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The Impact of Cross-Border Mergers and Acquisitions on Financial Performance and Intangible Assets of Agribusinesses in Emerging Countries

Wpływ transgranicznych fuzji i przejęć na wyniki finansowe oraz aktywa niematerialne przedsiębiorstw z branży agrobiznesu w gospodarkach wschodzących

Abstract

This study investigates the impact of mergers and acquisitions (M&A) on intangible assets and financial performance of agribusiness firms in emerging economies, focusing on Brazil, Russia, India, China, and South Africa. Using data from 25 firms between 2015 and 2020, this study applies Data Envelopment Analysis (DEA), Tobit regression, and t-tests to compare financial and intangible asset outcomes before and after M&A. The results show a significant post-merger increase in the scale and efficiency of intangible assets, accompanied by greater investments in customer relationships and marketing and improved sales turnover. However, short-term operating profitability, measured by EBIT margin, does not show a statistically significant improvement. These findings suggest that cross-border M&A strengthen intangible value creation and organizational capabilities, while financial performance gains may materialize after some time, due to integration costs and restructuring processes.

Keywords: Intangible Assets, Financial Performance, Emerging Economies, Mergers and Acquisitions.

JEL: F23, G34, Q13

Streszczenie

W artykule poddano analizie wpływ fuzji i przejęć (M&A) na aktywa niematerialne oraz wyniki finansowe przedsiębiorstw z branży agrobiznesu w gospodarkach wschodzących, koncentrując się na Brazylii, Rosji, Indiach, Chinach i Republice Południowej Afryki. Wykorzystano dane pochodzące z 25 firm z lat 2015–2020. Zastosowano analizę obwiedni danych (DEA), regresję Tobita oraz testy t w celu porównania wyników finansowych i efektów dotyczących aktywów niematerialnych przed i po M&A. Wyniki wskazują na istotny wzrost skali i efektywności aktywów niematerialnych po połączeniu, któremu towarzyszą większe inwestycje w relacje z klientami i marketing oraz wzrost obrotów ze sprzedaży. Jednak krótkookresowa rentowność operacyjna, mierzona marżą EBIT, nie wykazuje statystycznie istotnej poprawy. Ustalenia te sugerują, że transgraniczne fuzje i przejęcia wzmacniają tworzenie wartości niematerialnych oraz zdolności organizacyjne, natomiast poprawa wyników finansowych może ujawnić się dopiero po pewnym czasie, ze względu na koszty integracji i procesy restrukturyzacyjne.

Słowa kluczowe: Wartości niematerialne i prawne, wyniki finansowe, gospodarki wschodzące, fuzje i przejęcia.

JEL: F23, G34, Q13

1.Introduction

International mergers and acquisitions (M&A) have become a strategic tool for organizations to gain competitive advantage and sustain growth in the era of globalization and the continuous expansion of multinational corporations. Cross-border M&A in agribusiness, particularly in emerging markets, has been growing at an accelerated pace. Firms effect M&A transactions for multiple reasons: expanding operations into developed nations, achieving economies of scale, accessing larger markets, and introducing modern technology into their production processes. Such acquisitions not only extend the market reach of the surviving firms; they also provide strategic benefits that can reshape long-term competitiveness (Gombar et al., 2022).

Despite the growing body of evidence regarding cross-border M&A in agribusiness, there is still little comprehensive research on the linkages between M&A activities, intangible assets, and financial performance. The surviving firms often demonstrate limited competence in identifying, valuing, and integrating intangible assets—such as intellectual property, brand value, and human capital—which constrains their ability to maximize financial gains from M&A. This limitation highlights the strategic importance of intangible resources in determining post-M&A outcomes.

Recent research emphasizes that intangible resources such as intellectual property, brand reputation, customer relationships, and organizational knowledge are central to value creation in cross-border mergers and acquisitions, particularly in emerging market contexts where tangible asset advantages are often limited (Lamotte, 2021). These resources reduce informational asymmetries, facilitate foreign market entry, and shape post-merger integration outcomes. Accordingly, understanding not only the level but also the efficient utilization of intangible assets is critical for explaining post-acquisition performance.

In this study, the term *intangible assets* refers to non-physical resources that contribute to long-term value creation, including intellectual property, brand equity, customer relationships, marketing-related capital, and organizational knowledge. Because these resources are often difficult to value and integrate during acquisitions, their post-merger development and utilization can shape the extent of value creation from cross-border M&A.

The present study examines how cross-border M&A affects intangible assets and financial performance of agribusiness firms in emerging economies. Using data from 25 agricultural companies between 2015 and 2020, it analyzes the influence of M&A on both tangible and intangible performance indicators. It further highlights strategic opportunities and challenges that cross-border acquisitions bring to the agribusiness sector in developing countries.

M&A in agribusiness carries significant implications. These deals influence the degree of market concentration, potentially leading to monopolization by large corporations, and alter the organizational structures of agricultural markets. Importantly, M&A are a means of gaining access to intellectual property and innovation, which strengthens competitiveness (Gupta & Roos, 2001). From the intellectual capital perspective, intangible assets play a crucial role in value creation, innovation, and long-term success of agribusiness firms following an acquisition.

Evidence from literature suggests that M&A can improve performance, expand market coverage, and enhance trade in emerging economies. However, Ye and Zou (2021) advise caution, as such transactions involve risk, careful consideration of resources, regulatory adaptation, and cultural differences. The barriers agribusiness firms face include limited financial resources, regulatory complexities, and the challenge of integrating into unfamiliar markets (Jin & Hu, 2018). Hakimi et al. (2020) emphasize the need for detailed assessments of these challenges to ensure sustainability and performance improvements. Furthermore, the effects of M&A on performance are often not immediately visible, necessitating longitudinal evaluations (Hečkova et al., 2016).

Successful acquisitions provide opportunities for firms in emerging markets to gain manufacturing insights, modernize operations, expand internationally, and enhance competitiveness. For example, ChemChina's acquisition of the Swiss agrochemical company Syngenta demonstrates the scale and ambition of agribusiness M&A from emerging economies. Such cases illustrate the need for empirical analysis of M&A outcomes, particularly concerning intangible assets and financial performance.

Agribusiness firms in emerging countries often struggle with resource shortages, rapidly changing consumer demands, and lack of advanced technology. In response, they increasingly engage in cross-border M&A to overcome technological gaps, acquire expertise, and pursue internationalization strategies (Liu, 2022). However, research on the explicit effects of M&A on intangible assets and financial outcomes remains scarce. Existing studies, such as those by Lobanova et al. (2018), stress the importance of analyzing cross-border M&A in agribusiness separately from other industries, given its unique characteristics such as global supply chains, regulatory frameworks, risk diversification, and dependence on natural resources.

While the literature acknowledges the impact of intangible assets on firm performance (Haakantu & Phiri, 2022; Binh et al., 2020), few studies focus on how these assets interact with M&A transactions in agribusiness. Prior research has examined M&A motives (Tripathi & Lamba, 2015), links between intangible resources and earnings management (Kimouche, 2022), and the role of M&A in sustainable business practices (Ogendo & Ariemba, 2022). However, the specific relationship between intangible assets, M&A, and post-acquisition financial performance in agribusiness remains underexplored.

Other streams of literature, such as studies on innovation in the agri-food industry (Annosi, 2020; Barel-Shaked, 2023; Martos-Pedrero et al., 2022), corporate social responsibility practices, and family versus non-family business dynamics, also provide insights but do not explicitly address M&A outcomes in emerging economies. Furthermore, existing empirical analyses tend to focus on broader industrial sectors (Bajgai & Pradhan, 2021; Boloupremo & Ogege, 2019; Rastić et al., 2021), overlooking the unique features of agricultural markets.

The present research addresses these gaps by focusing on cross-border M&A in the agribusiness sector of emerging economies, with a specific emphasis on the integration of intangible assets and their influence on financial outcomes. This perspective is critical because intangible resources—such as intellectual property,

patents, technology, human capital, and organizational knowledge—often determine the true value creation in M&A. By applying DEA and Tobit regression, this study evaluates both efficiency and financial performance outcomes pre- and post-M&A.

Based on the above motivation, this study addresses two research questions: (RQ1) Do cross-border M&A transactions significantly strengthen intangible assets and the efficiency with which they are used in agribusiness firms in emerging economies? (RQ2) Do these transactions lead to measurable improvements in financial performance in the short post-merger period?

Accordingly, we test the following hypotheses:

H1: Acquiring a firm strengthens the financial performance of the surviving firms in emerging countries.

H2: Acquiring a firm strengthens the intangible assets of businesses in emerging countries.

The study contributes to three areas of knowledge. First, it enriches the literature on the role of intangible assets in M&A, providing evidence from emerging economies where research is still limited. Second, it offers insights into the financial transformation of acquiring agribusinesses post-M&A, highlighting how strategic integration of intangible assets can foster innovation, competitiveness, and growth. Third, it provides practical implications for policymakers, investors, and managers engaged in cross-border agribusiness transactions by identifying key drivers of success and potential pitfalls.

The remaining parts of this study are structured in such a way that section 2 describes the literature review, section 3 the methodology, and section 4 the results and discussion. Section 5 concludes this study with policy recommendations and a description of the limitations of this study.

2. Literature Review

This study offers originality by focusing specifically on the agricultural sector in emerging markets expanding into developed economies, an area often overlooked in M&A research. Unlike prior studies that broadly examine multiple industries, it employs DEA and Tobit regression to compare performance and intangible assets before and after mergers. By emphasizing intellectual property, branding, and human capital, the study highlights intangible resources often neglected in earlier work. It fills a critical gap by providing evidence on how cross-border M&A shape agribusiness efficiency and financial performance, enhancing understanding of corporate growth in underdeveloped markets. Recent empirical studies suggest that the effects of cross-border M&A as regards performance are contingent on firms' pre-existing capabilities and integration processes, rather than being automatic or immediate (Liu, 2025). This perspective aligns with dynamic capability theory, which emphasizes the persistence of firm-specific strengths before and after acquisition.

2.1. Cross-border M&A in Emerging Markets

Two instances of the types of strategic objectives that could be promoted by agribusinesses via cross-border M&A are geographical expansion and diversity (Gombhar et al., 2022). Moreover, they seem to be a very important tool in achieving a competitive advantage (Gombár et al., 2022). A cross-border M&A transaction is a promising process through which agribusinesses in emerging countries can obtain intangible assets, technologies, and skills in developed countries (Singla et al., 2012). However, there is little consensus regarding its impact on financial performance, because some studies have found the impact to be significant, and others have found the impact to be insignificant. Cross-border M&A outcomes are shaped by factors such as the integration of cultures and management styles (Minakov, 2022), the strategic tension between standardization and adaptation approaches (Rao-Nicholson K., Khan T., 2017), and the institutional distance between different regions (Liu, 2022). Cross-border M&A are fraught with risks, including tackling cultural diversity issues, overcoming legal obstacles, penetrating new environments, etc., in addition to the risk of losing the entire business (Ye & Zou, 2021). There are also extensive financial risks and value problems. The deregulation of economic and financial markets in such regions as the European Union (EU) has created greater potential for cross-border M&A activities (Hečková et al., 2016). Zhang et al., 2018) state that governmental and industry regulations, nevertheless, may affect cross-border M&A.

2.2. Pre- and Post-M&A Assessment

Pre- and post-M&A assessment of the financial performance of agribusiness is atopic being research ed. There are multiple works on the interconnection between these factors. Gachigo et al. (2022) carried out research to show the effects on the performance of banks in Kenya by computing average ratios of performance within a span of three years prior to and subsequent to particular M&A transactions (Gachigo et al., 2022). This paper highlights that a post-M&A performance evaluation is very important to commercial banks in Kenya. In a study by Roopesh & Sandhya (2022) aimed at studying the Indian public sector banks, it was revealed that performance was affected by M&A. The post-merger period was stable as compared to the pre-merger period. Nevertheless, Ahmed et al. (2018) showed that compared to pre-merger levels, the participating companies did not see improved profitability, asset turnover, and stability following the merger, finding that M&A may affect performance in different ways, depending on the situation. Aitaa & Mabel (2023) showed enhanced performance in the banking industry after a merger. Such results imply that M&A might influence the work of regions. Abbas et al. (2014) found that the financial performance of the banking organizations resulted in no change before or after an M&A transaction. Consequently, it is important to carry out a study to gain an insight into the various impacts of M&A on financial performance.

2.3. Financial Performance and M&A

Financial performance is a central aspect in evaluating the outcomes of M&A. Several key indicators are typically used to assess firm performance, including earnings before interest and taxes (EBIT), return per share, net asset value, equity holdings, and the value of intangible assets. For agribusinesses, these indicators are especially relevant, given their growing appeal to investors. Iin a study on the US agribusiness sector, Trejo Pech et al. (2021) found that firms with stronger performance are more likely to attract investors and partners in M&A transactions. Similarly, Katchova and Enlow (2013) emphasized the importance of agrifood businesses in investment portfolios, highlighting their consistent achievements.

Recent research also underscores the positive association between M&A and financial outcomes in agribusiness. For example, Aitaa and Mabel (2023) argue that M&A enhance performance by expanding market share, improving access to financing, and raising returns on investment. Studying Indian agribusinesses, Gill et al. (2018) showed that family financial support significantly improves profitability, illustrating how external resources can shape post-merger outcomes. Collectively, these studies are further evidence that financial indicators and resource mobilization are critical determinants of success in M&A, especially in the context of the agribusiness sector. Considering the above discussion, the first hypothesis in the research is as follows:

H_1: Acquiring a firm strengthens the financial performance of surviving firms in emerging countries

2.4. M&A and Intangible Assets

The topic of how M&A transactions affect assets is significant with regard to agribusiness. Creativity, customer loyalty and knowledge capital are some of the intangible assets used in assessing and realizing deals in this line of business. Many academic researchers have different perspectives on this relationship. Filipovic (2019) states that , M&A transactions in agribusiness are usually driven by value created by means of assets, advocating the need to take into account assets in decision-making and evaluation of the results achieved in practice.

In addition, Perwito et al. (2021) have drawn a parallel between market capitalization and M&A within the agribusiness industry. Their study also implies that asset-sharing companies use leverage, which means that these assets have a certain effect on the arrangements reached and the income produced during M&A transactions in the agribusiness sector. Zelalem & Abebe (2022) investigate empirically the effect of intangible assets on the performance and policies of banks and shed some light on their relevance to success (Zelalem & Abebe 2022). Also, this information helps us understand the influence of intangible assets in the operations of agribusiness enterprises engaging in M&A. Moreover, another study carried out by Mbuthia (2021) found that the surviving companies usually want to buy asset-based targets. This observation points out the role that assets play in

M&A decision-making processes. The relevance of these findings to M&A is how the surviving companies view and access assets in agribusiness .

H_2: Acquiring a firm strengthens the intangible assets of businesses in emerging countries.

3. Methodology

This study employs a two-stage methodological framework to analyze the effects of cross-border M&A on intangible assets and overall performance of agribusiness firms in emerging markets. The first stage uses DEA**,** a non-parametric technique widely applied to measure efficiency across firms or institutions. DEA is particularly suitable because it does not require predefined weights for input and output variables; instead, it derives the most appropriate weights automatically, allowing entities to be benchmarked relative to each other. This makes DEA a robust tool for evaluating efficiency scores and ranking firms based on their performance over time. Recent applications of DEA in M&A research highlight its suitability for evaluating how efficiently intangible assets are used, especially when performance measures are bounded between zero and one and involve multiple non-physical inputs (Rahman et al., 2025). In this study, the DEA-based efficiency score is referred to as *intangible asset capability*, capturing how effectively firms transform intangible-related inputs into operational and financial outputs rather than measuring the absolute stock of intangible assets. In this paper, *intangible asset capability* refers to the DEA-based efficiency score, capturing how effectively a firm transforms intangible-related inputs into operational and financial outputs. It is an efficiency measure (utilization), not a direct measure of the absolute stock of intangible assets.

The research sample comprises 25 cross-border acquisitions**,** selected according to a strict criterion, which was complete data availability for both the target and surviving firms for 2.5 years prior to and subsequent to the transaction. The 25 cross-border acquisitions were selected based on complete data availability for two full financial years prior to the transaction (t–2, t–1) and subsequent to (t+1, t+2). The year of the acquisition is treated as a structural break and excluded to avoid partial-year distortions and to ensure comparability across firms.

Data on M&A transactions were taken from Thomson One Banker, a comprehensive and widely used source in M&A research (Rahman et al., 2016). Complementary financial variables—both inputs and outputs—were taken from COMPUSTAT, which provides reliable longitudinal data on firm performance. This ensured consistency in measuring indicators before and after acquisitions. DEA computations were conducted using *DEAFrontierTM*, an Excel-based add-in developed by Professor Joe Zhu, which efficiently assesses DEA models and supports window analysis.

In the second stage, Tobit regression analysis was employed to examine the relationship between efficiency scores and firm-specific variables, including acquisition scale and characteristics of the target company. The Tobit model is appropriate here, as DEA scores are censored between 0 and 1, requiring a method that accounts for

limited dependent variables. This regression helps identify which factors significantly influence post-merger financial outcomes and intangible asset development.

In a two-stage DEA model, a dual-step approach is taken to determine efficiency. In the first step, productivity of all *decision-making units* (DMUs) as regards the use of the inputs to produce the intermediate outputs is measured. In stage two, efficiency of each DMU in production of final results is evaluated based on the intermediary findings of the first stage output. The overall definition of a two-stage DEA model is as follows:

$$\hat{\phi}^{\mathrm{DEA}}\left(\boldsymbol{x}\right)=\underset{\lambda\in\Re_{+}^{n}}{max}\left\{\sum\nolimits_{h=1}^{n}\lambda_h y_h\middle|\boldsymbol{x}\geq\sum\nolimits_{h=1}^{n}\lambda_h\boldsymbol{x}_h;\sum\nolimits_{h=1}^{n}\lambda_h=1\right\} \tag{1}$$

In the second stage, the following linear regression equation is formulated using OLS or ML

$$ln\left(\hat{\theta}_i^{\mathrm{DEA}}\right)=\alpha+\boldsymbol{z}_i\boldsymbol{\delta}+\omega_i,i=1,...,n, \tag{2}$$

where α is the intercept capturing the inefficiency as well as the finite sample bias of the DEA estimator, and (ω) i represents the noise term v of i and deviations from the expected inefficiency μ.

4. Results and Discussion

The results of DEA, Tobit regression and the paired sample t-test are illustrated below. The research employs two models: the first examines what happens to the intangible assets of the target companies; the second examines what happens to the financial performance of the target firms in the agribusiness of emerging countries. Section 4.1 gives the inputs and outputs to the DEA, whereas section 4.2 gives the descriptive statistics of the data collected in this paper.

4.1. Inputs and Outputs for DEA

Table 1 depicts the DEA together with its inputs and findings. The DEA is a non-parametric comparing the efficiency of the various organizations or units (DMUs) making business decisions. The DEA model consists of two steps; the first step measures the effectiveness of the use of inputs and outputs in companies, and the second looks at the effectiveness of companies in general.

Table 1.
Inputs and outputs for DEA

Input variables (first stage)	Description	Operationalization
	Intangible assets	Monetary value of intangible assets
	Customer relationship expenditure	receivable yearly dollar amount of accounts receivables
	Marketing expenditures	Sales, general and administrative expenses
Output variables (first stage)	Sales	Sales turnover
	Inventory turnover	Cost of goods sold / total inventory
Output variable (second stage)	Firm performance	EBIT (earnings before interest and taxes) / total revenue

Source: Authors' own elaboration

In stage 1, three input variables are used: (1) monetary value of intangible assets, (2) customer relationship expenditure (proxied by accounts receivable), and (3) marketing expenditure (sales, general, and administrative expenses). The stage 1 outputs are sales turnover and inventory turnover. In stage 2, firm performance is measured as an EBIT margin, calculated as EBIT divided by total revenue. Entering stage 2, the table shows only one output variable, firm performance, which is measured by EBIT/Total revenues (where EBIT means profits before interest and taxes). This metric considers the profitability of a company with regard to the overall sales and generates a comprehensive financial evaluation of the company. The influence of cross-border M&A can be used to measure the intangible assets and the overall performance of surviving companies in the agribusiness sector in developing countries by operationalizing the input and output factors. To understand the interaction between the post-acquisition input, output, and performance outcomes, these variables are used in the two-stage DEA analysis.

4.2. Mean Values of Inputs and Outputs

Table 2 presents mean values (USD million) for selected input and output variables across four periods: two years before the merger (t–2), one year before (t–1), one year after (t+1), and two years after (t+2). Intangible assets rose significantly from 127.37 (t–2) to 918.33 (t+2), highlighting the financial gains in intangible value resulting from cross-border M&A. Annual spending on customer relationships also increased, from 691.70 (t–2) to 1409.82 (t+2), indicating a clear strategic shift toward strengthening customer relations. Marketing expenditure nearly doubled, rising from 413.43 (t–2) to 826.86 (t+2), suggesting efforts to enhance market visibility and brand awareness. Sales performance followed this upward trend, reaching 88,385 (t+2), a strong indication of post-merger growth. However, inventory turnover showed a slight decline from the pre- to post-merger periods, likely reflecting adjustments in sales volumes or inventory management practices during integration.

Table 2.
Mean Values of Inputs and Outputs

Mean of inputs and outputs (in USD million, except inventory turnover and EBIT margin)				
Input and output variables	Pre-merger year (t -2)	Pre-merger year (t - 1)	Post-merger year (t þ 1)	Post-merger year (t þ 2)
Intangible assets	127.367	383.17	891.66	918.33
Customer relationship expenditure	691.70	851.02	1091.68	1409.82
Marketing expenditure	413.43	508.37	714.48	826.86
Sales	5524.27	5636.71	7449.87	8838.35
Inventory turnover	6.52	6.89	5.82	5.83
Firm performance (EBIT margin) (%)	17.5	20	18	-6.5

Source: Authors' own elaboration….

This shows alterations in the EBIT margin, which indicates the performance of the firm. This was 17.5 percent in the year prior to the merger (t-2), 20 percent in the year prior to the merger (t-1), and 18 percent in the year immediately after the merger (t+1) and experienced freefall to -6.5 percent in the year following the merger (t+2). It is possible to forecast a negative value of EBIT margin in the second year the merger (t+2), which might precede financial hardship or losses.

4.3. Descriptive Statistics

Descriptive statistics give a review of the performance change in key financial variables following the merger. The increases detected in intangible assets, customer relationships and marketing expenditure are potential indicators of investments to attain long-term strategic goals relative to the company. The descriptives are contained in table 3.

Table 3.
Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Intangible assets pre-merger	25	0.000	0.744	255.26	0.236	-0.034	0.174	-0.920	0.458
Intangible assets post-merger	25	0.015	0.855	280.37	0.312	-0.455	0.199	-1.650	0.515
Customer relationship expenditure. pre-merger	25	0.001	1.389	701.36	0.320	0.152	0.172	-0.735	0.458
Customer relationship expenditure. post-merger	25	0.003	1.449	825.39	0389	0.275	0.216	-0.840	0.541

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Marketing expenditure pre-merger	25	1.216	1.639	460.90	0.079	-0.162	0.179	-0.036	0.458
Marketing expenditure post-merger	25	1.325	2.010	551.89	0.081	-0.210	0.206	-0.077	0.563
Sales pre-merger	25	1.239	2.445	5155.49	0.340	0.274	0.267	-0.111	0.612
Sales post-merger	25	2.336	3.656	7335.55	0.421	0.325	0.321	-.121	0.679
Inventory turnover pre-merger	25	1.069	3.299	6.750	0.488	0.385	0.263	-0.192	0.612
Inventory turnover post-mercer	25	1.960	3.478	7.780	0.535	0.436	0.359	-0.222	0.779
margin) Firm performance (EBIT margin) pre-merger	25	1.229	1.669	19%	0.087	-0.255	0.247	-0.019	0.612
Firm performance post-merger	25	2.655	1.898	21%	0.098	-0.305	0.381	-0.039	0.689

Source: Authors' own elaboration

The mean values of the intangible assets prior to and subsequent to the merger indicate the increment of the values of the intangible assets following the merger. In the same manner, the value of customer relationship spending prior to and subsequent to the merger indicates that the cost is higher on the consumer relationships subsequent to the merger. It also reflects an increase in the spending on marketing after the merger. Average sales went up significantly after the merger. There was a minor hitch in the stock turnaround in the initial few months of the merger. By a small margin, the average performance (the EBIT margin) of the firms increased. Therefore, the descriptive data reveal that the merger brought about growth in the intangible assets, customer relationship spending, marketing spending, sales and performance of the firm.

4.4. Correlation Analysis

Table 4 presents the correlation results prior to and subsequent to M&A transactions. The off-diagonal coefficients highlight relationships between different variables. Notably, intangible asset values exhibit a moderate positive correlation prior to and subsequent to the merger, suggesting that firms with strong intangible resources tend to maintain or expand them following the acquisition. Customer relationship expenditure also correlates positively with marketing expenditure in both periods, confirming that investment in customer relations is closely tied to higher marketing spending. Similarly, financial performance indicators, particularly the EBIT margin, show strong positive correlations across pre- and post-merger phases. This means that firms with strong profitability before the acquisition are more likely to sustain or improve it afterward. Similar patterns have been documented in recent studies, which show that firms with stronger pre-merger capabilities tend to preserve and leverage these advantages after cross-border acquisitions, reinforcing the importance of due diligence and capability alignment (Elst, 2024).

Table 4.
Correlational Analysis

	Intangible assets pre--merger	Intangible assets post--merger	Customer relationship expenditure. Pre-merger	Customer relationship expenditure. Post-merger	Marketing expenditure pre-merger	Marketing expenditure post-merger	Sales pre--merger	Sales post-merger	Inventory turnover pre--merger	Inventory turnover post-merger	Firm performance (EBIT margin) pre-merger	Firm performance post-merger
Intangible assets pre-merger	1											
Intangible assets post-merger	0.572	1										
Customer relationship expenditure. Pre-merger	0.349	0.399	1									
Customer relationship expenditure. Post-merger	0.433	0.483	0.393	1								
Marketing expenditure pre-merger	0.65	0.71	0.61	0.357	1							
Marketing expenditure post-merger	0.685	0.735	0.645	0.574	0.884	1						
Sales pre-merger	0.456	0.506	0.416	0.609	0.919	0.934	1					
Sales post-merger	0.635	0.685	0.595	0.38	0.69	0.71	0.775	1				
Inventory turnover pre-merger	0.271	0.321	0.231	0.559	0.869	0.912	0.354	0.529	1			
Inventory turnover post-merger	0.265	0.315	0.225	0.195	0.505	0.645	0.314	0.41	0.559	1		
Firm performance (EBIT margin) pre-merger	0.747	0.797	0.707	0.189	0.499	0.555	0.745	0.766	0.633	0.51	1	
Firm performance post-merger	0.896	0.946	0.856	0.671	0.981	0.991	0.876	0.932	0.564	0.61	0.891	1

Source: Source: Authors' own elaboration

The results show a positive correlation of moderate value on the intangible value pre- and post-merger, which means that companies with higher intangible value can increase or rather maintain the value of the intangible value after the merger. This is also the case in customer relationship expenditure and marketing expenditure, a fact which is established both prior to and subsequent to the merger, to show that investments in customer relationships involve greater marketing expenditure. The link between sales and the marketing expenditure has been shown to be naturally a strong positive correlation, and hence the extra marketing activities will always mean better sales before or after the merger.

4.5. Sample t-test

The findings of the matching t-tests shown in table 5 are a comparison of the percentages of different input and output variables prior to and subsequent to the merger. The pre-merger mean, post-merger mean, t-stat and the corresponding p-value have been recorded in the table.

Table 5.
Paired Sample t-test

Input and output variables	Pre-merger mean	Post-merger mean	*T* (sig)
Intangible assets	255.26	931.05	–2.88 (.009)
Customer relationship expenditure	701.36	1145.25	–2.738 (.01)
Marketing expenditure	460.90	770.67	–3.60(.001)
Sales	5155.49	7489.11	–2.77(.01)
Inventory Turnover	6.75	5.77	1.98(.05)
Firm performance (EBIT margin)	19%	6%	1.08(.28)

Note: Sig are the *p* values. $p < 0.05$: Significant at the 5% level. $p < 0.01$: Significant at the 1% level. $p < 0.001$: Significant at the 0.1% level.

Source: Authors' own elaboration

The results reveal a marked increase in intangible assets after cross-border M&A transactions. The mean value rose from 255.26 before the merger to 931.05 subsequent to the merger, reflected by a negative T statistic (-2.88) and a significant p-value (0.009). This confirms that the monetary value of intangible assets increases substantially following M&A transactions. Similarly, spending on customer relationships rose from 701.36 prior to the merger to 1145.25 subsequent to the merger, supported by a T value of -2.74 and a p-value of 0.01, indicating that firms significantly increase their investments in customer relationships after acquisitions. Marketing expenditure also expanded, rising from 460.90 to 770.67, with a highly significant T value of -3.60 ($p = 0.001$). These findings suggest a strong commitment to expanding intangible resources subsequent to M&A transactions.

There was a notable improvement in sales turnover, increasing from 5155.49 prior to the merger to 7489.11 subsequent to the merger, with T = 2.77 and p = 0.01, confirming that cross-border M&A transactions improve revenue generation. In contrast, inventory turnover decreased from 6.75 to 5.77, a significant decline (T = 1.98, p = 0.05), suggesting that efficiency in inventory management may be adversely affected following a merger. However, no significant changes were observed in the EBIT margin, which fell from 19% to 6%, with T = 1.08 and p = 0.28, implying limited impact of M&A on operating profitability. This finding is consistent with recent evidence showing that cross-border M&A transactions often do not yield immediate improvements in operating profitability due to integration costs, governance frictions, and institutional adjustment processes, particularly in emerging market settings (Liu, 2025).

The results highlight that while cross-border M&A transactions enhance intangible asset capability, customer relationship investment, marketing expenditure, and sales turnover, they may also create inefficiencies in inventory management without significantly altering EBIT margins. Prior studies offer mixed findings: while Haakantu and Phiri (2022) reported performance improvements following M&A transactions, Ahmed et al. (2018) and Musah et al. (2020) found limited or inconsistent impacts. This study therefore reinforces the view that M&A outcomes are complex, benefiting some dimensions of firm performance while leaving others unaffected.

4.6. Intangible Asset Capability under the Constant Returns to Scale Model, DEA Window Analysis (First Stage)

Table 6 includes the information in the Constant Returns to Scale model that was considered with the DEA window analysis at the starting time in order to get the intangible asset capability scores.

Table 6.
Intangible Asset Capability

	Intangible asset capability score			
	Pre-merger years		Post-merger years	
	T - 2	*t* -1	*t* þ 1	*t* þ 2
Mean	0.4074	0.4351	0.4604	0.6262
Standard deviation	0.2951	0.2701	0.2771	0.2880
Min.	0.11	0.14	0.12	0.04
Max.	1	1	1	1
No. of efficient DMUs (M&A)	6	5	5	7
No. of inefficient DMUs (M&A)	18	19	19	17

Note: p < 0.05: Significant at the 5% level. p < 0.01: Significant at the 1% level. p < 0.001: Significant at the 0.1% level.
Source: Authors' own elaboration

The analysis reveals an upward trend in average intangible asset capability, increasing from 0.4074 and 0.4351 in the pre-merger periods to 0.4604 and 0.6262 in the post-merger years. This indicates that cross-border acquisitions enhance the intangible asset capabilities of the surviving firms. Standard deviation declined from 0.2951 to 0.2880, suggesting reduced variability and greater convergence in intangible asset efficiency across firms. The range of scores, from 0.11 to 1, shows that while some organizations made substantial improvements, others consistently maintained high efficiency. The number of efficient DMUs varied over time but peaked in year t+2, with 7 of 25 firms achieving optimal intangible asset performance. These findings align with earlier studies. Altunbas, Boloupremo, and Ogege (2019) argued that geographical or product-related mergers increase profitability when efficiency and deposit policies align, while Aggarwal and Garg (2019) found that post-merger banks benefit from stronger loan capacity, deposits, and workforce productivity.

4.7. Results of Tobit Regression

The results of a Tobit regression procedure, which is a commonly used procedure in situations where the dependent variable is censored or truncated, are displayed in table 7.

Table 7.
Results of Tobit Regression

Constant (*a*)	0.1676702***
Pre-merger intangible asset capability	0.7466769***
No. of observations	24
No. of left-censored observations	0
No. of right-censored observations	3
Log likelihood	13.671428
Chi-square	33.16***
Pseudo R^2	2.6442

Note: ***$p < 0.01$.

Source: Source: Authors' own elaboration

The Tobit regression results highlight the significant role of intangible assets in post-merger firm performance. The constant term (0.1677, $p < 0.01$) suggests a positive baseline effect even when pre-merger intangible capabilities are absent, indicating that other factors also contribute to performance. More importantly, the coefficient for pre-merger intangible asset capabilities (0.7467, $p < 0.01$) shows that a one-unit increase in intangibles leads to a 0.75-unit rise in performance, confirming their central influence on post-merger outcomes. Based on 24 observations, the model revealed no left-censored values and three right-censored cases, with a log-likelihood of 13.67 and a chi-square of 33.16 ($p < 0.01$), supporting strong

model significance. While interpreted cautiously, the pseudo-R^2 of 2.64 indicates meaningful explanatory power. Marginal effects further confirm that firms with stronger intangible capabilities consistently perform better after M&A transactions. These findings align with prior research emphasizing the strategic importance of intangible capital over tangible assets in driving long-term success.

4.8. Firm Performance

Using DEA, table 8 provides data on firm performance when the window analysis method is employed to determine the second stage data in terms of M&A transactions.

Table 8.
Results of DEA (Pre- and Post-merger Firm Performance)

	Firm performance			
	Pre-merger years		Post-merger years	
	t -2	*t* -1	*t* þ 1	*t* þ 2
Mean	0.2263	0.2832	0.3619	0.3787
Standard deviation	0.2841	0.3559	0.3637	0.3178
Minimum	0.0100	0.0000	0.0000	0.0000
Maximum	1	1	1	1
Number of efficient DMUs (M&A)	3	5	7	6
Number of inefficient DMUs (M&A)	21	19	17	18

Source: Authors' own elaboration

The results indicate a clear improvement in firm performance following cross-border M&A transactions. The arithmetic mean of performance rose from 0.2263 and 0.2832 in the pre-merger years to 0.3619 and 0.3787 in the post-merger period, confirming the positive effect of the transactions. At the same time, the standard deviation decreased from 0.3178 to 0.2841, suggesting a convergence in performance levels among the surviving firms and a reduction in variability across the sample. The range of scores, spanning zero to one, highlights the diversity of outcomes but also shows that the best-performing firms improved substantially after the transactions. Specifically, the number of effective DMUs increased from three to seven in the year after the merger, while underperforming DMUs slightly declined, signaling an overall rise in efficiency.

The second-stage DEA window analysis reinforces these findings by showing a positive trend in efficiency and greater consistency across firms. The increase in the number of competent DMUs demonstrates that more firms were able to achieve high levels of efficiency after the acquisitions. Collectively, these results suggest that cross-border M&A play a constructive role in enhancing performance within the agribusiness sector of emerging economies.

4.9. Tobit Regression

Table 9 shows the results of a Tobit regression analysis in which the dependent variable may be censored or truncated. Tobit regression is used to examine whether pre-merger intangible asset capability predicts post-merger outcomes. In table 8, the dependent variable is the post-merger intangible asset capability score (DEA efficiency), and the key explanatory variable is the pre-merger intangible asset capability score.

Table 9.
Results of Tobit Regression

Constant (*a*)	0.1786203
Pre-merger intangible asset capability	1.287255***
Number of observations	24
No. of left-censored observations	0
No. of right-censored observations	3
Log likelihood	4.4568665
Chi-square	33.85***
Pseudo R^2	0.7978

Note: ***$p < 0.01$.

Source: Authors' own elaboration

In table 10, the dependent variable is post-merger firm performance (DEA stage 2 efficiency score), and the key explanatory variable is pre-merger intangible asset capability. The constant (*a*) promotes the estimated intercept when the independent variable (pre-merger intangible asset capability) is zero. The constant (0.1786203) is the forecast of the dependent variable in this Tobit regression where the independent variable has been assigned as zero. The coefficient of pre-merger intangible asset capability is 1.287255, which is statistically significant at the level of $p < 0.01$. All other things being equal, this implies that there will be an increase of 1.287255 units on the dependent variable per one-unit increase in intangible asset capability before the merger. To obtain statistical significance, the Tobit regression was conducted on twenty-four observations.

The analysis revealed that there were no left-censored observations, implying that no company missed their value that was below a particular threshold . Three observations indicate that the values of companies significantly exceed the upper limit of the dependent variable, which implies right-censoring. The likelihood of maximization of the observed data is 4.4568665. This is a tool used by researchers to compare the models and check on goodness-of-fit. The statistically significant result of the chi-square is 33.85 at p(<0.01). At least one independent variable contributes to the model in a statistically significant manner, as the entire model is significant. The pseudo-R 2 is 0.7978. This is the percentage of the measured variance of the dependent variable, and can be explained by the model. The value is

usually higher when a better fit is reached. As the findings indicate, the ability of a company to exploit its intangible resources prior to a merger affects the level at which the company performs in agribusiness industry of the developing economies.

5. Conclusion and Recommendations

This study examined the impact of cross-border M&A transactions on intangible assets and financial performance in agribusiness firms from emerging economies. The results show that cross-border M&A significantly strengthen intangible assets and their utilization. Post-merger periods exhibit higher intangible asset values, increased investments in customer relationships and marketing, and improved sales performance, alongside higher intangible asset capability (DEA efficiency) scores. These findings support the second hypothesis.

In contrast, the first hypothesis not supported in the short post-merger period when financial performance is assessed using the EBIT margin. Although sales and DEA-based performance scores improve, paired-sample tests indicate that the EBIT margin does not change significantly following M&A transactions. This suggests that operating profitability gains may require a longer horizon due to integration costs, restructuring, and post-merger adjustment processes.

Correlation results indicate that firms with stronger pre-merger intangible resources and financial indicators tend to sustain these advantages subsequent to the merger, highlighting the role of pre-existing capabilities and due diligence quality in shaping outcomes. Collectively, the findings imply that managers should prioritize the identification, valuation, and integration of intangible resources during cross-border M&A, rather than expecting immediate profitability gains. Policymakers can support value creation through improved transparency and reporting of intangible assets and institutional frameworks that help to make cross-border investment effective. These results reinforce the growing view that efficiency-oriented assessments of intangible assets provide more informative insights into post-merger outcomes than balance-sheet measures alone, particularly in cross-border and emerging economy contexts (Dong, 2025).

Future research may extend the post-merger window, expand the sample, and test additional performance measures to capture the financial effects in the longer term. This study has limitations. The sample size is modest due to data availability constraints for cross-border agribusiness transactions in emerging markets. The post-merger observation window is relatively short and may not capture the delayed effects with regard to profitability. In addition, the analysis is limited to BRICS agribusiness firms and the selected DEA input-output proxies, which may not represent all dimensions of intangible resources.

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