

**Module Title: Quantitative Method for © UNIVERSITY OF LEEDS  
International Business**

Leeds University Business School

August Re-Assessment 2021/2022

**Exam information:**

- There are **11** pages to this exam.
- There will be **48 hours** to complete this exam. We anticipate that this exam should take students approximately **2 hours** to complete.
- This exam paper contains **4** questions.
- Answer **all** questions.
- The total word limit for **all questions** is 2000 words.
- You should allow a minimum of **30 minutes** to upload/submit your work.

**The deadline date for this assessment is 09:00:00 on Thursday 18<sup>th</sup> August 2022 (UK time).**

An electronic copy of your completed answers must be submitted to the exam submission area within the module resource on the Blackboard MINERVA website no later than the date and time stated above.

Faxed, emailed or hard copies of your exam answers will not be accepted.

Late submissions will not be accepted.

**Failure to meet this deadline will result in you being marked as absent from this assessment.**

**Producing your assessment**

We would prefer your examination answers to be typed up and submitted using Microsoft Word.

If in any answer, it is not possible to complete it electronically (eg calculations, graphs, formulae) these can be handwritten. Please take a photograph of your workings and save the image. The image should then be inserted into your examination paper at the correct point within your answer. It is your responsibility to ensure that any image that is inserted is readable. High quality images can impact the size of the file and causes issues with uploading.

Further information on how to insert images can be found on [this page](#)

**Submission**

Please ensure that you leave sufficient time to complete the online submission process, as upload times can vary. Accessing the submission link before the deadline does **NOT** constitute completion of submission. You **MUST** click the '**CONFIRM**' button before the date and time stated above for your answers to be classed as submitted on time.

**It is important that any file submitted follows the conventions stated below:**

**File name**

The name of the file that you upload must be your student ID only.

**Submission title**

During the submission process the system will ask you to enter the title of your submission. This should also be your student ID only.

**Front cover**

The first page of your submission should always be the Online Exam Coversheet, which is provided in the same Minerva area as this exam paper.

**Student name**

You should **NOT** include your name anywhere on your submission.

**Word limit**

You are required to adhere to the word limit specified and state an accurate word count on the cover page of your assignment. Your declared word count must be accurate, and should not mislead. Making a fraudulent statement concerning the work submitted for assessment could be considered academic malpractice and investigated as such. If the amount of work submitted is higher than that specified by the word limit or that declared on your word count, this may be reflected in the mark awarded and noted through individual feedback given to you

**Questions during your exam**

If you have a question about this examination paper during the exam, please direct all queries to the assessment team on [LUBSassessment@leeds.ac.uk](mailto:LUBSassessment@leeds.ac.uk) between the hours of 9am – 5pm (UK Time), Monday to Friday. All questions should go through this route. Do not contact your module leader directly.

Answer **all** questions

**Question 1.**

The transfer of knowledge-based resources from acquirers to the acquired units has been emphasised as an important driver of post-acquisition integration. A research project is carried out to investigate the facilitating role of Human Resource Management (HRM) practices in the success of knowledge transfer between the acquirer and target firms.

The researchers conducted a survey between 2018 and 2019. They specifically targeted the Chinese companies that had been fully acquired by foreign multinational enterprises (MNEs) between 2011 and 2016. The restricted time frame is to ensure that the respondents were able to remember about the knowledge flows and the issues influencing them. Acquisitions were required to be at least one year old to ensure enough time had passed for possible post-acquisition changes to be implemented.

To develop a list of firms to take part in the study, the researchers obtained and reviewed lists of foreign firms that made acquisitions in China's 10 largest cities and their surrounding areas (Beijing, Shanghai, Guangzhou, etc.). They combined this information and compiled a master list based on the following criteria for sampling:

- First, the Chinese firms had to be acquired by foreign firms coming from one of the following seven countries: Germany, France, South Korea, US, Sweden, Singapore, or the UK. These seven countries were chosen because they were the major investors in China.
- Second, the acquired company needed to have 20 or more employees, as with even smaller acquisitions we believe the issues involved are rather different.

Based on these sampling criteria, a list of 512 firms was generated. These firms were contacted in a written form and in person to ask if they would be willing to take part in this study. The total response rate was 35% and 181 firms completed questionnaires. Among these 181 firms, the smallest company had 30 employees and the largest employed 2000 individuals (the average = 353). The oldest company was founded in 1987 and the youngest company was founded in 2008, and the average firm age was around 17 years. Regarding the industries of the acquired firms, the top three industries of the acquired firms participating in this survey are manufacturing, wholesale trade, and information technology.

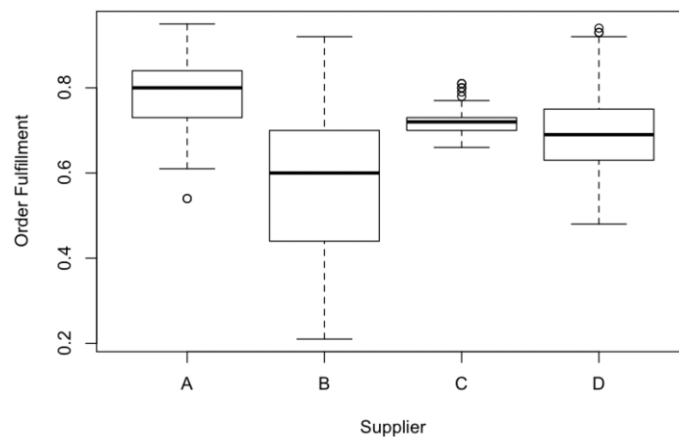
*Define the population of the research project. Evaluate the applied sampling strategy and the representativeness of the sample. Propose an alternative sampling strategy and justify its effectiveness.*

**[20 marks]**

**Question 2.**

Due to the increasing impact of global supply chain disruptions, a multinational enterprise (MNE) is re-evaluating its supply chain strategy to improve its resilience. The firm would like to change its current sole sourcing practice (i.e., only relying on a single supplier) to dual sourcing (i.e., using two suppliers). It carefully selects four potential suppliers (A, B, C, and D) in the global market and their order fulfilment rates in the past five years are reported in Figure 2.1. (Note that the order fulfilment rate is the number of orders processed divided by the total number of orders received. A low order fulfilment rate could be due to inadequate inventory, logistic complexity, etc.)

**Figure 2.1** Boxplot of Order Fulfilment Rate (%) of the potential suppliers



In addition, by analysing the data on supply chain within the industry, the firm finds that the order fulfilment rate could be influenced by the communication effectiveness (negatively associated with factors like linguistic distance and time zone difference) and return processing. They visualise the industry data in Figures 2.2 and 2.3. Accordingly, the firm collects the information on those two factors for each of the four potential partners and reports it in Table 2.1.

**Figure 2.2** Scatter plot (Communication Effectiveness vs. Order Fulfilment Rate)

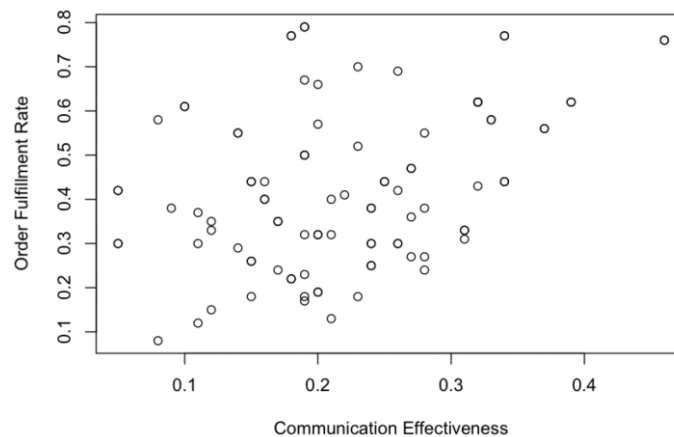


Figure 2.3 Scatter plot (Return Processing vs. Order Fulfilment Rate)

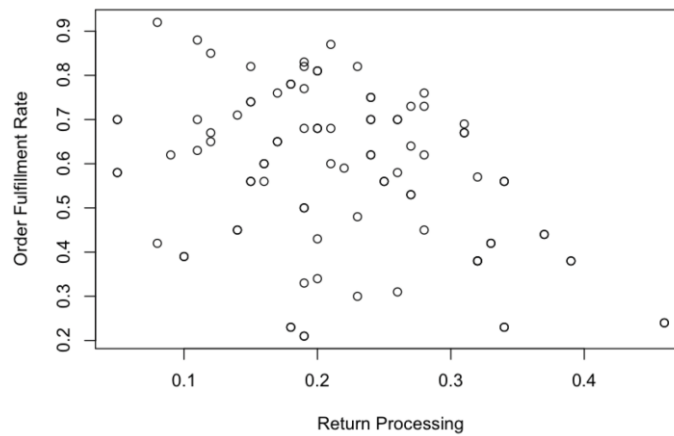


Table 2.1 The perceived trustworthiness, cultural distance, and legal protection level

	Partner A	Partner B	Partner C	Partner D
Communication effectiveness	0.25	0.4	0.1	0.3
Return processing	0.1	0.15	0.2	0.35

Based on the information provided, please advise the firm which two suppliers to choose and explain your answer.

**[20 marks]**

**Question 3.**

Cross-border mergers and acquisitions (M&As) by Chinese firms have risen significantly over the past decade. Chinese firms increasingly target firms in developed countries, especially in Europe, which accounted for over one-third of Chinese acquisitions globally between 2015 and 2017.

A project is developed to investigate the impact of acquiring similar or complementary technologies on the innovation performance of Chinese multinationals' strategic asset-seeking M&As in the EU, and whether such impact is contingent upon firm-level and region-level technological gaps. Six hypotheses are developed:

**Hypothesis 1.** *Technological similarity has a negative impact on Chinese acquirers' post-acquisition innovation performance.*

**Hypothesis 2.** *Technological complementarity has a positive impact on Chinese acquirers' post-acquisition innovation performance.*

**Hypothesis 3a.** *Firm-level technological gap has a moderating effect on the relationship between resource similarity and post-acquisition innovation performance, such that a larger gap will weaken the negative impact of resource similarity on innovation performance.*

**Hypothesis 3b.** *Firm-level technological gap has a moderating effect on the relationship between resource complementarity and post-acquisition innovation performance, such that a larger gap will strengthen the positive impact of resource complementarity on innovation performance.*

**Hypothesis 4a.** *Region-level technological gaps have a moderating effect on the relationship between resource similarity and post-acquisition innovation performance, such that a larger gap will weaken the negative impact of resource similarity on innovation performance.*

**Hypothesis 4b.** *Region-level technological gaps have a moderating effect on the relationship between resource complementarity and post-acquisition innovation performance, such that a larger gap will strengthen the positive impact of resource complementarity on innovation performance.*

The hypotheses were tested using a sample of 65 strategic asset-related M&A deals by Chinese firms acquiring EU firms. The results are reported in Table 3.1.

The variables involved in the analysis include:

- Chinese MNEs' post-acquisition *innovation performance*, measured by the rate of change in patent applications made by Chinese acquirers three years pre- and post-acquisition. Specifically, this variable is calculated by subtracting the number of patent applications three years before the M&A from patent applications three years after the M&A, and then dividing this difference by applications made three years after M&A;

- Resource *Similarity*, refers to the overlap of technological resources (patents) between acquirer (A) and target (T), calculated by:

$$\frac{\text{overlap patents in the same class}}{\text{total patents of A and T}} \times \frac{\text{total A patents in the same class}}{\text{total A patents}};$$

- Resource *Complementarity*, refers to the overlap in patents in the same subcategory but different class

$$\frac{\text{overlap patents in the same subcategory different class}}{\text{total patents of A and T}} \times \frac{\text{overlap patents in same category different class}}{\text{total A patents}};$$

- *Firm-level technology gap*, measured by the ratio of number of firm-level patents between target and acquirer, in natural logarithms;
- *Regional technology gap*, measured by the ratio of number of regional patent applications between target and acquirer, in natural logarithms;
- *State-ownership*, measured by a dummy variable, value 1 if a firm's ultimate owner is the government, 0 otherwise;
- *Firm size*, measured by the number of total employees, in natural logarithms;
- *External collaboration*, measured by a dummy variable, value 1 if a firm engages in other external research collaboration activities (e.g., university), 0 otherwise;
- *Firm age*, measure by total years since foundation;
- *Acquirer home region*, measured by the natural logarithm of regional GDP in the acquisition year;
- *Acquirer's industry R&D intensity*, measured by R&D expenditure over sales at industry level.

You are required to answer the following questions:

a) Write down the statistical model for Model 4.

**[2 marks]**

b) Suggest whether the results in Table 3.1 are consistent with any of the six hypotheses. Please support your answer with a detailed analysis (in terms of the directions and statistical significances of the key explanatory variables).

**[8 marks]**

c) The CEOs in the emerging markets would like to know how the results of this project can help them make decisions in strategic asset-related M&As. How would you respond?

**[12 marks]**

**Table 3.1** Regression results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	-6.68 (4.26)	-7.25* (4.28)	-6.00 (4.56)	-6.51 (4.18)	-7.30* (4.21)	-9.08* (4.35)
State ownership	-0.17 (0.46)	-0.06 (0.43)	0.01 (0.49)	-0.05 (0.44)	-0.06 (0.44)	-0.00 (0.43)
Firm size	4.59*** (0.71)	4.80*** (0.54)	4.41*** (0.73)	5.06*** (0.50)	4.63*** (0.68)	4.74*** (0.57)
Firm age	-0.04* (0.02)	-0.04 (0.03)	-0.06** (0.03)	-0.04* (0.02)	-0.04* (0.02)	-0.04** (0.02)
Acquirer region GDP	0.19 (0.39)	0.21 (0.40)	0.24 (0.41)	0.15 (0.39)	0.29 (0.40)	0.40 (0.40)
Industry R&D intensity	1.15 (4.17)	-0.21 (4.31)	2.07 (4.84)	-0.25 (4.54)	-0.24 (4.29)	0.46 (4.46)
External collaboration	0.16 (0.40)	0.17 (0.38)	-0.09 (0.37)	0.24 (0.41)	0.08 (0.39)	0.10 (0.37)
Similarity	-2.42 (1.57)		-7.97*** (2.55)	-1.47 (1.26)	-3.15* (1.71)	-1.57 (1.25)
Complementarity		7.34*** (2.48)	5.08*** (1.44)	1.59 (3.37)	5.44*** (1.39)	8.41*** (2.41)
Firm tech gap			-0.13 (0.43)	0.21 (0.34)	0.59* (0.33)	0.48 (0.31)
Regional tech gap			0.03 (0.02)	0.01 (0.02)	-0.015*** (0.05)	-0.10*** (0.03)
Similarity * Firm gap			-4.97*** (1.54)			
Complementarity * Firm gap				-9.13* (4.12)		
Similarity * Regional gap					0.39*** (0.14)	
Complementarity * Regional gap						1.16* (0.55)
Observations	65	65	65	65	65	65
R-square	0.32	0.32	0.32	0.31	0.35	0.37

Note. Standard errors are shown in parenthesis. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.



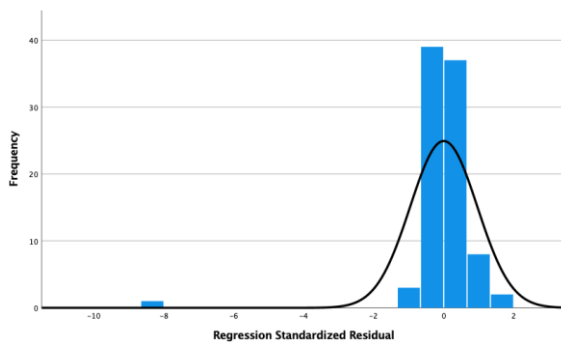
**Question 4.**

A research team is investigating the post-acquisition performance of multinational enterprises (MNEs) in emerging markets and collects a sample of 90 firms. The dependent variable in the study is the post-acquisition *performance*, measured by the rate of change in profit made by acquirers five years pre- and post-acquisition. The impacts of the following factors are examined:

- *PD distance* (the absolute difference between acquirer and target firms in power distance dimension);
- *IND distance* (the absolute difference between acquirer and target firms in individualism dimension);
- *MAS distance* (the absolute difference between acquirer and target firms in Masculinity dimension);
- *UA distance* (the absolute difference between acquirer and target firms in uncertainty avoidance dimension);
- *LTO distance* (the absolute difference between acquirer and target firms in long-term orientation dimension);
- *Prior CBA experience of the acquirer* (the number of cross-border acquisitions prior to the current deal);
- *Home country GDP* (the natural logarithm of home country GDP in the acquisition year).

The researchers conduct a linear regression analysis. The results are reported as follows:

**Figure 4.1** Residual histogram



**Figure 4.2** P-P plot

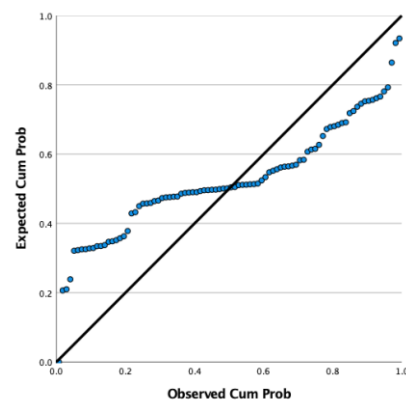


Figure 4.3 Scatter plot ( $\hat{y}$  against  $e$ )

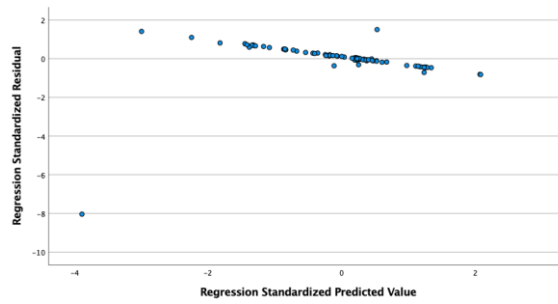


Table 4.1 Descriptive statistics

	Mean	Std. Deviation	N
Performance	-4.6939	44.08833	90
PD distance	35.14	13.880	90
IND distance	43.59	17.149	90
MAS distance	12.06	14.009	90
UA distance	19.33	16.565	90
LTO distance	26.62	17.128	90
Home Country GDP	28.6286	1.27339	90
Prior CBA Experience	5.50	6.814	90

Table 4.2 Correlation

		Performance	PD distance	IND distance	MAS distance	UA distance	LTO distance	Home Country GDP	Prior CBA Experience
Pearson Correlation	Performance	1.000	.208	.271	-.031	-.213	-.114	.174	.076
	PD distance	.208	1.000	.389	-.180	-.306	.019	.292	.102
	IND distance	.271	.389	1.000	-.386	-.230	.351	.512	-.134
	MAS distance	-.031	-.180	-.386	1.000	.306	-.111	-.128	-.056
	UA distance	-.213	-.306	-.230	.306	1.000	.018	.239	-.288
	LTO distance	-.114	.019	.351	-.111	.018	1.000	.291	-.234
	Home Country GDP	.174	.292	.512	-.128	.239	.291	1.000	-.153
	Prior CBA Experience	.076	.102	-.134	-.056	-.288	-.234	-.153	1.000

Table 4.3 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.420 <sup>a</sup>	.176	.106	41.68870	1.930

a. Predictors: (Constant), Prior CBA Experience, MAS distance, PD distance, LTO distance, Home Country GDP, UA distance, IND distance  
 b. Dependent Variable: Performance

Table 4.4 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		Correlations			Collinearity Statistics		
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-191.622	120.579		-1.589	.116					
	PD distance	.042	.373	.013	.112	.911	.208	.012	.011	.729	1.372
	IND distance	.674	.365	.262	1.846	.069	.271	.200	.185	.498	2.006
	MAS distance	.437	.353	.139	1.238	.219	-.031	.135	.124	.799	1.252
	UA distance	-.590	.342	-.222	-1.727	.088	-.213	-.187	-.173	.610	1.639
	LTO distance	-.598	.286	-.233	-2.094	.039	-.114	-.225	-.210	.815	1.228
	Home Country GDP	6.191	4.669	.179	1.326	.189	.174	.145	.133	.552	1.811
	Prior CBA Experience	.172	.708	.027	.243	.808	.076	.027	.024	.839	1.192

a. Dependent Variable: Performance

You are required to answer the following questions:

a) *Evaluate the use of linear regression model. Please include all the linear regression assumptions in your answer.*

**[20 marks]**

b) *Discuss the practical implications of the study from the perspective of the managers.*

**[10 marks]**

c) *The research team categorizes the dependent variable into a dummy variable, with a value of 1 if the firm's profit is increased post acquisition (i.e., performance > 0) and a value of 0 otherwise, and run a logistic regression. Write down the statistical model.*

**[4 marks]**

d) *The log-likelihood of the intercept-only model is -120.285 and the log-likelihood of the unconstrained model in c) is -105.108. Given  $\chi^2_{0.05,7} = 14.07$ , would you recommend that the variables in the logistic regression are useful to enhance our understanding on emerging market firms' cross-border acquisition performance? Explain your answer.*

**[4 marks]**

**[End]**