Research on the Impact of Expanding Cross-Border e-Commerce Business on e-Commerce Enterprises: A Case Study of Pinduoduo and Jingdong

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Abstract: As an emerging business model, rapid development has occurred on cross-border e-commerce in recent decades, not only providing businesses with a broader market space but also bringing new opportunities and challenges. Pinduoduo's (PDD) quick development and the meteoric rise in its market value have garnered significant public attention during these years. Team, a cross-border e-commerce retail store owned by PDD, was a remarkable success within a year of its launch, which may be one of the reasons for PDD＇s rapid development. This paper has conducted a series of data collection and analysis on how international e-commerce affects enterprises, aiming to reveal its actual influence on business operations. In this paper, the data of PDD and Jingdong(JD) was analyzed to investigate the effects of expanding cross-border e-commerce business on e-commerce enterprises. It discovered that expanding cross-border e-commerce business will not significantly improve the net income of e-commerce enterprises. However, the stock prices of e-commerce enterprises have boosted significantly after expanding cross-border e-commerce business. After further conjectures and summaries, it reveals that although expanding cross-border e-commerce business cannot significantly improve net income in the short term, it can significantly increase stock prices, which benefits boost investors' confidence and attract their attention and support. These results can provide suggestions and guidance for e-commerce enterprises when they decide whether to expand cross-border e-commerce business.

1 INTRODUCTION

As Internet technology advanced quickly, the cross-border e-commerce business grew significantly in the world, supported by advanced technologies, growing demand, and favorable policies(Ding, F., Huo, J., & Campos, J. K., 2017, September). This emerging business model is efficient enough compared with traditional transaction modes and facilitates fast transactions (Zhang, X., 2019). It has been rapidly expanding, offering companies a more extensive market space and presenting both opportunities and challenges along the way. The growth and development of e-commerce businesses have made the decision of whether to develop cross-border e-commerce become an important issue. The booming development of cross-border e-commerce has also attracted the increasing attention of the Chinese government. Following the implementation of

numerous policies by the Chinese government to encourage the growth of international e-commerce, e-commerce businesses like JD and PDD had successively established cross-border e-commerce platforms(Wang, Y., Wang, Y., & Lee, S. H., 2017).In recent years, the market value of PDD has grown enormously, which has attracted the attention of many stock investors and researchers.PDD and JD, as two representative e-commerce businesses in China, also have a prominent position in the domain of international e-commerce. They respectively developed cross-border e-commerce in September 2022 and April 2015. In 2023, Danmian Li et al. raised research about the success of temu, which is a platform for international e-commerce established by PDD. Temu achieved great success within a year of launch due to the right operational decisions and market positioning (Li, D., 2023).This paper observed the start of market value growth enormously of PDD coincides with the launch of temu. Previous studies

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have shown that developing cross-border e-commerce had a noteworthy favorable effect on promoting international trade in China (Wang, Y., Wang, Y., & Lee, S. H., 2017). In this paper, the conjecture was proposed:expanding cross-border e-commerce business is conducive to the development of e-commerce enterprises.To verify this conjecture, this paper took PDD and JD as the research objects and explored the effects of developing international e-commerce on them through data analysis. By studying the influence of JD and PDD on developing international e-commerce, it is beneficial to have a thorough awareness of the e-commerce industry's current state of development and trends. This paper collected and analyzed revenue and income data from the official quarterly reports of PDD and JD as well as stock price data from Yahoo Finance. In terms of data analysis, the data were first modeled and then subjected to regression analysis and difference in difference analysis (DID analysis). For the analysis of these three types of data, different results were obtained. Regarding the analysis of revenue, results indicated that developing international e-commerce didn't have a significant effect on the revenue of JD, but it has significantly improved PDD's revenue. In the analysis of net income, results indicated that there is no discernible effects of developing international e-commerce on PDD and JD's net income. The analysis results in both sections are contrary to the initial conjecture. However, in the analysis of net income, results indicated that developing international e-commerce boosted PDD and JD's stock prices significantly. It is the same as the original conjecture.

Through data analysis, this paper verified that the growth of e-commerce businesses is positively impacted by expanding cross-border e-commerce business, which has contributed to the research on the operation and development of international e-commerce. This research revealed that developing international e-commerce cannot significantly improve the profitability of e-commerce enterprises in the short term, but it can significantly boost the market value of enterprises.

2 LITERATURE REVIEW

2.1 Birth and Development of Cross-Border e-Commerce Business

The term cross-border e-commerce began to appear in 2011, which refers to a novel pattern of international trade, in which transaction subjects in different border regions reach transactions in the way of e-commerce,

order online, pay and settle, deliver goods through cross-border logistics, clear customs, and finally deliver, and complete transactions(Xue, W., Li, D., & Pei, Y., 2016).As an emerging trade pattern, cross-border e-commerce is the technology foundation for advancing trade globalization and economic integration, which is quite significant from a strategic perspective. International e-commerce has greatly altered the global economy and trade by promoting borderless trade and international trade.(Shuai, Q., Li, Z., & Zhang, Y., 2023).In cross-border trade, long supply chains with numerous middlemen allow consumers to buy goods from overseas.(Qi, X., Chan, J. H., Hu, J., & Li, Y., 2020).This emerging trade pattern is smaller, more often, and faster than before, which has been rapidly expanding, offering Cross-border e-commerce enterprises a more extensive market space and presenting both opportunities and challenges along the way. Although many large e-commerce enterprises throughout the globe have developed international e-commerce businesses, most studies do not provide the specific effects of developing international e-commerce on the development of enterprises, and merely a few research analyze some successful cases of e-commerce enterprises in developing international e-commerce business. The purpose of this paper is to obtain a thorough understanding of the ways in which cross-border e-commerce impacts cross-border e-commerce firms.

2.2 Success of Temu Attracted Attention

Temu is a platform for international e-commerce established by PDD. Since Temu was formally launched in the US on September 1, 2022, it has achieved success with its main selling point of low prices. Subsequently, Temu quickly entered markets such as Canada and Australia. By April 2023, Temu officially landed in the UK and rapidly expanded to other European markets such as Germany, France, Italy, the Netherlands, New Zealand, and Spain. It then entered Japan, South Korea, and some Southeast Asian countries. By September 2023, Temu's website covered Europe, North America, Oceania, Latin America, and Asia. Temu uses digital marketing techniques to increase its reach and discount pricing to attract customers. In addition, it leveraged data management practices to gain valuable customer insights. These strategies have allowed teum to expand rapidly and achieve remarkable results(Li, D., 2023).The success of temu has attracted attention of investors, it has been seen as beneficial to PDD's rapid

growth, which has led investors to look to PDD. Therefore, this paper took the impact of tume's success on PDD as part of the research.

2.3 PDD and JD are Selected as the Research Objects

In China, platforms like PDD and JD stand out as key players in the e-commerce industry, particularly in the realm of cross-border trade. Through a thorough examination of these platforms, valuable insights can be gained into the current status and future trends of e-commerce. PDD, known for its pseudo-self-operated model, has revolutionized the market through social e-commerce and group buying strategies, embodied in its motto "Team Up, Price Down." The success of Tume after its launch has led to further development of PDD. On the other hand, JD has established itself as a trustworthy platform by combining self-operated services with a robust logistics system. Through financing, M&A and self-construction, JD had also established a cross-border e-commerce company, which had achieved some success(Xu, H., 2023).Engaging in outbound M&A also has a positive impact on Chinese firms achieving their main objectives(Edamura, K., Haneda, S., Inui, T., Tan, X., & Todo, Y., 2014).They represent different operating models and market positioning in the e-commerce industry. By analyzing the effects of developing cross-border e-commerce on PDD and JD, the impact of developing cross-border e-commerce on e-commerce enterprises can be further indicated. Therefore, PDD and JD were selected as the research objects in this paper.

3 MATERIALS AND TOOLS

This section gathered the data on quarterly financial statements of PDD and JD from Q1 2015 to Q3 2023.Through the selection of numerous data, revenue and net income was finally selected as the research objects.The stock price was also collected from Yahoo Finance.This paper used simple linear regression analysis to explore the correlation between the variables that are independent and dependent, and further investigate the impact of Temu's launch through DID analysis.

3.1 Data Object of the Research

In this paper, revenue, net income and stock price were selected as data objects for research. One crucial financial metric for businesses is revenue, which is

crucial for their financial management. With an increase of revenue, the market share of the enterprise will expand accordingly, which helps to improve the position and influence of the enterprise in the industry. So this research chose it as a research object.Net income is the net operating income realized by an enterprise in a certain period of time. It reflects the net operating income realized by an enterprise in a certain period of time, which is one of the important indicators of the operating status of an enterprise. The growth of net income can directly indicate the enhancement of enterprise profitability. So this research chose it as a research object. An increase in stock prices can increase the market value of a business, which helps the company attract the attention and support of investors. Investors will believe that the company has greater potential for growth and development. So this research chose it as a research object.

3.2 Tools and Analytical Methods of the Research

In order to verify the conjecture, this paper uses regression analysis, DID analysis and logarithmic transformation.Regression analysis is a statistical tool that is used to determine the relationship between two or more variables and to establish mathematical models to represent this relationship.It is commonly used to determine the causal effect of one variable on another(Sykes, A. O., 1993).By calculating the correlation coefficient, regression analysis can evaluate and measure the closeness of the relationship between variables.

4 DATA ANALYSIS OF PDD AND JD

4.1 Regression Analysis of Revenue

In this section, this paper conducted a simple linear regression analysis using revenue data from the official quarterly reports from PDD and JD to explore the correlation between independent and dependent variables. This section selected revenue as dependent variables and developing cross-border e-commerce as an independent indicator variable. Considering that revenue is quarterly data, it will be affected by different time Settings. The data models also introduced trend effect based on year factors to eliminate the influence of time in the data. Sample size of data is 27 for both PDD and JD. Time horizon

of data is from Q1.2017 to Q3.2023 on PDD and from Q1.2013 to Q3.2019 on JD. The regression equation is (1).Part of the data models details are presented in Table 1.Then regression analysis was done separately, the results of PDD were presented in Table 2, and JD's were presented in Table 3 .In the results, the coefficients of "Temu's online" is positive and p-value is lower than 0.05 in Table 2.Coefficients of developing international e-commerce is negative and p-value is higher than 0.05.Results indicate that "Temu's online" significantly boosted the revenue of PDD, but developing international e-commerce did not have a noteworthy effect on the revenue of JD. It prompts further contemplation.

$$revenue = \alpha + \beta * \text{Developing cross-border} \quad (1)$$
$$\text{e-commerce} + \gamma * \text{Year} + \varepsilon .$$

4.2 Regression Analysis of Net Income

In this section, net income was selected as dependent variable, a line chart of net income data was drawn in Figure 1.Sample size of data is 38.Time horizon of

data is from Q1.2019 to Q3.2023.As shown in Figure1, the blue line represents net income of PDD, the orange line represents net income of JD, red dot represents the time node of developing cross-border e-commerce of PDD, all numbers are in 100 million RMB.In the line chart, it reveals that net income of PDD has increased obviously and continued to be higher than JD's at the red node and after.Before the regression analysis, some of the data are observed that they do not follow a normal distribution.So the net income data was performed a logarithmic transformation.The transformation equation is (2). The number A is 44.79 billion RMB.After testing, the logarithmic transformation successfully normalized the data that originally did not follow a normal distribution.Data models were built and part of it is presented in Table 4.Then the DID analysis was done, analysis result are presented in Table 5.In the result, It can be observed that the coefficient is negative and p-value is smaller than 0.05 about the interaction.

$$Y=ln(X+A). \quad (2)$$

Table 1: Part of the Data Models Details.

Time	Revenue	Developing cross-border e-commerce	Trend Effect
2017Q1	37, 019	0	0
2017Q2	104, 617	0	0
2017Q3	423, 038	0	0
2018Q2	2, 709, 046	0	1
2018Q3	3, 372, 418	0	1
2019Q1	4, 545, 204	0	2
2019Q2	7, 290, 008	0	2
2022Q3	35, 504, 304	1	5
2022Q4	39, 820, 028	1	5
2023Q1	37, 637, 050	1	6

Table 2: Revenue Analysis Results of PDD.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-2114271.869	2320682.759	-0.911055964	0.371326199	-6903925.676	2675381.939
Temu's on-line	15308932.73	4176144.393	3.665805414	0.001220194	6689794.322	23928071.14
Trend Effect	6003899.882	831907.876	7.217024932	1.85829E-07	4286926.414	7720873.351

Table 3: Revenue Analysis Results of JD.

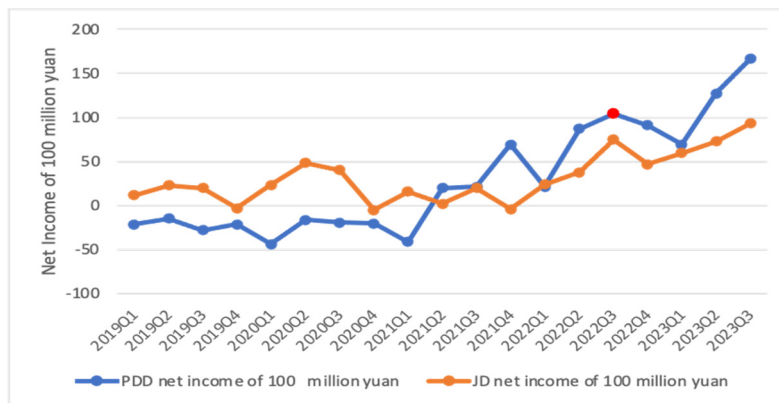|	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	10370082.29	3930397.469	2.638430941	0.014394193	2258140.608	18482023.97
Developing cross-border e-commerce	-4560525.272	7711996.72	-0.59135467	0.559812002	-20477304.21	11356253.67
Trend Effect	21275327.23	1864351.217	11.41165197	3.51287E-11	17427495.44	25123159.03

Figure 1: Net Income Comparison Between PDD and JD.

Table 4: Part of Data Models Details of DID Analysis.

Time	Ln(X+A)	Before/After	Treatment	Interaction	Trend Effect
2019Q1	3.16800349	0	0	0	0
2019Q2	3.403528	0	0	0	0
2019Q3	2.8361502	0	0	0	0
2019Q4	3.16209381	0	0	0	0
2020Q1	0	0	0	0	1
2020Q2	3.35235722	0	0	0	1
2020Q3	3.24688002	0	0	0	1
2020Q4	3.19826487	0	0	0	1
2021Q1	1.25276297	0	0	0	2
2021Q2	4.17346377	0	0	0	2
2021Q3	4.19509447	0	0	0	2
2021Q4	4.73654926	0	0	0	2

Table 5: DID Analysis Results.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	2.63732057	0.3439089	7.66866052	7.8944E-09	1.93763266	3.33700848
Before/After	0.76055276	0.56030895	1.35738108	0.18387137	-0.3794044	1.90050988
Treatment	0.76480205	0.29685893	2.57631478	0.01464873	0.16083801	1.36876609
Interaction	-1.0894113	0.64698904	-1.6838173	0.10165485	-2.4057204	0.22689776
Trend effect	0.09376054	0.03405205	2.7534473	0.00951397	0.02448111	0.16303997

4.3 Regression Analysis of Stock Price

This section will explore the impact of developing cross-border e-commerce on e-commerce firms by focusing on changes in stock prices. Data on stock prices was collected from Yahoo Finance. First, a separate regression analysis was conducted on the stock price data of PDD and JD. It is considered that time may have a trend effect on changes in stock prices, so trend effect factors in months were also introduced to eliminate the influence of time in the data. The sample size of data is 70 for both PDD and JD. The time horizon of data is from 1st Jan. 2022 to

28th Apr. 2023 on PDD and from 8th Aug. 2014 to 14th Dec. 2015 on JD. The data models of PDD and JD were built separately. Part of PDD is presented in Table 6 and part of JD's is presented in Table 7. Then the regression analysis was done separately. The results of PDD were presented in Table 8 and JD's were presented in Table 9. In the results, it can be observed that the coefficient of "Temu's on-line" is positive and the p-value of "Temu's on-line" is smaller than 0.05 on PDD. The coefficient of developing cross-border e-commerce is positive and the p-value of developing cross-border e-commerce is smaller than 0.05 on JD. These results demonstrate

that developing cross-border e-commerce can boost the stock price of e-commerce enterprises significantly. Further, the line chat was drawn presented in Figure 2. Sample size of data is 140. The time horizon of data is from 1st Jan. 2022 to 28th Apr. 2023. As shown in Figure 2, the dark blue line represents the stock price of JD, the red dot represents the time node of developing cross-border e-commerce of PDD, and all numbers are in one RMB. Through the line chart, It could be observed that the stock price of PDD has a significant premium to JD's at the red node and after. To investigate the relationship between developing international e-commerce and stock price changes more thoroughly. After data models were built, a part of which is presented in Table 10.DID analysis was done and the results were presented in Table 11. In the analysis results, the coefficient of interaction is positive and the p-value of interaction is smaller than 0.05. It demonstrated that "Temu's Online" provided a driving force for PDD's stock price, significantly and positively influencing it, helping to provide momentum for stock price growth.

Table 6: Part of the Data Models Details of PDD.

Time	Stock Price	Temu's Online	Trend Effect
2022/1/1	55.900002	0	0
2022/1/8	60.41	0	0
2022/1/15	62.41	0	0
2022/1/22	53.049999	0	0
2022/1/29	55.849998	0	0
2022/2/5	60	0	1
2022/2/12	56.029999	0	1
2022/2/19	51.650002	0	1
2022/2/26	41.27	0	1
2022/3/5	32.130001	0	2

Table 7: Part of the Data Models Details of JD.

Time	Stock Price	Developing cross-border e-commerce	Trend Effect
2014/8/18	30.959999	0	0
2014/8/25	31.92	0	0
2014/9/1	29.030001	0	1
2014/9/8	29.25	0	1
2014/9/15	28.35	0	1
2014/9/22	26.93	0	1
2014/9/29	25.98	0	1
2014/10/6	25.01	0	2

Table 8: Regression Analysis Results of PDD.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	45.59727	2.919575	15.61778	5.11E-24	39.76978	51.42477
Temu's on-line	14.1512	5.701079	2.482196	0.01557	2.771797	25.5306
Trend effect	1.503681	0.613849	2.449594	0.016922	0.278433	2.728929

Table 9: Regression Analysis Results of JD.

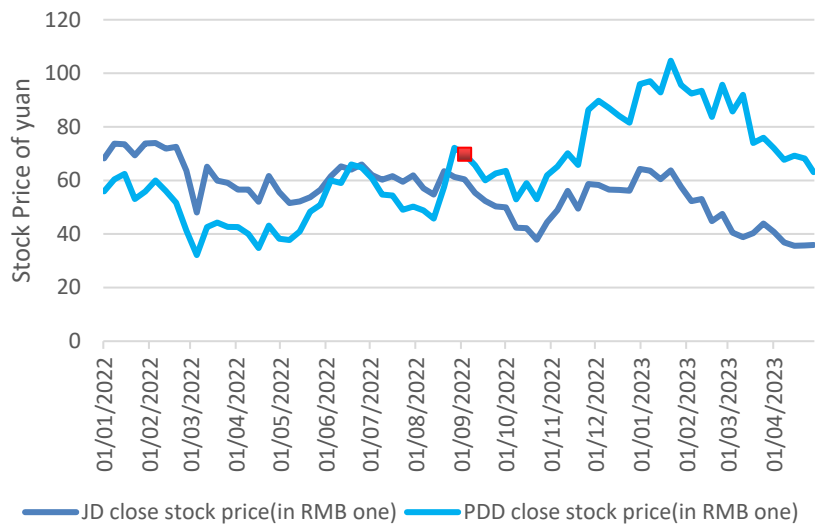|	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	28.0950383	0.86980692	32.300316	1.4175E-42	26.3588964	29.8311802
Developing cross-border e-commerce	6.41571516	1.55710811	4.12027598	0.0001063	3.30771436	9.52371595
Trend effect	-0.312331	0.16757438	-1.8638352	0.06672726	-0.6468109	0.02214883

Figure 2: Stock Price Comparison Between PDD and JD.

Table 10: Part of Data Models Details of DID Analysis.

Stock Price	Before/After	Treated/Control	Interaction	Trend Effect
68.239998	0	0	0	0
73.720001	0	0	0	0
73.459999	0	0	0	0
69.339996	0	0	0	0
73.769997	0	0	0	0
73.980003	0	0	0	1
71.860001	0	0	0	1
72.5	0	0	0	1
63.59	0	0	0	1
47.990002	0	0	0	2
65.129997	0	0	0	2
59.919998	0	0	0	2
59.09	0	0	0	2
56.540001	0	0	0	3
56.560001	0	0	0	3

Table 11: DID Analysis Results of Stock Price.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	62.07933847	2.204042144	28.16613042	2.22405E-58	57.72042135	66.4382556
Before/After	-12.10263393	3.962372074	-3.054391083	0.00271772	-19.93898658	-4.266281279
Treatment	-11.12942834	2.495506747	-4.459786918	1.71122E-05	-16.06477276	-6.194083922
Interaction	38.72857111	3.529179487	10.97381736	2.0093E-20	31.7489401	45.70820213
Trend Effect	-0.044602112	0.381996165	-0.116760627	0.907223267	-0.800072978	0.710868754

5 RESULT AND DISCUSSION

Considering the analysis above, this research detected the following conclusions:For PDD and JD, developing cross-border e-commerce cannot significantly improve net income in the short term, but it could significantly boost stock prices.Developing cross-border e-commerce can significantly improve revenue for PDD, but cannot for JD.Considering the data performance analysis of JD and PDD, this research also has proposed several speculations regarding the differences between the

two. First, this paper has highlighted that differences in company positioning and market strategies may result in varying responses to overseas e-commerce.The distinct market positions of JD and PDD could significantly influence their performance in the international e-commerce landscape. Second, disparities in market conditions may lead to differences in revenue and stock price performances.JD and PDD may encounter unique challenges and opportunities due to differing market conditions, thus impacting their financial performances differently. Last, differences in operational management strategies could be a significant factor driving the disparities in data outcomes. Variances in how the companies handle business operations may contribute to differences in their data performances.Taking into account these diverse aspects and giving precedence to sustained expansion over transient variations is essential while investigating the growth of international e-commerce.Finally, If the goal of e-commerce enterprises is to enhance a company's market value in the short term, then embarking on international e-commerce development is a favorable option.However, it's essential to bear in mind while exploring international e-commerce, a thorough consideration of various factors is crucial. Prioritize long-term growth over short-term fluctuations. If e-commerce enterprises are aiming for long-term business benefits, it's imperative to take into account a broader spectrum of factors beyond immediate gains.

6 CONCLUSION

The effects of international e-commerce on e-commerce businesses was investigated in this study.In light of above analysis, the following conclusions were draw:Although expanding international e-commerce business may not significantly improve e-commerce enterprises' revenue and profitability in the short term, it can significantly increase the stock price of enterprises, which is helpful to attract more investors.According to the findings of the JD and PDD data study, several speculations were proposed regarding the differences between the two:First, differences in company positioning and market strategies may result in varying responses to cross-border e-commerce.Second, disparities in market conditions may lead to differences in revenue and stock price performances. JD and PDD may encounter unique

challenges and opportunities due to differing market conditions, thus impacting their financial performances differently.Last, differences in operational management strategies could be a significant factor driving the disparities in data outcomes. Variances in how the companies handle business operations may contribute to differences in their data performances.In expending international e-commerce business, it is imperative to consider these various factors and prioritize long-term growth over short-term fluctuations.Lastly, this study makes some recommendations for e-commerce enterprises:If the goal is to enhance company's market value in the short term, then embarking on developing international e-commerce would be a wise move.However, it's essential to bear in mind while exploring international e-commerce, a thorough consideration of various factors is crucial. Prioritize long-term growth over short-term fluctuations.If enterprises are aiming for long-term business benefits, it's imperative to take into account a broader spectrum of factors beyond immediate gains.

The limitation of this paper mainly lies in the different operational decisions and market positioning of different e-commerce enterprises when developing cross-border e-commerce.Due to the limitation of tume's launch time, only the existing short-term effects are studied in this paper.More detailed questions were left to future researchers.

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