

INTERNATIONAL EXPANSION THROUGH START-UP OR ACQUISITION: A REPLICATION

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Research summary: We use a sample of Singapore firms to replicate Barkema and Vermeulen's (1998) study of international expansion through start-ups or acquisitions by Dutch firms. We discover that the authors misinterpreted the regression coefficients for hypothesis testing and only two of their four hypotheses were actually tested. For these two hypotheses, one is not supported in either their study or ours, while the other is supported in their study but not ours. For the remaining two hypotheses we find support for one of them, which is concerned with the curvilinear effect of product diversity on the mode of expansion. In sum, the original study claims that all four hypotheses are supported, whereas only one is supported in the replication. More specifically, the former results, including the effects of the independent and control variables, are largely not generalizable to the latter.

Managerial summary: Barkema and Vermeulen's (1998) study investigates the international expansion by Dutch firms during the period from 1966 to 1994. Their results indicate that whether a firm expands through setting up a greenfield operation or acquiring an existing operation is affected by the diversity of the firm's product lines, the diversity of the countries to which it has expanded, and how far the expansion is related to its existing business. We replicate their study using a sample of Singapore firms for the period from 1980 to 2000. Our results show only an effect of a firm's product diversity on its mode of international expansion. Our study clearly indicates the risk of drawing managerial implications from the results of a single study. More replication studies are needed for establishing a solid theoretical foundation to inform management decisions. Copyright © 2016 John Wiley & Sons, Ltd.

INTRODUCTION

Empirical evidence with regard to the limits posed by learning and absorptive capacity on diversification is provided by various studies. Barkema and Vermeulen (1998)

showed that as product diversity increased, there was a greater propensity for firms to expand abroad through a greenfield subsidiary rather than an acquisition. They argued that this is because diversity enhances the ability to absorb knowledge by providing a rich and more varied background, which eases cognitive limits and enables the firm to develop its own complementary knowledge pertaining to a market (Kumar, 2009: 102).

Keywords: replication; organizational learning; foreign direct investment; acquisition; start-up

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Kumar's (2009) above quote cites Barkema and Vermeulen's (1998) finding when deriving his hypothesis concerning the relationship between firm growth along the product dimension and

firm growth along the international dimension.¹ Note that this finding is the outcome of analyzing foreign direct investment (FDI) data from 23 large nonfinancial Dutch firms during the period from 1966 to 1994, and to the best of our knowledge, Barkema and Vermeulen's (1998) study has never been replicated. However, Kumar (2009) seems to presume that the finding is generally true and applicable to his own study based on Standard & Poor's Compustat database of U.S. firms. He does not mention that Barkema and Vermeulen's (1998) study was based on a dataset of Dutch firms and might therefore not be generalizable to U.S. firms. Hundreds of researchers have cited Barkema and Vermeulen's (1998) study in a similar way. Kumar's citation format is typical for presenting a literature review, yet it also reflects a scattered pattern of knowledge accumulation in our field where "empirical studies are rarely replicated and can differ greatly in terms of research method, measurement instrument, definition of key constructs, population of subjects, nature of phenomenon investigated, and so forth" (Tsang and Kwan, 1999: 771).

By replicating Barkema and Vermeulen's (1998) study using FDI data from Singapore, we aim to show that building knowledge on isolated and never-replicated studies may not be conducive to establishing a sound foundation for our discipline. We chose Barkema and Vermeulen (1998) for several reasons. First, the study was published by the *Academy of Management Journal*, which is commonly regarded as a top management journal. This study must therefore have undergone a rigorous review process, judged both theoretically and methodologically sound. Furthermore, it won the *Academy of Management Journal* best article award. Second, it is a quantitative study based on archival data with clearly described methods of measurement and analysis. By following these methods closely, we can reliably compare the results of both studies. Finally, Barkema and Vermeulen (1998: 7) claim that their study "brings a fresh approach—a learning perspective—to the literature examining whether firms expand internationally through start-ups or acquisitions." The

topic of how firms expand abroad is important in FDI research (Brouthers and Hennart, 2007). Moreover, this study has been heavily cited and accordingly has shaped the path of this research stream.² It is surely one of the exemplar studies that deserve to be replicated.

We carefully replicated Barkema and Vermeulen's (1998) measurements and analytical methods as much as possible, and then tested the same hypotheses using FDI data from Singapore firms. We found that among the four original hypotheses only Hypothesis 2 was supported, whereas the original study claims that three hypotheses are strongly supported and the remaining one (Hypothesis 4) is also supported after some "finer-tuned modeling" (p. 17). We explain in the Results section below that Barkema and Vermeulen (1998) misinterpret the related coefficients when testing Hypotheses 1, 2, and 4, and interpret their nonlinear binomial logit and multinomial logit models as if they were linear models. There is in fact insufficient information in their Table 3 to determine whether Hypotheses 1 and 2 are supported. We therefore cannot fairly compare the results of these two hypotheses between their study and ours. For the two remaining hypotheses, both the original study and ours indicate that Hypothesis 4 is not supported, and that Hypothesis 3 is supported in the original study but not ours. To summarize, the results of the original study, including the effects of the independent and control variables, are largely not generalizable to ours. This outcome serves as a warning that caution is needed when the original study is cited.

The article is organized as follows. In the next section we summarize Barkema and Vermeulen's (1998) arguments leading to their four hypotheses. We then describe our data, measurements, and methods of analysis. After comparing the results of both studies, we attempt to explain the differences in results, and highlight our contributions.

EXPANDING THROUGH START-UP OR ACQUISITION?

Barkema and Vermeulen's (1998) conceptual framework is built on two core arguments, the

¹ Strictly speaking, this is a miscitation because Barkema and Vermeulen's (1998) related hypothesis predicts that there is an inverted U-shaped (versus linear as Kumar states) relationship between a firm's product diversity and its propensity to expand through a start-up rather than an acquisition. As we point out below, Barkema and Vermeulen (1998) erroneously state that their finding supports this hypothesis.

² By the end of February 2015 the study had 420 and 1,333 citations in Web of Science and Google Scholar, respectively. It was the third most cited article among the 44 articles published in that volume of the *Academy of Management Journal*.

first concerning organizational learning and the second the characteristics of start-ups versus acquisitions. According to the first argument, learning is enhanced by diversity in experience. Operating within diverse national markets, product markets, or both therefore promotes the infusion of new ideas and new practices, in turn triggering innovations and boosting technological capabilities. For the second argument, the option of acquisitions is less attractive than that of start-ups for firms with strong technological capabilities. Acquisitions have relatively little to offer to such firms in terms of technological skills, and it would be difficult for these firms to transfer their technological capabilities to acquisitions due to organizational inertia. On the other hand, starting with a clean slate, start-ups are more conducive to such transfers.

Following the first argument, multinational diversity enhances a firm's technological capabilities, and, in turn, according to the second argument, increases the firm's propensity to choose start-ups. Their first hypothesis is therefore:³

Hypothesis 1: Multinational diversity increases the propensity of a firm to set up a new venture in a foreign country rather than to acquire an existing company.

Similarly, product diversity fosters technological capabilities. However, a complication is that when the number of a firm's product lines becomes too large, its management team faces cognitive constraints and is likely to adopt a multidivisional structure. This arrangement reduces information sharing between relatively independent divisions as well as between divisions and headquarters, hindering learning and innovation. Barkema and Vermeulen (1998) therefore expect an inverted U-shaped relationship between product diversity and technological capabilities. Based on the second core argument mentioned above that the level of a firm's technological capabilities is positively related to its propensity to expand through start-ups versus acquisitions, Barkema and Vermeulen (1998) expect a similar curvilinear relationship between product diversity and the propensity to establish start-ups.

Hypothesis 2: The relationship between a firm's product diversity and its propensity to expand

through start-ups rather than acquisitions is curvilinear (an inverted U-shape).

Hypothesis 3 concerns the interaction between multinational diversity and product diversity. Although this hypothesis depicts a complicated relationship, Barkema and Vermeulen (1998) provide a brief argument. They assert that when compared with single-business firms and highly product-diversified firms, "intermediately product-diversified firms have relatively little cognitive capacity left with which to handle the further complexities of increasing multinational diversity" (p. 11) and to benefit from the learning opportunities generated by multinational diversity. Multinational diversity accordingly has a stronger positive effect on the technological capabilities of single-business firms and highly product-diversified firms, thus weakening the relationship between product diversity and the propensity to expand through start-ups.

Hypothesis 3: The curvilinear (inverted U-shaped) relationship between product diversity and the propensity to set up new ventures in foreign countries becomes weaker at higher levels of multinational diversity.

Finally, Barkema and Vermeulen (1998) argue that if a firm expands overseas into a familiar business through either horizontal, related, or vertical expansion then it can readily transfer its routines and technological capabilities into a newly established venture. In contrast, if the expansion is unrelated to its own core business then the firm is less likely to be able to rely on its existing routines and will have to purchase the needed capabilities through acquisition. As a result:

Hypothesis 4: Horizontal, related, and vertical expansions into foreign countries are more likely to be start-ups, and unrelated expansions are more likely to be acquisitions.

METHODS

Sample

Our sample consists of foreign ventures set up by indigenous Singapore firms listed on the main board of the Stock Exchange of Singapore during the period from 1980 to 2000. We chose this

³ We repeat the exact wording of their four hypotheses in this article.

period because Singapore firms began expanding overseas in a significant manner from the early 1980s. We used four main criteria to construct the sample. First, a firm must have had a market capitalization of at least \$250 million (Singapore dollars) at the end of 2000 and have established at least 15 FDIs during the observation period. The threshold of 15 FDIs was to make sure that our research resources were employed efficiently. Second, a firm must have been listed in 1991 or earlier so that we could collect at least 10 years of data. Third, we followed Barkema and Vermeulen (1998) and excluded financial institutions. Finally, we also excluded hotels because a considerable number of hotels listed in the stock exchange belonged to international chains and it was very likely that their FDI decisions were influenced by the chain's headquarters.

The final sample comprised 36 major firms in most of the industries under ten two-digit SIC codes. We extracted the required FDI information from annual reports and supplemented with newspaper cuttings. We obtained a total of 733 observations consisting of 485 acquisitions and 248 start-ups in 18 countries. Table 1 shows the geographical distribution of these acquisitions and start-ups, comparing with that of Barkema and Vermeulen's (1998) sample. For both samples, there were more acquisitions than start-ups. As somewhat expected, the FDIs in our sample were concentrated in Asia and Australia, whereas those of their sample were in Europe and North America.

Variables and model specification

We measured the dependent and independent variables by following Barkema and Vermeulen (1998) closely. The dummy *mode of foreign entry* had a value of 1 if the venture was a start-up, and 0 if it was an acquisition. We measured *multinational diversity* as the number of foreign countries that the firm had entered at the time of the expansion, and *product diversity* as the number of three-digit SIC codes in which the firm was active at the time of expansion. We coded an expansion as *horizontal* if it was within the same three-digit SIC category as the firm's core business activities, as *related* if it was within the same two-digit SIC category but not the same three-digit category, as *vertical* if it was within the firm's value-added chain, and as *unrelated* if none of the above three categories applied.

Table 1. Geographical distribution of the observations

| Expansion type | Europe | | North America | | Latin and South America | | Asia | | Africa | | Australia | | Total | |
|----------------|----------|-------------|---------------|-------------|-------------------------|-------------|----------|-------------|----------|-------------|-----------|-------------|----------|-------------|
| | Original | Replication | Original | Replication | Original | Replication | Original | Replication | Original | Replication | Original | Replication | Original | Replication |
| Start-up | 104 | 18 | 34 | 44 | 34 | 1 | 44 | 150 | 12 | 0 | 6 | 35 | 234 | 248 |
| Acquisition | 343 | 39 | 168 | 83 | 26 | 1 | 20 | 226 | 18 | 1 | 20 | 135 | 595 | 485 |

With the exception of two variables we again closely followed Barkema and Vermeulen's (1998) measurement of control variables.⁴ The two control variables were legal restrictions and country risk. We failed to replicate the measurement for these variables based on Barkema and Vermeulen's (1998) description. We therefore contacted one of the authors who promptly replied and kindly gave us the variables; however, he cautioned that he could not remember exactly how legal restrictions were measured and was not sure whether or not the version he gave us was in fact the one used in their study. Another problem was missing values related to these two variables for the countries in our sample. We decided to create our measurement after careful consideration.

We measured *legal restrictions* based on the FDI Regulatory Restrictiveness Index in 1997 provided by the Organisation for Economic Co-operation and Development. For each industrial sector of a country, an FDI index is compiled to measure statutory restrictions on FDI, including equity restrictions, screening and approval requirements, restrictions on foreign key personnel, and other operational restrictions in 58 countries (Kalinova, Palerm, and Thomsen, 2010); the index accordingly reflects Barkema and Vermeulen's (1998) definition of legal restrictions on FDI well. We measured a country's legal restrictions using the total FDI index from the dataset, which is the average of FDI indices of all industrial sectors within the country.

For *country risk* we followed Barkema and Vermeulen (1998) and created three dummy variables—low, medium, and high country risk—based on the ratings provided by the *International Country Risk Guide* (ICRG) which assesses the political, economic, and financial risks of 140 countries and has been used by a number of leading management journal articles (e.g., Chan, Isobe, and Makino, 2008; Click and Weiner, 2010). We aggregated a country's political, economic, and financial risks into that country's overall risk and used the k-means clustering method to categorize the 140 countries covered by the ICRG into the three country-risk groups. Since the beginning year of the ICRG coverage is 1984, we assigned the country risk data of 1984 to 14 observations from 1980 to 1983.

⁴ Space constraints do not allow us to describe the measurement of these standard control variables here. Interested readers may refer to the original study.

For model specification we strictly followed Barkema and Vermeulen (1998), testing the hypotheses using binomial logit models with regard to the choice of a start-up versus an acquisition when the focal firm expanded overseas. To conduct further analysis, we also followed their method and estimated multinomial logit models with a fourfold dependent variable (wholly owned start-up, jointly owned start-up, wholly owned acquisition, and jointly owned acquisition).

RESULTS

Table 2 presents the descriptive statistics of both samples. There are some notable differences between the samples. The Dutch firms were on average larger than their Singapore counterparts and were more likely to set up wholly owned subsidiaries. Keeping other things constant, this relationship between size and the propensity to select wholly owned subsidiaries is somewhat expected because wholly owned subsidiaries require more capital and other resources than joint ventures. A key characteristic of the expansion strategy of Chinese family enterprises, to which many of the firms in our sample belonged, has been the tendency to choose unrelated diversification (Erdener and Shapiro, 2005). This characteristic is reflected in the fact that the Singapore firms had a higher ratio of unrelated expansion overseas and were more diversified productwise. Finally, Singapore firms were less likely to invest in high-risk countries than their Dutch counterparts, probably because they were smaller in size and thus less able to absorb losses from risky investments.

Table 3 presents the correlations among the variables of both samples. For our sample, the dummy variable low country risk is highly correlated with medium country risk. However, this should not be an issue because we only included the latter in our models. The same applies to the moderately high correlation between unrelated expansion and horizontal expansion. Gross national product (GNP) per capita is highly correlated with both cultural distance and legal restrictions. We still included GNP per capita in the models in order to produce a faithful replication.⁵ By the same token, in order

⁵ Barkema and Vermeulen (1998) do not state the units that they used for measuring real GNP and GNP per capita. We presume that they used the same units as we did (i.e., one trillion dollars).

Table 2. Descriptive statistics

| Variable | | Original | | Replication | |
|----------|---------------------------|----------|------|-------------|-------|
| | | Mean | s.d. | Mean | s.d. |
| 1. | Start-up | 0.28 | 0.45 | 0.34 | 0.47 |
| 2. | Multinational diversity | 9.04 | 5.99 | 9.71 | 5.67 |
| 3. | Product diversity | 8.83 | 5.15 | 20.27 | 12.33 |
| 4. | Horizontal expansion | 0.64 | 0.48 | 0.72 | 0.45 |
| 5. | Related expansion | 0.13 | 0.33 | 0.07 | 0.26 |
| 6. | Vertical expansion | 0.15 | 0.36 | 0.02 | 0.15 |
| 7. | Unrelated expansion | 0.08 | 0.28 | 0.20 | 0.40 |
| 8. | Cultural distance | 2.27 | 0.79 | 2.14 | 1.50 |
| 9. | Local experience | 2.84 | 4.17 | 6.77 | 9.63 |
| 10. | Return on equity | 0.15 | 0.14 | 0.08 | 0.08 |
| 11. | Time | 2.66 | 0.69 | 2.64 | 0.39 |
| 12. | Legal restrictions | 0.17 | 0.38 | 0.36 | 0.21 |
| 13. | Low country risk | 0.75 | 0.43 | 0.77 | 0.42 |
| 14. | Medium country risk | 0.18 | 0.38 | 0.22 | 0.42 |
| 15. | High country risk | 0.08 | 0.26 | 0.01 | 0.07 |
| 16. | Real GNP (\$1 trillion) | 1.15 | 1.48 | 1.93 | 3.28 |
| 17. | GNP growth | 0.06 | 0.22 | 0.06 | 0.04 |
| 18. | GNP per capita (\$10,000) | 1.22 | 3.35 | 1.54 | 1.42 |
| 19. | Wholly owned subsidiary | 0.71 | 0.45 | 0.28 | 0.45 |
| 20. | Size | 13.4 | 1.13 | 7.03 | 1.23 |

Original study, $N = 829$; Replication study, $N = 733$.

to have a fair comparison with Barkema and Vermeulen's (1998) results, we did not mean-center the two diversity variables as recommended by Aiken and West (1991). Models 1–3 in Table 4 have rather large variance inflation factors (VIFs)—reaching the greatest value of 35.07 for Model 2—because the interaction terms of the diversity variables tend to increase the value of VIFs.

Hypothesis testing

Table 4 summarizes the logit regression results with a comparison against the original study. Barkema and Vermeulen (1998) test Hypothesis 1 by referring to the coefficient of multinational diversity in Model 1. However, multinational diversity is involved in two interaction terms within the same model. The coefficient of multinational diversity therefore does not represent its main (or marginal) effect on the dependent variable (Aiken and West, 1991; Brambor, Clark, and Golder, 2006) and cannot be used to determine whether the hypothesis is supported. We accordingly add

Model 0, which does not include the two interaction terms, to Table 4. Another issue is that unlike linear regression, logit regression is nonlinear and thus coefficient estimates have to be interpreted in a different way (Shaver, 2007), as discussed below. However, Barkema and Vermeulen (1998) interpret their results in the same way as that of linear regression.⁶

Model 0 shows that the coefficient of multinational diversity is negative ($p < 0.001$) and is opposite to that predicted by Hypothesis 1; the hypothesis is therefore not supported. Instead of being a constant (i.e., -0.279), the value and standard error of the marginal effect of multinational diversity vary with each observation. Following the practice of Ai and Norton (2003) as well as Wiersema and Bowen (2009), we graphically present the result in Figure 1a, which plots the average marginal effect of multinational diversity on the likelihood to expand through start-ups at the 95 percent confidence interval against values of multinational diversity. Multinational diversity in fact decreases

for real GNP and ten thousand dollars for GNP per capita). Our presumption is reasonable because the magnitudes of the mean values shown in Table 2 are somewhat similar for both samples.

⁶ We thank the editors for highlighting this issue. It should be noted that when Barkema and Vermeulen's (1998) paper was published about 20 years ago, a more nuanced way of interpreting interaction terms in non-linear models was not practiced.

Table 3. Correlation matrices

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. Start-up | | | | | | | | | | | | | | | | | | | | |
| 2. Multinational diversity | -0.06 | 0.02 | 0.11 | 0.02 | -0.00 | -0.01 | -0.00 | 0.22 | -0.28 | -0.23 | -0.28 | 0.26 | -0.31 | 0.27 | 0.12 | -0.22 | -0.01 | 0.02 | -0.11 | -0.17 |
| 3. Product diversity | 0.06 | 0.56 | | -0.12 | 0.14 | -0.10 | 0.17 | 0.12 | -0.01 | -0.27 | 0.04 | 0.03 | -0.16 | 0.03 | 0.22 | -0.01 | -0.07 | 0.09 | 0.00 | 0.24 |
| 4. Horizontal expansion | 0.15 | 0.16 | 0.11 | | -0.50 | -0.55 | -0.40 | 0.02 | -0.07 | 0.09 | -0.06 | 0.03 | -0.10 | 0.08 | 0.06 | -0.06 | 0.03 | -0.08 | 0.01 | -0.11 |
| 5. Related expansion | -0.06 | -0.04 | 0.03 | -0.44 | | -0.15 | -0.11 | -0.02 | 0.04 | -0.15 | 0.04 | -0.02 | 0.06 | -0.02 | -0.07 | -0.03 | 0.02 | -0.01 | 0.02 | 0.14 |
| 6. Vertical expansion | 0.01 | 0.01 | -0.02 | -0.24 | 0.14 | | -0.13 | -0.03 | 0.09 | 0.09 | 0.08 | -0.03 | 0.03 | -0.02 | -0.02 | 0.12 | -0.04 | 0.13 | 0.00 | -0.02 |
| 7. Unrelated expansion | -0.14 | -0.14 | -0.14 | -0.79 | -0.14 | -0.07 | | 0.03 | -0.04 | -0.09 | -0.05 | 0.03 | 0.07 | -0.08 | -0.00 | -0.02 | -0.02 | -0.01 | -0.05 | 0.06 |
| 8. Cultural distance | -0.14 | 0.00 | -0.27 | -0.06 | -0.03 | 0.06 | 0.08 | | -0.20 | -0.09 | -0.10 | 0.15 | -0.33 | 0.27 | 0.13 | -0.32 | -0.01 | -0.03 | -0.22 | -0.06 |
| 9. Local experience | 0.03 | 0.39 | 0.51 | 0.02 | 0.03 | 0.09 | -0.04 | -0.22 | | -0.27 | 0.38 | -0.21 | 0.31 | -0.25 | -0.14 | 0.57 | -0.06 | 0.04 | 0.17 | 0.18 |
| 10. Return on equity | 0.06 | -0.25 | -0.14 | -0.10 | 0.01 | 0.01 | 0.10 | 0.11 | -0.10 | | 0.30 | -0.15 | 0.12 | -0.08 | -0.08 | 0.17 | 0.05 | 0.04 | 0.17 | -0.12 |
| 11. Time ^a | -0.01 | 0.50 | 0.36 | 0.05 | -0.10 | 0.03 | 0.01 | 0.05 | 0.24 | 0.15 | | -0.34 | 0.15 | -0.04 | -0.18 | 0.29 | -0.07 | 0.08 | 0.11 | 0.47 |
| 12. Legal restrictions | 0.11 | -0.01 | 0.27 | 0.02 | 0.03 | -0.06 | -0.03 | -0.92 | 0.24 | -0.10 | 0.00 | | -0.32 | 0.30 | 0.09 | -0.28 | -0.02 | -0.08 | -0.18 | -0.20 |
| 13. Low country risk | -0.15 | -0.13 | -0.19 | -0.06 | -0.00 | 0.06 | 0.05 | 0.54 | -0.07 | 0.03 | -0.08 | -0.52 | | -0.80 | -0.49 | 0.38 | 0.02 | 0.04 | 0.22 | 0.11 |
| 14. Medium country risk | 0.15 | 0.12 | 0.19 | 0.05 | 0.01 | -0.06 | -0.05 | -0.53 | 0.08 | -0.03 | 0.07 | 0.52 | -0.98 | | -0.13 | -0.31 | 0.04 | -0.11 | -0.12 | -0.01 |
| 15. High country risk | 0.03 | 0.01 | 0.03 | 0.05 | -0.02 | -0.01 | -0.04 | -0.04 | -0.05 | -0.01 | 0.04 | 0.03 | -0.14 | -0.04 | | -0.18 | -0.09 | 0.09 | -0.18 | -0.17 |
| 16. Real GNP (\$1 trillion) | 0.00 | 0.20 | -0.04 | 0.14 | -0.09 | -0.04 | -0.10 | 0.43 | -0.03 | -0.08 | 0.05 | -0.60 | 0.23 | -0.22 | -0.04 | | -0.06 | 0.28 | 0.19 | 0.11 |
| 17. GNP growth | 0.06 | 0.01 | 0.14 | 0.06 | -0.02 | -0.08 | -0.04 | -0.62 | 0.12 | -0.01 | 0.08 | 0.62 | -0.20 | 0.22 | -0.06 | -0.22 | | 0.01 | -0.05 | -0.06 |
| 18. GNP per capita (\$10,000) | -0.11 | 0.09 | -0.20 | -0.01 | -0.04 | 0.06 | 0.03 | 0.94 | -0.19 | 0.08 | 0.11 | -0.94 | 0.53 | -0.52 | -0.07 | 0.63 | -0.56 | | 0.07 | -0.01 |
| 19. Wholly owned subsidiary | 0.24 | -0.07 | -0.31 | 0.10 | -0.09 | 0.03 | -0.08 | 0.24 | -0.19 | 0.09 | -0.01 | -0.29 | 0.13 | -0.12 | -0.05 | 0.26 | -0.16 | 0.27 | | -0.14 |
| 20. Size | -0.05 | 0.65 | 0.26 | -0.04 | 0.03 | 0.09 | 0.02 | 0.17 | 0.13 | -0.09 | 0.43 | -0.10 | -0.01 | -0.01 | -0.01 | 0.03 | -0.07 | 0.16 | -0.05 | |

^a Value is a logarithm.
 Lower side: Replication study, N = 733.
 Upper side: Original study, N = 829.

Table 4. Results of logit models: start-up versus acquisition

| Variable | Model 0 | Model 1 | | Model 2 | | Model 3 | |
|---|---------------------|-------------------|--|-------------------|--|-------------------|--|
| | Replication | Original | Replication | Original | Replication | Original | Replication |
| Intercept | −9.801 (397.419) | −4.482 (1.712) | −11.782 (582.684) | −2.701 (1.635) | −12.602 (413.86) | −5.800 (1.924) | −12.295 (366.223) |
| Multinational diversity | −0.279 (0.067) | 0.267 (0.065) | −0.641 (0.191) | 0.272 (0.067) | −0.492 (0.156) | 0.298 (0.070) | −0.492 (0.162) |
| Product diversity | 0.258 (0.089) | 0.332 (0.132) | 0.380 (0.132) | 0.459 (0.137) | 0.324 (0.124) | 0.515 (0.141) | 0.401 (0.131) |
| Product diversity squared | −0.003 (0.001) | −0.016 (0.005) | −0.010 (0.003) | −0.020 (0.006) | −0.008 (0.003) | −0.022 (0.006) | −0.009 (0.003) |
| Multinational diversity × product diversity | | −0.049 (0.015) | 0.017 (0.012) | −0.062 (0.015) | 0.013 (0.011) | −0.069 (0.016) | 0.011 (0.011) |
| Multinational diversity × product diversity squared | | 0.002 (0.001) | 0.003×10^{-2} (0.021×10^{-2}) | 0.002 (0.001) | 0.003×10^{-2} (0.002×10^{-1}) | 0.003 (0.001) | 0.007×10^{-2} (0.002×10^{-1}) |
| Horizontal expansion | 0.161 (0.321) | −0.209 (0.371) | 0.167 (0.326) | −0.196 (0.365) | 0.265 (0.311) | 3.372 (1.134) | 0.252 (0.312) |
| Related expansion | −0.390 (0.530) | 0.256 (0.442) | −0.231 (0.539) | −0.031 (0.441) | −0.119 (0.512) | 3.561 (1.587) | −0.073 (0.532) |
| Vertical expansion | 0.353 (0.886) | 0.249 (0.448) | 0.396 (0.880) | 0.338 (0.437) | 0.572 (0.886) | 3.376 (1.580) | 1.138 (0.964) |
| Cultural distance | −0.135 (0.384) | 0.244 (0.099) | −0.169 (0.388) | 0.248 (0.096) | −0.072 (0.367) | 0.257 (0.097) | −0.075 (0.368) |
| Local experience | 0.008 (0.018) | −0.251 (0.062) | 0.003 (0.018) | −0.218 (0.059) | 0.007 (0.017) | −0.223 (0.059) | 0.008 (0.172) |
| Return on equity | 2.162 (1.900) | −3.412 (1.046) | 1.335 (1.953) | −3.430 (1.104) | 1.311 (1.640) | −3.479 (1.118) | 1.247 (1.645) |
| Time | | | | −0.730 (0.235) | 1.453 (0.641) | | |
| Horizontal expansion × time | | | | | | −0.766 (0.262) | 1.433 (0.659) |
| Related expansion × time | | | | | | −0.771 (0.481) | 1.611 (1.381) |
| Vertical expansion × time | | | | | | −0.559 (0.464) | −4.301 (2.845) |
| Unrelated expansion × time | | | | | | 0.704 (0.409) | 1.483 (0.993) |
| Legal restrictions | 1.412 (1.958) | 0.511 (0.259) | 1.896 (1.996) | 0.512 (0.248) | 2.778 (1.855) | 0.539 (0.250) | 2.794 (1.870) |
| Medium country risk | 1.107 (0.361) | 1.209 (0.293) | 1.124 (0.364) | 1.108 (0.305) | 0.561 (0.288) | 1.139 (0.287) | 0.605 (0.291) |
| High country risk | 1.678 (1.493) | 0.370 (0.441) | 2.002 (1.425) | −0.022 (0.441) | 1.482 (1.373) | −0.010 (0.427) | 1.586 (1.382) |
| Real GNP (\$1 trillion) | 0.064 (0.065) | −0.002 (0.102) | 0.088 (0.066) | −0.003 (0.102) | 0.082 (0.063) | −0.019 (0.102) | 0.082 (0.063) |
| GNP growth | −0.614 (4.107) | 0.538 (0.447) | −1.424 (4.144) | −0.095 (0.459) | −2.571 (3.459) | −0.172 (0.470) | −2.004 (3.495) |
| GNP per capita (\$10,000) | 0.098 (0.438) | 0.005 (0.013) | 0.154 (0.442) | 0.007 (0.019) | 0.091 (0.417) | 0.005 (0.013) | 0.120 (0.416) |
| Wholly owned subsidiary | 1.993 (0.327) | 0.096 (0.235) | 2.110 (0.338) | −0.056 (0.220) | 1.943 (0.316) | −0.002 (0.220) | 1.973 (0.321) |
| Size | −0.834 (0.500) | 0.054 (0.121) | −0.526 (0.510) | −0.047 (0.120) | −0.586 (0.442) | −0.001 (0.121) | −0.703 (0.451) |
| Log likelihood | −315 | −332 | −311 | −355 | −327 | −351 | −324 |
| Percentage correct | 78.6 | 80.0 | 78.6 | 78.5 | 78.2 | 79.0 | 77.9 |

$n = 733$; start-up = 1. In Models 0 and 1, dummy variables for time are not shown. In Models 0–3, dummy variables for firm are not shown.

Numbers in parentheses are standard errors. All two-tailed tests.

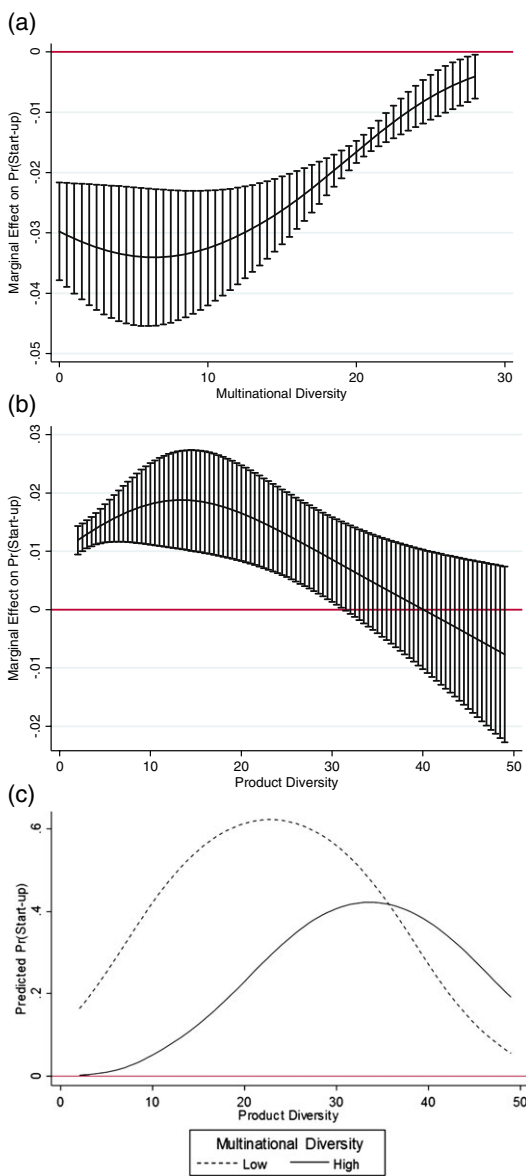


Figure 1. (a) Effect of multinational diversity on propensity to expand through start-up for the replication study. (b) Effect of product diversity on propensity to expand through start-up for the replication study. (c) Moderating effect of multinational diversity on the relationship between product diversity and propensity to expand through start-up for the replication study

Singapore firms' likelihood to set up a new venture versus acquiring an existing company within a foreign country. This effect becomes smaller in magnitude as multinational diversity increases.

Similar to the case of Hypothesis 1, Barkema and Vermeulen (1998) refer to the coefficients of both product diversity and product diversity

squared in Model 1 when testing Hypothesis 2. Model 0 shows that the coefficient of product diversity is positive ($p = 0.004$) and the coefficient of product diversity squared is negative ($p = 0.014$). Figure 1b shows the curvilinear marginal effect of product diversity, supporting the inverted U-shaped relationship predicted by Hypothesis 2. Since a model corresponding to our Model 0 is missing in the original study, there is insufficient information to determine whether Hypotheses 1 and 2 are supported in the original study.⁷

Hypothesis 3 predicts a moderating effect of multinational diversity on the curvilinear relationship between product diversity and the propensity to set up new ventures. Following Greene's (2010) suggested approach to examining the moderating effect in nonlinear models, we draw Figure 1c, which presents the relationship between product diversity and the propensity to set up new ventures when multinational diversity is high (one standard deviation above the mean) and when it is low (one standard deviation below the mean) with respect to Model 1. If the prediction of Hypothesis 3 is accurate, the inverted U-shaped curve associated with the higher multinational diversity level will be flatter. Figure 1c shows that although the two curves are not identical in shape, they do not materially differ from one another. Therefore, Hypothesis 3 is not supported. Although the two interaction terms in Barkema and Vermeulen's (1998) study are significant and of the right signs, without a figure that corresponds to Figure 1c, there is insufficient information to determine the extent that Hypothesis 3 is supported.

Hypothesis 4 is concerned with the effects of the different expansion modes. Referring to the coefficients of the three expansion modes—horizontal, related, and vertical—in Model 1, Barkema and Vermeulen (1998) initially conclude that the

⁷ A casual inspection of Models 0 and 1 indicates that the coefficients of multinational diversity, product diversity, and product diversity squared remain fairly consistent in sign and significance level across both models. This may motivate one to presume that had Barkema and Vermeulen (1998) produced Model 0, the coefficients of these three terms would have been similar to those in Model 1. This presumption is not only groundless but also risky. A comparison between Models 2 and 3 of Barkema and Vermeulen's (1998) results shows that after adding the four interaction terms to Model 3, the coefficients for the three expansion modes change drastically. Moreover, even if they had produced Model 0, without the figures that correspond to Figure 1a, b, the coefficients alone would not provide sufficient information for determining whether and how far the hypotheses were supported.

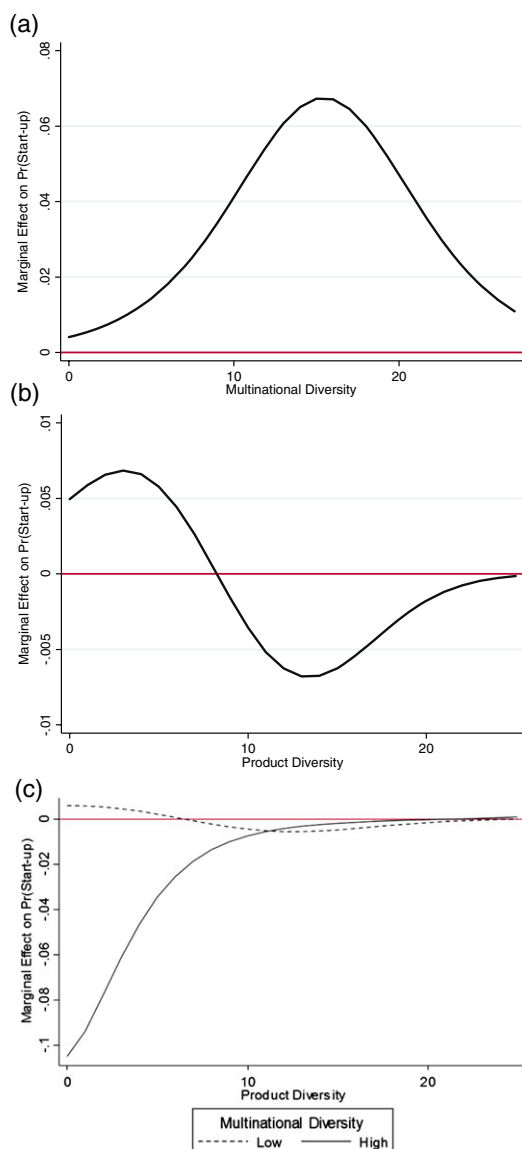


Figure 2. (a) Effect of multinational diversity on propensity to expand through start-up for the original study. (b) Effect of product diversity on propensity to expand through start-up for the original study. (c) Moderating effect of multinational diversity on the relationship between product diversity and propensity to expand through start-up for the original study

hypothesis is not supported. They then replace the time dummies with the variable *time*, which is calculated as the logarithm of time (1966 = 1 to 1993 = 27),⁸ and create Model 2. They add the four

⁸ There is a typo in the original article: “1993 = 27” should be replaced by “1993 = 28” because there are 28 years for the period 1966–1993 if both the beginning and ending years are counted.

interaction terms including time to Model 3, refer to the coefficients of the three expansion modes (which are significant and in the direction predicted by Hypothesis 4), and conclude that the result “is consistent with Hypothesis 4” (p. 17). Although the expansion modes are dummies instead of continuous variables, the above-mentioned rule governing the interpretation of their coefficients still holds (see Yip and Tsang, 2007). That is, these coefficients do not represent main effects. Barkema and Vermeulen (1998) should have instead referred to Model 2 which, like Model 1, clearly shows that Hypothesis 4 is not supported. Models 1 and 2 also indicate that the hypothesis is not supported for the replication sample.

Although Barkema and Vermeulen (1998) do not plot any graphs corresponding to those of Figure 1a–c, the information provided in their Tables 2 and 3 enables us to work out the marginal effects of multinational diversity and product diversity by setting the values of other variables to their means. Based on Model 1 of Table 4, Figure 2a plots the marginal effect of multinational diversity when product diversity is zero, and vice versa for Figure 2b.⁹ Likewise, Figure 2c shows the marginal effect of product diversity when multinational diversity is high (one standard deviation above the mean) and when it is low (one standard deviation below the mean). Figure 2a indicates that the marginal effect of multinational diversity is always positive, opposite to the finding of the replication sample (Figure 1a). Moreover, the two graphs of Figure 2c contradict the impression given by Barkema and Vermeulen (1998) that Hypothesis 3 is fully supported.

To summarize, our results indicate that only Hypothesis 2 is supported. Without a model corresponding to our Model 0, the information contained in Barkema and Vermeulen’s (1998) Table 3 is insufficient to test Hypotheses 1 and 2, but shows that, contrary to their claim, Hypothesis 4 is not supported. As to Hypothesis 3, although the coefficients of the two interaction terms are significant and of the right signs, without a figure that corresponds to Figure 1c, the extent to which the hypothesis is supported cannot be determined. Table 5 summarizes the comparison between the results of the two studies, including both Barkema

⁹ As mentioned, strictly speaking Figure 2a, b do not represent the marginal effects of multinational diversity and product diversity, respectively, because of the presence of their interactions terms.

and Vermeulen's (1998) interpretation of their results and our revised interpretation.

Robustness checks

We re-ran the analysis of the four models in Table 4 by mean-centering the two diversity variables. The VIFs for Models 1–3 become substantially smaller with Model 1 having the greatest VIF value of 8.04. The results are similar to those of the non-mean-centering case, and the corresponding Figure 1c remains very similar. In spite of Aiken and West's (1991) claim, whether mean-centering can alleviate the problem of multicollinearity is still a contentious issue (see Echambadi and Hess, 2007). We also excluded GNP per capita, which is highly correlated with both cultural distance and legal restrictions, and reran the analysis. We obtained very similar results with the testing of all hypotheses remaining the same.

We conducted additional robustness checks in order to confirm that the results were not idiosyncratic to our alternative way of measuring either legal restrictions or country risk. First, we measured country risk in the form of a continuous variable instead of using three dummy variables and obtained qualitatively the same results. Second, we replaced the legal restrictions and country risk variables with country dummy variables in our estimation. One merit of using these country dummy variables was to control for country-specific effects including but not limited to legal restrictions and country risk. Another improvement was that the number of observations increased to 956 and the number of foreign countries entered increased to 21. Again the results remain qualitatively the same. Finally, we excluded the 14 observations from 1980 to 1983 that were assigned with 1984 country risk data, reran the analysis, and obtained similar results.

Further analysis

Barkema and Vermeulen (1998) conduct additional analysis using alternative measures of key variables and different statistical models to test the robustness of their results. We also replicated such analysis. We constructed an entropy measure of multinational diversity using the number of expansions present in a cultural block identified by Ronen

and Shenkar (1985) as weight.¹⁰ While Barkema and Vermeulen's (1998) models estimated with the entropy measure yield similar results, our results are somewhat different from those presented in Models 0 and 1 of Table 4. Although both Hypotheses 3 and 4 remain unsupported, the coefficient of multinational diversity (based on the entropy measure) becomes nonsignificant and product diversity no longer has a curvilinear relationship.

We also ran a model using a finer distinction of the degree of ownership: majority, half, and minority (with full ownership as the omitted category). Compared with wholly owned subsidiaries, majority-owned, half-owned, and minority-owned ventures are more likely to be acquisitions. In contrast, Barkema and Vermeulen (1998) report that majority-owned and half-owned ventures are more likely to be acquisitions and start-ups, respectively, and that there is no material difference between minority-owned and wholly owned ventures in this respect. A caveat here is that while we report our results based on the way of interpreting nonlinear regression models suggested by the literature (Ai and Norton, 2003; Shaver, 2007; Wiersema and Bowen, 2009), Barkema and Vermeulen (1998) interpret their results as if their models were linear in nature.

Again following Barkema and Vermeulen (1998), we ran a multinomial logit regression with a four-fold dependent variable (wholly owned start-up, jointly owned start-up, wholly owned acquisition, and jointly owned acquisition). Table 6 presents the results of our study and those of Barkema and Vermeulen's (1998) with wholly owned acquisition as the omitted category. Within each of the three other categories, a positive coefficient stands for a preference for that category over wholly owned acquisitions. The large standard errors associated with the coefficients of high country risk for our sample are due to the very small number of entries in this category of host countries: two start-up joint ventures and two acquired joint ventures. As mentioned, the Singapore firms were generally more conservative than their Dutch counterparts probably because they were smaller in size and thus less able to bear the risk of investing in such countries.

¹⁰ Owing to the unavailability of sales data, we were not able to construct an entropy measure of multinational or product diversity using sales as weight.

Table 5. Comparison of logit regression results

| Hypothesis | Interpretation by original study | Revised interpretation | Result of replication study |
|--|--|--------------------------------|---|
| Hypothesis 1. Multinational diversity increases the propensity of a firm to set up a new venture in a foreign country rather than to acquire an existing company | Supported | Undetermined | Not supported, the opposite of the hypothesis supported |
| Hypothesis 2. The relationship between a firm's product diversity and its propensity to expand through start-ups rather than acquisitions is curvilinear (an inverted U-shape) | Supported | Undetermined | Supported |
| Hypothesis 3. The curvilinear (inverted U-shaped) relationship between product diversity and the propensity to set up new ventures in foreign countries becomes weaker at higher levels of multinational diversity | Supported | Extent of support undetermined | Not supported |
| Hypothesis 4. Horizontal, related, and vertical expansions into foreign countries are more likely to be start-ups, and unrelated expansions are more likely to be acquisitions | Supported, after some "finer-tuned modeling" (Barkema and Vermeulen, 1998: 17) | Not supported | Not supported |

As explained earlier, the coefficients of multinational diversity, product diversity, product diversity squared, and the three expansion modes do not represent their main effects because of the presence of their interaction terms. In other words, the results do not provide the information required for testing Hypotheses 1, 2 and 4, in contrast to Barkema and Vermeulen's (1998) claim that the results support Hypotheses 1 and 2. Table 7 presents the results without the interaction terms for testing these two hypotheses. Each of the four models compares between an acquisition and a start-up mode of FDI. Consistent with the results of Model 0 in Table 4 and contrary to Hypothesis 1, in three of the four models multinational diversity increases the propensity of a firm to choose the acquisition mode. Hypothesis 2 is not supported although it is supported in Model 0 of Table 4.¹¹

To test Hypothesis 3, we focus on the first two models of Table 6 because the last one, which compares acquired wholly own venture with acquired joint venture, is not relevant. Barkema and Vermeulen (1998) interpret the results as supporting the hypothesis. For our study, the associated figures

indicate that Hypothesis 3 is not supported, similar to the case of Model 1 of Table 4.

The results presented in Table 6 cannot be used to test Hypothesis 4 due to the presence of the interaction terms between modes of expansion and time. We reran the four models of Table 7 by excluding these interaction terms. Similar to Models 1 and 2 of Table 4, Hypothesis 4 is not supported. To summarize, with the exception of Hypothesis 2, the results of hypothesis testing are similar to those of the logit models shown in Table 4.

DISCUSSION

We replicated Barkema and Vermeulen's (1998) study of Dutch firms' overseas expansion through start-up and acquisition using a sample of Singapore firms. The information contained in their Table 3 (i.e., our Table 4) cannot be used to test Hypotheses 1 and 2. As summarized in Table 5, our results do not support Hypothesis 1 but support Hypothesis 2. In fact, the effect of multinational diversity on the propensity to expand through start-ups is opposite to the prediction of Hypothesis 1. Since Hypothesis 1 is not supported and Hypothesis 3 is about the interaction of the effects proposed in Hypotheses 1 and 2, it is not surprising that Hypothesis 3 is

¹¹ Owing to space limitations, the related figures are not included here, but are available from us upon request.

Table 6. Results of multinomial logit analysis: jointly and wholly owned ventures

| Variable | Start-up wholly owned venture | | Start-up joint venture | | Acquired joint venture | |
|--|-------------------------------|----------------------|------------------------|---------------------|------------------------|---------------------|
| | Original | Replication | Original | Replication | Original | Replication |
| Intercept | -3.337 (2.325) | -7.420 (2.118) | -10.298 (2.300) | -8.978 (2.373) | -10.332 (1.885) | -6.150 (1.908) |
| Multinational diversity | 0.291 (0.078) | 0.093 (0.189) | 0.202 (0.100) | -0.015 (0.201) | 0.082 (0.071) | -0.151 (0.174) |
| Product diversity | 0.474 (0.163) | 0.256 (0.166) | 0.470 (0.198) | 0.656 (0.178) | 0.086 (0.154) | 0.536 (0.158) |
| Product diversity squared | -0.022 (0.007) | -0.080 (0.005) | -0.026 (0.009) | -0.019 (0.006) | -0.010 (0.007) | -0.018 (0.005) |
| Multinational diversity \times product diversity | -0.050 (0.017) | -0.031 (0.022) | -0.052 (0.022) | -0.040 (0.023) | -0.025 (0.016) | -0.025 (0.021) |
| Multinational diversity \times product diversity squared | 0.002 (0.001) | 0.001 (0.001) | 0.003 (0.001) | 0.002 (0.001) | 0.001 (0.001) | 0.001 (0.001) |
| Horizontal expansion | 4.775 (1.695) | 0.438 (0.432) | 0.106 (1.364) | 0.523 (0.449) | 0.104 (1.052) | -0.449 (0.350) |
| Related expansion | 6.527 (2.355) | 1.028 (1.096) | 3.677 (2.210) | 0.928 (1.062) | 2.566 (1.964) | 0.910 (0.961) |
| Vertical expansion | 0.449 (2.733) | 0.711 (1.276) | 1.689 (1.974) | 0.039 (1.567) | -3.310 (2.171) | -0.710 (1.144) |
| Cultural distance | 0.229 (0.123) | 0.243 (0.417) | 0.649 (0.135) | -0.336 (0.455) | 0.426 (0.123) | 0.457 (0.348) |
| Local experience | -0.222 (0.068) | -0.059 (0.032) | -0.251 (0.091) | -0.012 (0.025) | -0.019 (0.038) | -0.027 (0.023) |
| Return on equity | -5.619 (1.289) | 4.799 (1.670) | -5.120 (1.586) | -1.735 (2.189) | -3.035 (1.072) | 0.318 (1.679) |
| Horizontal expansion \times time | -0.930 (0.277) | -1.469 (0.621) | -0.578 (0.346) | -1.204 (0.667) | -0.387 (0.283) | -1.431 (0.568) |
| Related expansion \times time | -1.458 (0.668) | -0.320 (1.485) | -1.625 (0.749) | 0.243 (1.709) | -1.441 (0.656) | -0.262 (1.305) |
| Vertical expansion \times time | 0.574 (0.787) | -4.158 (3.692) | -0.616 (0.609) | -0.698 (5.548) | 0.781 (0.698) | -0.303 (3.901) |
| Unrelated expansion \times time | 0.927 (0.604) | -1.146 (1.016) | 0.035 (0.478) | -0.356 (1.254) | -0.147 (0.314) | -0.998 (0.883) |
| Legal restrictions | 0.460 (0.314) | 2.883 (2.509) | 1.380 (0.365) | 3.158 (2.795) | 0.937 (0.326) | 2.489 (2.234) |
| Medium country risk | 1.369 (0.340) | 1.011 (0.612) | 1.196 (0.406) | 0.652 (0.557) | 0.592 (0.431) | 0.120 (0.533) |
| High country risk | -0.342 (0.544) | -0.603 (1193.924) | 1.409 (0.580) | 14.067 (872.748) | 1.485 (0.577) | 12.962 (872.748) |
| Real GNP (\$1 trillion) | -0.166 (0.122) | 0.123 (0.072) | 0.160 (0.153) | 0.028 (0.079) | -0.144 (0.116) | 0.031 (0.063) |
| GNP growth | -0.627 (0.644) | -4.362 (6.739) | 0.092 (0.518) | 1.911 (6.498) | 0.690 (0.476) | 1.377 (6.142) |
| GNP per capita (\$10,000) | 0.006 (0.009) | 0.100 (0.502) | -0.011 (0.016) | 0.136 (0.507) | -0.024 (0.035) | 0.528 (0.421) |
| Size | -0.181 (0.121) | 0.766 (0.192) | 0.445 (0.156) | 0.720 (0.203) | 0.732 (0.130) | 0.713 (1.829) |

$n = 733$; start-up = 1. Acquired wholly owned subsidiary is the omitted category. Numbers in parentheses are standard errors. All two-tailed tests.

not supported in our study. The coefficients of the two interaction terms in their study indicate that Hypothesis 3 is supported but the extent of support is unknown. Finally, Hypothesis 4 is not supported

in either study, and this is the only consistent finding between the two studies.

Tables 4 and 6 show that the results are generally very different between the two studies. In other

Table 7. Results of additional multinomial logit analysis for the replication study

| Variable | Omitted category: acquired wholly owned venture | | Omitted category: acquired joint venture | |
|------------------------------------|--|-----------------------------------|---|---|
| | Start-up wholly owned venture | Start-up joint venture | Start-up wholly owned venture | Start-up joint venture |
| Intercept | -6.474 (1.917) | -6.513 (2.081) | -2.075 (1.486) | -2.113 (1.559) |
| Multinational diversity | -0.217 (0.051) | -0.216 (0.050) | -0.063 (0.040) | -0.062 (0.035) |
| Product diversity | 0.034 (0.078) | 0.148 (0.076) | -0.062 (0.052) | 0.052 (0.044) |
| Product diversity squared | 0.001 (0.002) | 0.027×10^{-3} (0.002) | 0.058×10^{-2} (0.001) | -0.073×10^{-2} (0.088×10^{-2}) |
| Horizontal expansion | 0.490 (0.427) | 0.526 (0.440) | 0.987 (0.327) | 1.023 (0.324) |
| Related expansion | 1.099 (1.118) | 1.011 (1.085) | 0.142 (0.616) | 0.054 (0.528) |
| Vertical expansion | 0.573 (1.274) | -0.063 (1.530) | 1.322 (1.018) | 0.686 (1.290) |
| Cultural distance | 0.252 (0.402) | -0.302 (0.444) | -0.215 (0.318) | -0.769 (0.365) |
| Local experience | -0.057 (0.032) | 0.002 (0.025) | -0.043 (0.025) | 0.015 (0.013) |
| Return on equity | 5.151 (1.723) | -0.449 (2.163) | 3.703 (1.341) | -1.897 (1.758) |
| Horizontal expansion \times time | -1.398 (0.601) | -1.160 (0.647) | 0.105 (0.405) | 0.343 (0.453) |
| Related expansion \times time | -0.097 (1.514) | 0.375 (1.666) | 0.053 (0.925) | 0.525 (1.118) |
| Vertical expansion \times time | -4.013 (3.617) | -0.775 (5.207) | -3.645 (2.919) | -0.407 (4.434) |
| Unrelated expansion \times time | -0.963 (0.993) | -0.148 (1.188) | -0.086 (0.647) | 0.729 (0.925) |
| Legal restrictions | 3.304 (2.490) | 3.520 (2.732) | 0.510 (1.924) | 0.725 (2.040) |
| Medium country risk | 0.964 (0.599) | 0.875 (0.539) | 0.636 (0.402) | 0.546 (0.271) |
| High country risk | 0.099 (1399.107) | 14.342 (853.506) | -13.037 (1108.616) | 1.205 (1.127) |
| Real GNP (\$1 trillion) | 0.113 (0.071) | 0.002 (0.078) | 0.119 (0.062) | 0.008 (0.067) |
| GNP growth | -3.404 (6.492) | 2.826 (6.286) | -6.094 (4.088) | 0.135 (3.269) |
| GNP per capita (\$10,000) | 0.031 (0.485) | 0.288 (0.497) | 0.308 (0.377) | 0.627 (0.137) |
| Size | 0.754 (0.188) | 0.648 (0.196) | 0.154 (0.137) | 0.047 (0.137) |

$n = 733$.

Numbers in parentheses are standard errors. All two-tailed tests.

words, to a large extent Barkema and Vermeulen's (1998) findings are not replicable in the context of Singapore. This is not surprising given the fact that the two studies differ a great deal at both the country and the firm levels. During the period of Barkema and Vermeulen's (1998) study from 1966 to 1994,

the Netherlands was already a developed economy, whereas Singapore was a newly industrialized economy moving toward the status of a developed economy during 1980–2000, the period of our study. Moreover, the sociocultural, institutional, and political environments of the two countries

are different. Such home country characteristics would have influenced the development of firms that are founded within the country's borders. Studies have found that the FDI strategies of firms from newly industrialized economies are different from those from developed economies (Filatotchev *et al.*, 2007; Makino, Lau, and Yeh, 2002). At the firm level, the Dutch and the Singapore firms of the two studies differ substantially in size, product diversity, the choice of FDI locations and expansion modes, and so on (Tables 1 and 2). Moreover, there is probably a higher proportion of family-owned firms in the Singapore sample. Prior research has found that Chinese family enterprises generally exhibit certain distinct FDI behavior due to highly centralized management control and strategic decision making (Tsang, 2002a).

In addition to discovering problems in the original study, our study has generated some interesting results. The fact that our data support Hypothesis 2, predicting an inverted U-shaped relationship between product diversity and the propensity to expand through start-ups versus acquisitions, is noteworthy. That said, it should be noted that this finding is not replicable in the multinomial logit analysis that distinguishes between wholly owned subsidiary and joint venture (Table 7). Therefore the result is not robust.

Another interesting finding is that contrary to Hypothesis 1, multinational diversity decreases the propensity to expand through start-ups ($p < 0.001$, Table 4). Moreover, this finding is largely replicated in the multinomial logit analysis (Table 7). A plausible explanation is that during the study period of 1980–2000, Singapore was a newly industrialized economy and Singapore firms were in general not technologically advanced. Foreign acquisitions, particularly in developed countries, could be an attractive way to gain access to valuable skills and knowledge (Cho and Padmanabhan, 1995; Luo and Tung, 2007; Makino *et al.*, 2002). However, it is well established that post-acquisition integration with the aim of creating value and synergy could pose a serious challenge for the acquiring firm (Hitt, Harrison, and Ireland, 2001). Given the complications associated with cultural and institutional differences, the challenge is even greater in the case of cross-border acquisitions. As a firm gains more experience of operating in different countries (i.e., more multinationally diversified), it would learn the skills of tackling the challenge through learning-by-doing (Tsang, 2002b) and thus

have a higher tendency to expand via acquisitions. Figure 1a indicates that the marginal effect of multinational diversity decreases in magnitude once the number of countries entered by the firm reaches a certain level. This finding is in line with the diminishing returns to learning at high levels of experience discovered by prior studies (see Argote and Miron-Spektor, 2011).

Note that although both our explanation and Barkema and Vermeulen's (1998) argument leading to Hypothesis 1 make use of organizational learning theory, the mechanisms proposed are very different. Ours is based on the perspective of an emerging market firm trying to strengthen its capabilities through cross-border acquisitions whereas theirs adopts the standpoint of a developed country firm that "wants to apply superior technology in a foreign country" (Barkema and Vermeulen, 1998: 10).

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