

VERTICAL INTEGRATION STRATEGIES AND THE PERFORMANCE OF POULTRY FIRMS IN GHANA

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Abstract. The poultry sector serves as a major source of income for many people around the world. Its performance can be improved and its relatively high cost of production reduced through effective vertical integration strategies. In spite of the potential gains of vertical integration, Ghanaian poultry firms continue to operate with high transaction costs. This study aimed to examine the effects of vertical integration on the performance of layer (egg production) poultry firms in the Ashanti region of Ghana. Primary data on the degree of vertical integration of sixty large-scale poultry firms, measured as balanced or partial, was used to assess their performance, which was measured using profit margin and value added to sales. Simple linear regression, which was used to test the relationship between vertical integration and performance (profit margin), indicated that balanced vertical integration has a positive and significant relationship with profit margin. The propensity score matching result showed that poultry firms that have adopted balanced vertical integration have a higher average value in profit margin and value added to sales ratio than partially integrated poultry firms. Therefore, poultry farmers and potential investors are encouraged to pursue more integration initiatives to gain control over transaction costs, ensure timely delivery, and achieve higher profits.

Keywords: Ghana, poultry production, profit margin, simple linear regression, value added to sales, vertical integration

INTRODUCTION

The poultry sector serves as a major source of income for many people around the world. Increasing purchasing power, urbanization, and human populations have contributed significantly to the growth and industrialization of the sector (Akunzule et al., 2009). In Ghana, the sector makes a substantial contribution to the meat and egg supply as well as income generation (Atuahene et al., 2012). The sector is divided into small-scale, medium-scale, and large-scale, and most firms are small- or medium-scale. Small-scale firms are usually focused on

broiler production while medium-to-large scale firms concentrate on layer production. The prospects of the Ghanaian poultry industry hinge on several determinants, such as the availability of land and labor and the production of eggs per bird. However, the sector faces many challenges, such as fluctuating maize prices, high interest rates on loans, the failure of the government to protect local industry from the importation of cheap poultry products, and a lack of subsidies on poultry inputs (Ayisi and Adu, 2016). The cost of poultry production is relatively high compared to the production costs of other livestock, like small ruminants. This high

Accepted: 5.08.2024

Published: 30.09.2024

Cite as: Oppong, A. K., Donkor, E., Asare, J., Nimoh, K. (2024). Vertical integration strategies and the performance of poultry firms in Ghana. *J. Agribus. Rural Dev.*, 3(73), 294–301. <http://dx.doi.org/10.17306/J.JARD.2024.01829>



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cost affects the competitiveness of local poultry production, thus affecting returns to investors in the sector. To increase the net returns to poultry firms, an effective strategy would be to reduce the cost of production. Cost reductions and cost savings can be achieved through vertical integration (Bamiro and Shittu, 2009; Guan and Rehme, 2012).

Vertical integration is a business strategy that is used by firms. Its major objective is to eliminate or at least reduce the transaction costs incurred when separate companies are responsible for two stages of production (Buzzell, 1983). It serves as a means of increasing market share and economies of scale and an avenue for innovation and efficiency (Buzzell, 1983; Cho and Lee, 2010; Liu, 2016; Williamson, 1971; Zhou and Wan, 2017). Vertical integration can be forward, backward or both (Martin, 1986). In the context of the poultry industry, the vision for adopting the vertical integration strategy is to reduce transaction costs, increase competitiveness, deliver high-quality products, etc. (Sumberg, 2013). Many firms use vertical integration to increase efficiency, coordinate the delivery of raw materials and control the quality of inputs, which results in increased competitiveness (Cho and Lee, 2010; Liu, 2016; Williamson, 1971). Hence, vertical integration is an effective way of reducing costs for poultry firms and increasing their profitability (Bamiro and Shittu, 2009).

Despite the potential gains of vertical integration in the poultry industry, Ghanaian poultry firms (especially broiler firms) continue to operate with higher transaction costs. Vertical integration can have a significant effect on firms' performance. The majority of poultry firms have adopted the vertical integration strategy, but there is no empirical study on how this strategy impacts their performance. This study investigated the effect of vertical integration on poultry firms' performance in the Ashanti region of Ghana. Additionally, it sought to describe the integrated activities adopted, the reasons they were adopted, and relevant constraints.

Based on the literature, vertical integration can be measured in different ways, such as return on investment, value added to sales, degree or type of vertical integration, and inverse of value added to sales (Isaksen et al., 2002; Lu and Tao, 2008; Shin, 2001). Considering the relationship of vertical integration and performance, the effect of vertical integration can either be positive or negative (Isaksen et al., 2002; Martin, 1986; Shin, 2001). However, the specific strategies adopted play

a key role, as fully integrated firms have higher performance than partially integrated and non-integrated firms (Bamiro et al., 2009).

Based on the findings from other studies, this study tested the following hypotheses.

H₁: Balanced integration strategies have a positive effect on poultry firms' performance.

H₂: Firms with balanced vertical integration have higher performance (profit margin and value added to sales ratio) than partially integrated firms.

MATERIALS AND METHODS

Study area and data collection

The study was conducted in the Ashanti region of Ghana, the second largest for poultry production in the country after Brong-Ahafo. Poultry firms are predominant in the region, and they operate under different degrees of integration. The target population was all poultry firms in the Ashanti region. A purposive sampling technique was used to select five districts in the region based on the concentration of poultry firms. The districts were Atwima Kwanwoma, Atwima Nwabiagya, Bosomtwe, Ejisu-Juaben and Kumasi Metropolis. This study focused more on large-scale (5,000 birds and above) layer (egg production) poultry firms, because they were all vertically integrated to varying degrees. A purposive sampling technique was used to select sixty respondents, and these firms were categorized based on the vertical integration strategy they had adopted for poultry production. The study did not include small-scale farmers due to their lack of adoption of vertical integration strategies, coupled with their relatively smaller scale of production (less than 1,000 birds). Following Selen (2011), vertical integration was measured according to the degree of vertical integration. Hence, the sixty firms were grouped into partial (either operating backward or forward vertical integration) and balanced (adopting both forward and backward vertical integration), with thirty firms in each category.

Data collection was done through face-to-face interviews using structured questionnaires. Information was obtained directly from farm directors and general managers, leveraging their expertise in the poultry business. Primary data encompassed various aspects, including managerial demographics (age, gender, experience, education), flock size, production characteristics, and economic aspects of production. Performance variables

were also recorded to compute performance indicators and assess firms' financial performance. Moreover, the rationale behind the adoption of vertical integration was explored to identify associated benefits and constraints.

Data analysis

Stata version 15 and Microsoft Excel 16 were used to analyze the data. Descriptive statistics such as graphs, mean and percentages were used to differentiate firms within the industry based on their adoption of vertical integration, and other socioeconomic and farm-related characteristics. The financial performance of the poultry firms was calculated using data extracted from the farms' financial statements in the 2016 production period.

Variables in the study

Outcome variables

Profit margin was the outcome variable and performance indicator, measuring profitability concerning sales generated (Van Horne and Wachowicz, 2005). It shows how much profit firms make on their sales after subtracting their expenses. It is calculated as the ratio of net profit to sales expressed as a percentage.

$$\text{Profit Margin (PM)} = \text{Net profit/Sales} \times 100 \quad (1)$$

The value added to sales was employed as a measure of the extent of vertical integration in the poultry industry (Buzzell, 1983; Shin, 2001). Value added is defined as sales revenue minus all purchases directly associated with production (Bamiro et al., 2009).

$$\text{Value added as a percentage of sales} = \frac{(\text{Sales} - \text{Purchases})}{\text{Sales}} \times 100 \quad (2)$$

All other things being equal, the more vertically integrated a firm is, the higher the value added to sales ratio and vice versa. Hence, a value added to sales ratio of 100% implies that 100% of sales contributed or added value to products.

Empirical model

Propensity score matching

The propensity score matching technique, initially introduced by Rosenbaum and Rubin (1983) was applied to match the balanced and partially integrated firms. This technique was used to estimate the difference in the performance of the two types of vertical integration strategies by dealing with biases in both firm and manager characteristics, such as firm age, size, and managerial

experience, which could affect the poultry firms' performance (profit margin and value added to sales ratio).

Linear Regression model

To assess the relationship between vertical integration and poultry firms' financial performance (profit margin), a simple linear regression model was employed (Safarova, 2010).

Vertical integration served as an independent variable in the model and was binary in nature. A value of 1 represented balanced vertical integration, characterized by the adoption of at least one activity from both forward integration (such as processing and distribution) and backward integration (such as hatchery plants and feed mills). Conversely, a value of 0 indicated the adoption of a partial vertical integration strategy involving activities from either forward or backward integration. Other explanatory variables were added based on other studies (Audia and Greve, 2006; Isaksen et al., 2002; Safarova, 2010).

These additional variables included firms' specific characteristics, such as marketing costs, production costs, and sales, which were measured in (log) value terms. Additionally, variables relating to manager characteristics, like educational background and experience, were included. The linear regression model was specified as:

$$PM = \beta_0 + \beta_1 VI + \beta_2 Cost + \beta_3 Size + \beta_4 Mark + \beta_5 ExpM + \beta_6 EduM + \beta_7 Fage + ei \quad (3)$$

where PM = profit margin; VI = vertical integration; $Cost$ = log of direct cost; $Size$ = log of total number of birds in the firm; $Mark$ = log of marketing cost; $ExpM$ = years of experience of firm's manager; $EduM$ = years of education of manager; and $Fage$ = firms' age.

RESULTS

Summary of variables

The summary of variables used in the regression model is presented in Table 1. Firms that had adopted balanced integration had a mean age of 19 years, higher than that of partially integrated firms (16). Managers at firms that had adopted balance integration had an average of 15 years of education, while those at partially integrated firms averaged 14 years. The mean experience of managers was 12 and 14 years for balanced and partially integrated firms respectively. Balanced firms recorded

Table 1. Poultry firm demographics

Variables	Balanced		Partial		
	Mean	Standard error	Mean	Standard error	Mean difference
Age of firm	18.90	3.72	16.20	3.18	2.70
Size of farm	47 484.00	13 835.37	22 116.33	6 229.03	25 401.00
Experience of managers	12.40	1.31	13.73	1.88	–1.33
Years of education of manager	15.03	0.79	14.37	0.79	0.67
Direct cost (GHS)	1 997 359.96	554 367.03	1 096 085.80	302 092.11	901 274.17
Marketing cost (GHS)	61 428.00	14 667.27	37 795.00	10 662.19	23 632.90

1 EUR = 16.82 GHS.

Source: own elaboration.

higher direct costs than partially integrated firms. Additionally, they were larger than partially integrated firms. The average marketing outlay of firms with balanced integration was GHS 61,428, higher than the outlay for partially integrated firms.

Activities adopted by firms

The adoption of various activities by poultry firms categorized under the two types of vertical integration is presented in Table 2. In general, aside from the core activity of raising birds, these firms engaged in six additional activities: the adoption of maize farms, feed mills, hatchery plants, processing plants, retail outlets and distribution vans. None of the partially integrated firms engaged in any forward integration activities (such as processing, distribution, or retailing). Only 10% of both the balanced and partially integrated firms had their own maize farm to support the feeding of the birds,

with managers indicating that buying the maize was relatively cheaper than cultivating the maize. However, this increased feed costs due to the high price of maize on the market. Both balanced and partially integrated firms operated a feed milling plant to prepare feed for their birds due to the sensitivity of feed. Utilizing high-quality feed significantly impacts bird weight and laying rates, as described by Atuahene et al. (2012).

About 7% of firms with balanced integration and 3% of partially integrated firms had a hatchery plant. This difference arises from the considerable acquisition costs associated with hatcheries and processing plants, which renders them unaffordable for many firms. Around 13.3% of balanced firms were engaged in bird processing for consumers. About 77% distributed directly to consumers' doorsteps, while 40% operated retail outlets for their products.

Performance under the two types of vertical integration

Three firms lay in the out-of-support region, so the sample size for the matching was 57 firms. Both the unmatched and nearest neighbor matching algorithms indicated that the balanced firms outperformed the partially integrated firms in terms of profit margin and the value added to sales ratio (see Table 3). These findings are comparable to those of previous studies (Bamiro et al., 2009; Isaksen et al., 2002). Before matching, the balanced firms gained more on every cedi of sales (GHS 0.38) compared to the partially integrated firms (GHS 0.26), resulting in a mean difference of GHS 0.12, which was statistically significant at 5%. Furthermore,

Table 2. Activities adopted by firms

Type	Activity	Partial (%)	Balanced (%)
Backward integration	Maize farm	10	10
	Feed mill	100	100
	Hatchery plant	3.3	6.7
Forward integration	Processing plant	0	13.3
	Distribution van	0	76.7
	Retail outlet	0	40

Source: own elaboration.

Table 3. Summary of performance under the two types of vertical integration

Outcome indicators	Tests	Balanced mean	Partial mean	Mean difference	Standard error	T
Profit Margin Ratio (GHS)	Unmatched (T test)	0.38	0.26	0.12*	0.05	2.40
	Nearest neighbor matching	0.37	0.29	0.08*	0.06	1.33
Value Added to Sales Ratio (GHS)	Unmatched (T test)	0.31	0.14	0.17**	0.06	2.83
	Nearest neighbor matching	0.32	0.17	0.15**	0.07	2.14

Significant at: *5%, **1%.

Source: own elaboration.

before matching, vertical integration contributed more to the sales value of the balanced firms (GHS 0.31) than to that of the partially integrated firms (GHS 0.14), indicating a mean difference of GHS 0.17. However, after matching the balanced and partially integrated firms, the mean difference was reduced. The mean difference for profit margin decreased from GHS 0.12 to 0.08, and the mean difference for value added to sales was reduced from GHS 0.17 to 0.15.

Effect of vertical integration on the profit margins of poultry firms

The summary detailing the estimation of the simple linear regression model conducted for the poultry firms can

be seen in Table 4. The total direct cost was statistically significant at 1% and it had a negative effect on firms' performance. A unit increase in direct cost negatively affected performance (profit margin) by 30%. This indicates that a reduction in direct cost will increase profit margin, which is consistent with Safarova (2010).

In this model, it was observed that the size of the firm had a positive effect on profit margin and was statistically significant at the 1% level, consistent with the relationship between firm size and performance found in previous studies (Audia and Greve, 2006; Mitchell, 1994). The relationship between marketing outlay and profit margin showed a positive correlation, aligning with the findings of Safarova (2010). Klette (1996) also

Table 4. Simple Linear Regression Model

Variables	Coef.	St. err.	t-value	[95% conf. interval]	
Balance integration	0.091**	0.046	1.990	−0.001	0.183
Direct cost	−0.303***	0.069	−4.400	−0.441	−0.165
Size of firm	0.184***	0.047	3.950	0.091	0.278
Marketing cost	0.220***	0.053	4.180	0.114	0.326
Experience of manager	0.017	0.026	0.650	−0.035	0.068
Managers education	−0.003	0.005	−0.660	−0.014	0.007
Age of firm	−0.040	0.026	−1.550	−0.093	0.012
Constant	0.464	0.316	1.470	−0.169	1.098
R-squared	0.448	Number of obs.	60		
F-test	6.039	Prob > F	0.000		
Akaike crit. (AIC)	−36.458	Bayesian crit. (BIC)	−19.703		

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

indicated that reducing or abstaining from incurring marketing costs can diminish a firm's ability to compete in the market. The results of this study indicate that an increase in marketing costs will increase the profit margin by 22%, indicating a strongly significant relationship at the 1% level.

This study initially hypothesized that balanced vertical integration has a positive effect on firms' performance and that balanced firms should outperform partially integrated firms, and this hypothesis can be accepted based on the results. The analysis demonstrated that balanced integration positively influenced profit margins, with statistical significance observed at the 5% level. These findings are similar to those of prior research (Bamiro et al., 2009; Isaksen et al., 2002).

DISCUSSION

The results of our study show that adoption of a balanced integration strategy granted firms a competitive advantage over partially integrated firms. Our results give more insights into the motivations and constraints associated with adopting these integration activities. Firms engaged in maize farming to secure a consistent maize supply for feed preparation but had to provide diligent supervision to mitigate losses on the farm. The adoption of feed milling activities was associated with factors including cost reduction, ensuring high-quality feed and timely availability, and maintaining the right quantity of feed. Due to the sensitivity of birds to feed in the poultry industry, preparing the feed in-house enables the firms to precisely control the ingredients and quantities used in feed preparation.

The results obtained in this study show a positive relationship between the adoption of vertical integration strategies and performance. The profitability measures indicate that poultry firms that have adopted balanced integration are more profitable than partially integrated firms. Both the unmatched and nearest neighbor matching algorithms indicate higher performance in the balanced firms than in partially integrated firms. The higher ratio may be attributed to the fact that balanced integrated firms have adopted more activities than partially integrated firms. Therefore, a firm's level of integration directly correlates with its profitability, where higher integration leads to increased profitability. Our findings align with those of previous studies (Bamiro et al., 2009; Isaksen et al., 2002).

The results of the regression analysis validated the study's initial hypothesis regarding the positive impact of balanced vertical integration on firms' performance. The positive impact of balanced integration on firms' performance stems from the advantages provided by vertical integration. In particular, the adoption of more activities significantly contributed to the performance of firms with balanced integration by reducing transaction costs, ensuring quality, and facilitating timely deliveries. Notwithstanding, firms with larger flock sizes outperformed their counterparts, and this affirms other research which suggest that larger companies have a competitive edge over their smaller counterparts (Audia and Greve, 2006; Mitchell, 1994; Sharma and Kesner, 1996).

However, these positive impacts must be weighed against negative dynamics that have been reported in other studies. Other studies have indicated that the effect of vertical integration can either be positive or negative (Lu and Tao, 2008; Martin, 1986). Selen (2011) found a negative relationship between vertical integration and firms' performance but indicated that this could be due to the reduced net income figures of the companies and the downsides associated with vertical integration. Moreover, potential drivers of these variations may be related to industry-specific factors, the performance indicators employed, the nature of the integration activities, firm size, or the location in which the research was conducted.

The consistency of our findings with the established literature strengthens the argument for the adoption of vertical integration strategies within the poultry industry. This study contributes to the theoretical understanding of vertical integration by empirically affirming established theories and extending their application in the context of the Ghanaian poultry industry. It further provides empirical evidence on the positive correlation between the adoption of vertical integration strategies and performance.

While our study contributes key insights, it is crucial to acknowledge some limitations. It mostly focused on large-scale poultry firms, using profit margin and value added to sales as performance indicators. Therefore, future research should focus on small-scale firms and other performance indicators. It should also be noted that an analysis based on gross value added leaves room for manipulation in the context of currency depreciation, and we acknowledge this as a limitation of the study, as

the different types of integration were interpreted under the assumption of capital uniformity.

CONCLUSION AND RECOMMENDATIONS

Based on the results, firms with balanced integration adopted more activities and were more profitable than partially integrated poultry firms, and integration type has a significant positive effect on poultry firms' performance. Hence, the more integrated a firm is, the higher its profitability. An understanding of the effects of vertical integration on performance is beneficial for anyone seeking to make informed decisions that can improve the poultry industry and the economy at large. As such, we recommend that prospective investors and poultry managers desiring to enhance profitability consider vertical integration for their firms. Specifically, a focus on balanced integration is encouraged, as it allows firms to reap the benefits more effectively than partial integration. For firms lacking the resources for independent integration, collaboration through joint ventures could be a viable alternative strategy.

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