose M&As over alliances under the conditions of higher expected ER in the partner country.

6. Conclusion

ER has an important impact on corporate strategies, and the choices around cross-border M&As and alliances are critical decisions for international ventures. Examining a sample of the cross-border M&A and alliance deals conducted by US firms entering 39 host countries over the last two decades, we show that firms choose cross-border M&As over alliances when the partner firm has high ER. This preference is significant for firms with good governance quality and financial slack. Our results remain robust when we use the foreign partner's risk from social, governance, and overall ESG performance and control for the institution quality, expropriation risk, and carbon risk.

We use the international ESG regulations and the Paris Agreement as exogenous shocks to alleviate endogeneity concerns. Sustainability disclosure reforms in the host countries and the Paris Agreement increase the likelihood of US firms choosing cross-border alliances over M&As. Further, M&A deals rather than alliances could yield higher CARs when US firms face foreign partners with high ER. The market reaction is more pronounced for firms operating in competitive markets and conducting horizontal deals.

We present a mean-variance utility (MVU) model to illustrate the optimal mode of internationalization (M&As or alliances) under high ER of the foreign partner firm. The sufficiency condition to optimally choose M&As over alliances can be comprehended in terms of the relative risk-return trade-offs. When the degree of absolute risk aversion is not overly amplified with the possibility of high expected net efficiency gains of M&As over alliances, it is optimal to select M&As.

Our work contributes to a growing body of literature on the importance of ER in firm strategy. It is among the first studies highlighting the direct effect of ER on cross-border M&As and alliances. Overall, our study enriches our understanding of the importance of ER as a driving force behind corporate international expansion strategy.

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Appendix Model

In this appendix, we derive the first-order conditions of Case 2.

In this case, we have

$$\widetilde{D} = I\left[\widetilde{F_2}(1-\alpha) - \theta\right]$$

Therefore,

$$\mu_D = I\left[\mu_{F_2}(1-\alpha) - \theta\right]. \tag{6.1}$$

$$v_D = I^2(1-\alpha)^2 v_{F_2}. \tag{7.1}$$

Now the vector of the appropriate parameters (other than the primary decision (endogenous) variable, I) for our model is

$$\mathbf{\Phi} = \left(\mu_{F_2}, v_{F_2}, \alpha\right).$$

We define the MRS between risk and return as:

$S\left(v_D(I,\mathbf{\Phi}), \mu_D(I,\mathbf{\Phi})\right) = -\frac{U_v\left(v_D(I,\mathbf{\Phi}),\mu_D(I,\mathbf{\Phi})\right)}{U_\mu\left(v_D(I,\mathbf{\Phi}),\mu_D(I,\mathbf{\Phi})\right)} > 0$, for risk aversion.

Solving

$$\max_{I^*>0} U(v_D, \mu_D).$$

$$\text{s.t. (6.1), (7.1), and } \widetilde{D^*} > 0$$

We obtain,

$$\frac{\left[\mu_{F_2}(1-\alpha) - \theta\right]}{2I^*(1-\alpha)^2 v_{F_2}} = S\left(v_D(I^*,\mathbf{\Phi}), \mu_D(I^*,\mathbf{\Phi})\right). \tag{12.1}$$

Given (12.1), for risk aversion, $\mu_{F_2} > \{\theta/(1-\alpha)\} > 0, \because 0 < \alpha < 1$.

Substituting the optimal I^* from (12.1) into the MV utility function, maximizing it w.r.t. α, and applying envelope theorem, we obtain

$$\partial U^*(.)/\partial\alpha = -(\partial U^*(.)/\partial\mu_D)I^*\mu_{F_2} - 2(\partial U^*(.)/\partial v_D)I^{*2}v_{F_2}(1-\alpha) = 0.$$

$$\partial U^*(.)/\partial\alpha U_{\mu_D} I^* = \underbrace{-\mu_{F_2}}_{[1]} + \underbrace{2\{S^*(v_D(\alpha^*,\dots),\mu_D(\alpha^*,\dots))\}I^* v_{F_2}(1-\alpha)}_{[2]} = 0. \qquad (15.1)$$

Term [1] indicates the *wealth effect of signing an M&A deal*, which is negative; and term [2] indicates the *risk effect or substitution effect*, which is positive. Hence, the total welfare effect of signing the M&A rather than alliance deal is ambiguous, depending on the relative strength of the two opposite effects.

Implicitly differentiating Eq. (15.1) w.r.t. μ_{F_2},

$$\left(\frac{\partial\alpha^*}{\partial\mu_{F_2}}\right) = \left[\underbrace{-1}_{Wealth\ Effect} + \underbrace{2S^*_{\mu_D}I^{*2}v_{F_2}(1-\alpha^*)^2}_{Risk\ Effect}\right] < 0;$$

The risk-effect, in Case 2 is positive, if and only if $S^*_{\mu_D} > 0$.

Eq. (12.1) shows that, as μ_{F_2} rises, the risk-premium in the numerator, namely $[\mu_{F_2} - \{\theta/(1-\alpha^*)\}]$, rises. The risk-averse source country firm, under ceteris paribus, would optimally respond by choosing lower α^*, thereby ensuring even a higher risk-premium at the optimal. This is the Wealth Effect.

The risk effect, $2v_D^*S^*_{\mu_D}(.)$, is positive if and only if $S^*_{\mu_D}(.) > 0$.

$$\partial\alpha^*/\partial\mu_{F_2} = \left(-1 + 2v_D^*S^*_{\mu_D}(\alpha^*,\dots)\right), \qquad (16.1)^5$$

Hence, $\partial\alpha^*/\partial\mu_{F_2} \leq 0$, if and only if $S^*_{\mu_D}(.) \leq (1/2v_D^*)$. This sufficiency condition for $\partial\alpha^*/\partial\mu_{F_2} \leq 0$ already includes the possibility of a DARA preference structure of the US firm.

[5] We have for the 2nd term in the RHS of (16.1) as: $2I^*v_{F_2}(1-\alpha)S^*_{\mu_D}\left(\partial\mu_D^*/\partial\mu_{F_2}\right) = 2I^{*2}v_{F_2}(1-\alpha)^2S^*_{\mu_D} = 2v_D^*S^*_{\mu_D}(.)$.