

Shortage Gaming and Performance of Food and Beverage Manufacturing Firms in Kenya.

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DOI: [10.61108/ijir.v3i1.198](https://doi.org/10.61108/ijir.v3i1.198)

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ABSTRACT

The food and beverage manufacturing sector in Kenya faces persistent challenges related to demand variability, perishability, and inadequate cold chain infrastructure, which amplify inefficiencies within supply chains. A major driver of these inefficiencies is shortage gaming, a phenomenon where customers exaggerate orders during actual or perceived shortages in anticipation of rationing. This behaviour distorts demand signals, complicates production planning, and increases inventory and operational costs, thereby undermining firm performance. The purpose of this study was to assess the relationship between shortage gaming, as a dimension of the bullwhip effect, and the performance of food and beverage manufacturing firms in Kenya. The study adopted a descriptive research design anchored in a post-positivist philosophy, targeting 217 food and beverage firms registered with the Kenya Association of Manufacturers. A sample of 208 respondents comprising logistics and procurement managers was selected using Yamane's formula and simple random sampling. Primary data was collected through structured and unstructured questionnaires, and reliability was confirmed using Cronbach's Alpha ($\alpha \geq 0.7$). Data analysis employed descriptive statistics, Pearson correlation, and multiple regression analysis with the aid of SPSS software. The findings revealed that shortage gaming significantly influences firm performance. Customers' exaggerated orders and promotional mechanisms such as discounts and rebates were found to create artificial demand spikes, leading to inefficiencies in production planning and inventory management. Regression results indicated a strong positive correlation ($R = 0.871$) and high explanatory power ($R^2 = 0.759$), confirming that 75.9% of the variation in firm performance is explained by shortage gaming practices. The study concludes that shortage gaming has a significant and positive effect on profitability, sales volume, and market share. It recommends enhancing supply chain visibility, adopting transparent rationing policies, and strengthening supplier partnerships to mitigate opportunistic ordering behaviors and improve performance.

Keywords: Shortage Gaming, Bullwhip Effect, Supply Chain Performance, Inventory Management

APA CITATION

Nyamwaro, L. K., Wachiuri, E. W., & Namusonge, E. (2025). Shortage Gaming and Performance of Food and Beverage Manufacturing Firms in Kenya. *International Journal of Innovations and Interdisciplinary Research (IJIIR)* ISSN 3005-4885 (p);3005-4893(o), 3(1), 59–70. <https://doi.org/10.61108/ijir.v3i1.198>

1.0 INTRODUCTION

1.1 Background of the Study

The food and beverage manufacturing sector in Kenya operates within complex supply chains characterized by fluctuating demand, limited storage infrastructure, and heightened competition. A central challenge in such environments is the bullwhip effect, where minor demand variations at the consumer level cause amplified fluctuations upstream in the supply chain. One of the key drivers of this effect is shortage gaming, a behavior where customers deliberately exaggerate their orders during times of perceived or actual shortages in order to secure sufficient stock (Lee et al., 2016). This practice often distorts actual demand signals, resulting in inefficiencies in production planning, inventory management, and distribution, thereby negatively affecting organizational performance.

Shortage gaming is particularly prevalent in markets where suppliers face frequent disruptions or apply rationing mechanisms. For instance, when demand exceeds supply during promotional periods, manufacturers distribute products proportionally—such as supplying only 70% of each customer's order when supply is constrained (Wilck, 2017). Anticipating such rationing, customers inflate orders, only to cancel or return surplus stock later, transferring all the risk to suppliers. The widespread availability of return policies further incentivizes this behavior, as customers can secure excess stock with minimal financial risk.

Another factor intensifying shortage gaming is the prevalence of promotions and trade deals, including price discounts, rebates, and special payment terms. Research shows that manufacturers allocate large portions of their budgets to such incentives—47% to trade deals and 28% to consumer promotions (Kotler, 2019). These pricing fluctuations encourage customers to engage in forward buying, purchasing larger-than-needed quantities when prices are low and halting purchases when prices normalize. This creates artificial demand patterns that do not reflect actual consumption, exacerbating the bullwhip effect (Buzzell, 2017).

The consequences of shortage gaming are far-reaching. For manufacturers, inflated orders distort production planning, leading to overproduction, stock imbalances, and higher holding costs. For suppliers, unreliable demand signals reduce the accuracy of forecasting and resource allocation, often resulting in missed opportunities or costly inefficiencies (Sterman, 2019). This misalignment between reported demand and true consumption patterns undermines operational efficiency and erodes profitability, particularly in sectors like food and beverage where product perishability amplifies risks.

Beyond supply chain practices, global evidence highlights how external economic shocks such as exchange rate fluctuations and commodity price volatility interact with shortage-related behaviors to affect firm performance. For example, Fapetu et al. (2022) found that commodity price shocks significantly influence inflation, exchange rates, and GDP growth in Nigeria, underlining how volatile prices intensify uncertainty across supply chains. Similarly, studies by Iwegbu & Adeoye (2020) and Ibrahim (2017) demonstrated that inflationary expectations and exchange rate volatility affect investment decisions, reinforcing the importance of stable pricing structures to limit speculative ordering behaviors. These insights, although drawn from different contexts, mirror challenges in Kenya's food and beverage industry, where macroeconomic instability often encourages customers to hoard or exaggerate orders.

In the Kenyan context, empirical studies on shortage gaming remain limited, though related research highlights its relevance. For example, Njuguna & Ismael (2017) identified poor demand forecasting and order rationing as drivers of the bullwhip effect in Kenyan firms, while Oboge et al. (2024) confirmed that inventory policies such as Economic Order Quantity (EOQ) directly influence supply chain performance. The findings suggest that distortionary behaviors like shortage gaming could similarly undermine firm performance by weakening the alignment of production, distribution, and demand.

Return policies further complicate shortage gaming in Kenya. While global studies such as Janakiraman et al. (2018) indicate that lenient return policies can boost customer satisfaction and loyalty, they also create opportunities for inflated ordering that harms supplier efficiency. Locally, retailers like DOS allow product returns within 14 days, but no empirical evidence directly connects such practices to performance outcomes in Kenya. From a financial perspective, PwC (2023) advises firms to account for potential returns in

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revenue recognition, underscoring the importance of managing risks associated with exaggerated or speculative orders.

1.2 Statement of the Problem

The food and beverage supply chain in Kenya is highly vulnerable to inefficiencies due to uncertainties at every stage, inadequate cold chain systems, and the perishability of products (Atieno & Karuti, 2019). These challenges often translate into wastage, delayed deliveries, and frequent customer complaints, undermining firm performance (Saremi & Zadeh, 2019). To cope with demand variability, firms maintain relatively large inventories; however, this exposes them to higher holding costs and amplifies the bullwhip effect, where small demand changes lead to large fluctuations in supply orders (Yigitbasioglu, 2019).

A key driver of the bullwhip effect in food and beverage firms is shortage gaming. During product shortages, customers inflate orders in anticipation of rationing, only to cancel or return the excess later. This exaggeration distorts demand signals, misguides production schedules, and increases inventory risks for manufacturers (Lee et al., 2016). For example, when supply constraints force producers to distribute only 70% of orders, customers tend to overstate demand to secure their needs, creating inefficiencies across the supply chain (Wilck, 2017). Such practices contribute to higher operational costs and diminished competitiveness.

The financial implications are significant. Inventory constitutes 50–60% of total costs in food and beverage manufacturing firms (Songet, 2020), meaning that inefficiencies linked to shortage gaming can erode profitability substantially. Effective inventory management could reduce total costs by as much as 6% (Barratt, 2020; Chen, 2019), yet this potential remains untapped in Kenya due to persistent bullwhip-related practices.

At a macro level, Kenya's manufacturing sector dominated by food and beverage firms has stagnated at an average 10% contribution to GDP for over a decade, compared to the Vision 2030 target of 20% (RoK, 2015; World Bank, 2021). With growth at just 3.1%, below the national average of 5%, inefficiencies such as shortage gaming undermine competitiveness and threaten national industrialization goals (KAM, 2020).

Despite the severity of the problem, empirical research on shortage gaming in Kenyan food and beverage firms is scarce. Prior studies focus on general bullwhip effects (Buchmeister, Pavlinjek & Palcic, 2021; Otieno, Ondiek & Odhiambo, 2020), but none directly address shortage gaming. This study seeks to bridge that gap by examining its effect on firm performance.

1.3 Objective of the Study

The general objective of the study is to assess the relationship between Shortage Gaming as bullwhip effect and performance of food and beverage manufacturing firms in Kenya..

1.4 Research Hypotheses

H₀₁: There is no significant relationship between Shortage Gaming as a component of the bullwhip effect and the performance of food and beverage manufacturing firms in Kenya.

1.5 Scope of the Study

This study sought to assess the relationship between Shortage Gaming as a component of the bullwhip effect and the performance of food and beverage manufacturing firms in Kenya. Conceptually, the study examined the effect of Promotions, Free Return Policy and Anticipated price change on performance of food and beverage manufacturing firms in Kenya. The study focused on the 217 large food and beverage manufacturing firms selected from the list obtained from the Kenya KAM as at 31st December 2020. The large manufacturing firms are selected due to well established internal governance structures and can provide data required for the study. The study collected primary data using questionnaires. The study was conducted between June 2023 and May 2024

2.0 LITERATURE REVIEW.

2.1 Theoretical Framework- Transaction Cost Economics

Transaction Cost Economics (TCE), introduced by Coase and advanced by Williamson (1979), explains how firms organize transactions and select governance structures that minimize both production costs and transaction costs. These costs are influenced by three critical dimensions: uncertainty, frequency, and asset specificity. In supply chain management, TCE has been widely applied to understand inter-firm collaboration and opportunistic behaviors that arise under uncertain market conditions (Bakos, 2009).

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In the context of food and beverage manufacturing firms in Kenya, shortage gaming reflects a form of opportunism explained by TCE. When supply shortages occur, customers exaggerate their orders to secure sufficient allocation, shifting risks upstream to manufacturers (Lee et al., 2016). This behavior inflates coordination costs, such as increased inventory holding and production rescheduling, while also raising opportunity costs when resources are misallocated to meet distorted demand. Given that inventory accounts for 50–60% of total costs in food and beverage firms (Songet, 2020), such opportunism significantly undermines performance.

Uncertainty central to TCE manifests here through fluctuating demand, supply disruptions, and promotional pricing. For example, rationing during shortages (e.g., supplying only 70% of orders) incentivizes inflated ordering (Wilck, 2017), while trade deals and discounts create forward buying that distorts true demand (Kotler, 2019). TCE suggests that firms can mitigate these risks through governance mechanisms such as contracts, rationing rules, and information-sharing systems, which reduce opportunism and align incentives (Artz & Brush, 2018).

Thus, TCE provides a strong theoretical lens for this study by explaining how shortage gaming increases transaction costs and weakens performance. By adopting efficient governance mechanisms, Kenyan food and beverage firms can reduce the bullwhip effect, enhance coordination, and improve competitiveness, which is essential for meeting Vision 2030 manufacturing growth targets.

2.2 Conceptual Framework

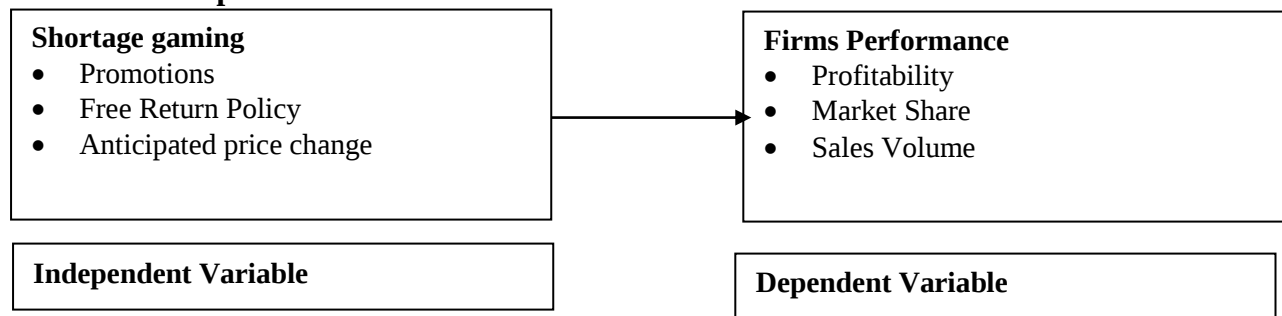


Figure 1: Conceptual Framework

2.3 Empirical Review of the Study

Shortage gaming is a critical dimension of the bullwhip effect, occurring when customers exaggerate orders during supply shortages to maximize their chances of meeting true demand. This opportunistic behavior distorts demand signals, shifting inventory and financial risks to manufacturers and undermining performance (Lee et al., 2016). In the Kenyan food and beverage sector, where perishability and cold chain limitations already strain supply chains (Atieno & Karuti, 2019), shortage gaming poses unique challenges that require closer empirical investigation.

Globally, empirical studies show how shortage gaming alters supply chain dynamics. Wilck (2017) demonstrated that when producers ration supply—for example, providing only 70% of requested orders—customers respond by inflating their orders, resulting in demand distortion once the shortage stabilizes. This behavior complicates forecasting and resource allocation, especially for firms dealing with perishable products where inventory mismanagement leads to waste and lost revenue.

Promotional strategies and trade deals have been empirically linked to shortage gaming through forward buying. Kotler (2019) highlighted that manufacturers allocate up to 47% of their promotion budgets to trade deals and 28% to consumer promotions. Empirical evidence suggests that such high-low pricing strategies encourage customers to buy in bulk during low-price periods and halt purchases when prices normalize, creating artificial demand cycles (Buzzell, 2017). For food and beverage firms in Kenya, where inventory costs represent 50–60% of total operating costs (Songet, 2020), such exaggerated ordering behaviors severely impact cost efficiency and profitability.

Sterman (2019) further emphasized that distorted orders caused by promotions and shortage gaming often lead managers to make misguided production and resource allocation decisions. These inaccuracies are particularly risky in food and beverage firms, where product shelf life is short and market competition is intense.

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Beyond promotional distortions, macroeconomic shocks also interact with shortage gaming behaviors. Adedokun et al. (2023) found that exchange rate fluctuations in Nigeria increased uncertainty in domestic pricing, encouraging speculative purchasing and inventory hoarding. Similarly, Fapetu et al. (2022) demonstrated that commodity price shocks significantly influenced inflation, exchange rates, and GDP, destabilizing supply chains. These findings mirror conditions in Kenya, where volatile input prices and exchange rates likely fuel shortage gaming behaviors among distributors and retailers seeking to shield themselves from uncertainty.

Return policies provide another empirical lens. Janakiraman et al. (2018) found that lenient return policies increased sales and customer retention but also created opportunities for order inflation, as customers faced minimal risk in returning surplus stock. In Kenya, retailers such as DOS allow returns within 14 days for defective or excess items. While designed to improve customer satisfaction, such policies inadvertently encourage speculative orders, shifting risks to manufacturers. PwC (2023) advises firms to recognize potential returns in revenue reporting, underscoring the financial risks linked to shortage gaming.

Kenyan-specific studies, though limited, highlight the importance of managing bullwhip drivers like shortage gaming. Otieno, Ondiek, and Odhiambo (2020) found that capacity constraints were a major cause of inefficiencies in Kenyan supply chains. Njuguna and Ismael (2017) revealed that inaccurate forecasting and order rationing amplified variability in a Kenyan manufacturing firm, directly aligning with shortage gaming behaviors. These studies suggest that inflated orders, if unaddressed, can erode competitiveness, particularly as the manufacturing sector's GDP contribution stagnates at **10%**, below the Vision 2030 target of 20% (World Bank, 2021; RoK, 2015).

Other regional insights reinforce these dynamics. Antwi et al. (2020) modeled stock price jumps in Ghana, finding that anticipation of shortages led to sudden fluctuations—similar to how customers inflate orders when anticipating product rationing. Arku et al. (2021) linked crude oil price increases to inflationary pressures, showing that expectations drive opportunistic behaviors in markets. These findings can be extended to Kenyan food and beverage firms, where perceived scarcity often drives exaggerated orders.

In summary, empirical studies reveal that shortage gaming, fueled by promotions, rationing policies, macroeconomic volatility, and return practices, distorts demand and undermines supply chain efficiency. For Kenya's food and beverage firms—where inventory is costly, products are perishable, and competitiveness is critical—the bullwhip effect triggered by shortage gaming significantly impacts performance. However, limited empirical work has been conducted specifically on shortage gaming in Kenya, creating a research gap this study seeks to address.

3.0 RESEARCH METHODOLOGY

This study adopted a descriptive research design to investigate the relationship between shortage gaming—a key dimension of the bullwhip effect—and the performance of food and beverage manufacturing firms in Kenya. A descriptive design was appropriate because it enables systematic collection of both qualitative and quantitative data while allowing for the analysis of multiple variables simultaneously without manipulating the environment (Creswell, 2017; Kombo & Tromp, 2016).

The research was grounded in post-positivist philosophy, which balances positivist assumptions of objective reality with interpretivist insights on socially constructed knowledge. This philosophy was considered suitable as it allows for empirical testing of hypothesized relationships between shortage gaming practices and firm performance while incorporating managerial perceptions (Neuman, 2016; Creswell & Creswell, 2017).

The target population comprised 217 food and beverage manufacturing firms registered by the Kenya Association of Manufacturers, with procurement and logistics managers serving as the units of observation. A sample of 208 respondents was determined using Yamane's (1997) formula, representing 47.9% of the population, and selected through simple random sampling to minimize bias (Mugenda & Mugenda, 2018). Data was collected using structured and unstructured questionnaires, which were pretested through a pilot study involving 21 respondents to assess reliability and validity. Reliability was measured using Cronbach's Alpha, where a threshold of 0.7 confirmed internal consistency (Hair, 2019), while validity was ensured through expert review and content evaluation (Saunders et al., 2019).

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Data analysis employed both descriptive and inferential statistics. Pearson correlation was used to examine the association between shortage gaming and firm performance, while multiple regression analysis determined the predictive strength of shortage gaming alongside other bullwhip effect factors. SPSS software facilitated this analysis, ensuring accuracy and replicability (Mugenda & Mugenda, 2019).

4.0 RESULTS AND ANALYSIS

4.1 Response Rate

The sample size for the study was 208 respondents comprising of logistics/ procurement managers and their assistants working in food and beverage manufacturing firms in Kenya. The researcher distributed 208 questionnaires.

Table 4.1: Response Rate

Category	Frequency	Percent
Response	193	92.8
Non-Response	15	7.2
Total	208	100

Out of 208 questionnaires distributed, 193 were completely filled and returned to the researcher, this gave a response rate of 92.8%. This response rate was found to be within the acceptable limits for further analysis and reporting according to Sekaran and Bougie's (2019) criteria. They suggest that a response rate of 50% or above is adequate, 60% or above is good and 70% or above is excellent for analysis. Therefore, the response rate of 92.8% is excellent and provides a solid foundation for further analysis and reporting.

4.2 Descriptive Statistics

The respondents were asked to give the level to which they agreed or disagreed with statements on each variable; the study used a 5-point Likert scale, where 1 = Strongly Disagree, 2= Disagree, 3= Neutral, 4=Agree and 5= strongly agree. The results provided were analyzed and the findings interpreted using frequencies (f), means (M) and standard deviation (SD) values.

The means show where the responses are concentrated while standard deviation indicates the variation of the response from the mean score. The values of standard deviations were used to determine convergence and divergence of views expressed by respondents on the statements. Low values of standard deviations show that respondents shared common views on the statements and large standard deviations indicate that respondents' views differed.

4.2.1 Shortage Gaming and Rationing and Firm Performance

The four objective of the study was to find out the effect of shortage gaming and rationing on performance of food and beverage manufacturing firms in Kenya. The respondents were requested to indicate their level of agreement on various statements relating to shortage gaming and performance of food and beverage manufacturing firms in Kenya. The results were as shown in Table 4.2.

Table 4.2: Descriptive Results For Shortage Gaming

Shortage Gaming	Mean	Std. Dev.
Customers exaggerate orders causing a shortage in the market	3.961	0.345
Customers exaggerate orders in hopes that through the distribution of product amongst many customers they will get their true order fulfilled	3.955	0.319
Our company offers price discounts as promotion mechanisms	3.942	0.367
Our company offers quantity discounts as promotion mechanisms	3.936	0.325
Our company offers coupons as promotion mechanisms	3.866	0.333
Our company offers rebates as promotion mechanisms	3.836	0.356
Promotion mechanisms leads to price fluctuations	3.831	0.352
Our competitors influence rationing of our product	3.803	0.337
Our competitors influence promotion of product	3.786	0.348
Shortage gaming negatively affects our production planning and scheduling.	3.783	0.389
Rationing is a strategy employed by our organization to manage shortages effectively.	3.776	0.432
Shortage gaming leads to inefficiencies in our inventory management processes.	3.766	0.387

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The findings show that the respondents agreed that customers exaggerate orders causing a shortage in the market ($M= 3.961$, $SD= 0.345$). In addition, the respondents agreed that customers exaggerate orders in hopes that through the distribution of product amongst many customers they will get their true order fulfilled ($M= 3.955$, $SD= 0.319$). Further, the respondents agreed that their company offers price discounts as promotion mechanisms ($M= 3.942$, $SD= 0.367$). The findings further show that the respondents agreed that their company offers quantity discounts as promotion mechanisms ($M= 3.936$, $SD= 0.325$). In addition, the respondents agreed that their company offers coupons as promotion mechanisms ($M= 3.866$, $SD= 0.333$). From the results, the respondents agreed that their company offers rebates as promotion mechanisms ($M= 3.836$, $SD= 0.356$). In addition, the respondents agreed that promotion mechanisms lead to price fluctuations ($M= 3.831$, $SD= 0.352$). Further, the respondents agreed that their competitors influence rationing of their product ($M= 3.803$, $SD= 0.337$). The respondents also agreed that their competitors influence promotion of product ($M= 3.786$, $SD= 0.348$). The findings are in line with those of Lee, Padmanabhan, and Whang (2019) who established that the bullwhip effect occurs when fluctuations in customer orders lead to larger variability in orders placed upstream in the supply chain. This behavior is often a result of customers attempting to secure their required quantities during perceived shortages, thereby causing artificial demand spikes and supply chain inefficiencies. According to Blattberg and Neslin (2020) promotional tactics are commonly used to stimulate demand, clear excess inventory, and compete effectively in the market

The respondents agreed that shortage gaming negatively affects production planning and scheduling ($M= 3.783$, $SD= 0.389$). The findings further show that rationing is a strategy employed by their organization to manage shortages effectively ($M= 3.776$, $SD= 0.432$). In addition, the respondents agreed that shortage gaming leads to inefficiencies in their inventory management processes ($M= 3.766$, $SD= 0.387$). The results are in line with the findings of Porter (2021) who revealed that competitive actions and reactions significantly impact market strategies and outcomes. Firms often adjust their rationing and promotional strategies in response to competitors' actions to maintain market share and customer loyalty. According to Chen, Drezner, Ryan, and Simchi-Levi (2021), demand variability and inaccurate forecasts resulting from shortage gaming can disrupt production schedules, increase safety stock requirements, and lead to suboptimal inventory levels.

From the findings above, it was clear that shortage gaming influence rationing on performance of food and beverage manufacturing firms in Kenya and this was supported by a aggregate mean score of 3.782 ($M= 0.341$). The findings agree with those of Graves (2019) who established that shortage gaming influence organization performance. The study also indicated that to illustrate the effects of rationing gaming on the variance amplification, consider a supply chain consisting of a manufacturer, multiple wholesalers, and multiple retailers. If the manufacturer appears to be in short of supply, wholesalers played the rationing game to get a large share of the supply. The study results are also in line with the findings of Hunt and Kern (2016) who established that shortage gaming influences firm performance.

The respondents were requested to briefly provide their input on other ways of which shortage gaming and rationing influence performance of food and beverage manufacturing firms in Kenya. From the results, the respondents indicated that shortage gaming disrupts production planning and scheduling, leading to inefficiencies in resource utilization. Rationing decisions, while necessary to manage shortages, can also disrupt normal operations as resources are allocated based on priority criteria rather than optimal production schedules. In addition, shortage gaming undermines the stability of the supply chain by creating fluctuations in demand patterns and inventory levels. Rationing decisions may exacerbate this instability if not communicated transparently and consistently across the supply chain. Cachon and Lariviere (2019) discussed how rationing can be used to prioritize key customers and ensure a fair distribution of limited resources during shortages. This strategic approach helps firms maintain customer relationships and operational stability during periods of constrained supply.

The respondents further revealed that shortage gaming erodes trust between the firm and its customers, as customers may perceive the organization as unreliable or unfair in its allocation of products. Rationing decisions, if not managed carefully, can lead to dissatisfaction among customers who feel they are unfairly treated compared to others. It was also found that both shortage gaming and rationing can have financial implications for the firm. Shortage gaming may result in lost revenue due to inaccurate demand signals and

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missed sales opportunities. Rationing, while necessary to manage shortages, can lead to increased costs associated with expedited shipping, overtime labor, or alternative sourcing. The study found that shortage gaming and rationing can damage the firm's reputation in the market, leading to long-term consequences such as loss of customers and decreased brand loyalty. Negative perceptions of the firm's ability to manage shortages and allocate resources fairly can impact its competitiveness in the market. According to Simchi-Levi, Kaminsky, and Simchi-Levi (2019), strategic prioritization during shortages ensures that critical customers receive their orders, thereby maintaining service levels and customer satisfaction even during supply constraints.

4.2.2 Performance of Food and Beverage Manufacturing Firms

Performance of food and beverage manufacturing firms in Kenya was measured through use of profitability, market share and sales volume in a period of 5 years from 2018-2022. The results were as shown in Figures 4.1.

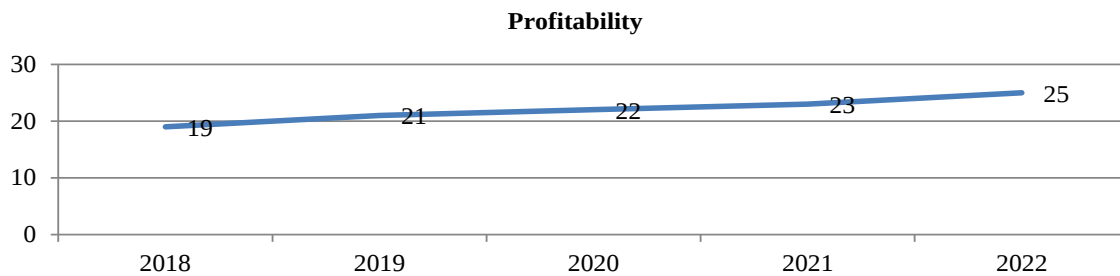


Figure 4.1: Profitability

The study collected data on profitability of food and beverage manufacturing firms in Kenya for a period of 5 years from 2018 to 2022. The results were as shown in Figure 4.5. From the results, profitability of food and beverage manufacturing firms in Kenya improved by 19% in the year 2018, in the years 2019, profitability increased by 21% and slightly increased to 22% in 2020 before increasing to 23% and 25% in 2021 and 2022 respectively.

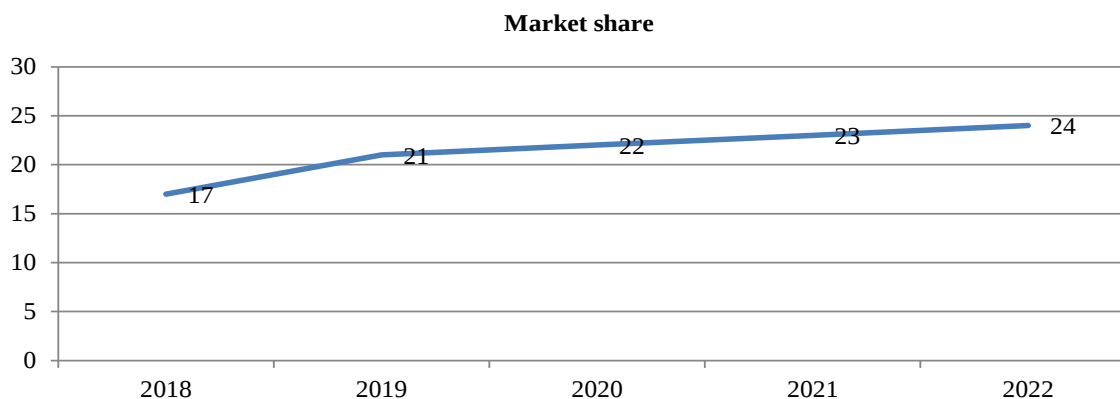


Figure 4.2: Market share

The study collected data on market share of food and beverage manufacturing firms in Kenya for a period of 5 years from 2018 to 2022. The results were as shown in Figure 4.6. From the results, the market share of food and beverage manufacturing firms in Kenya improved by 17% in the year 2018, in the years 2019, the market share increased by 21% and slightly increased to 22% in 2020 before increasing to 23% and 24% in 2021 and 2022 respectively.

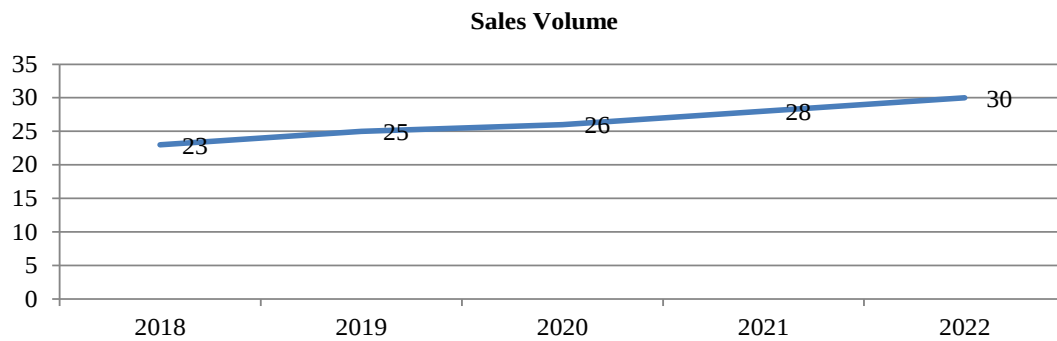


Figure 4.3: Sales Volume

The study collected data on sales volume of food and beverage manufacturing firms in Kenya for a period of 5 years from 2018 to 2022. The results were as shown in Figure 4.7. From the results, the sales volume of food and beverage manufacturing firms in Kenya improved by 23% in the year 2018, in the years 2019, the sales volume increased by 25% and slightly increased to 26% in 2020 before increasing to 28% and 30% in 2021 and 2022 respectively.

4.3 Inferential Statistics

The analysis of variance was used to determine whether the regression model is a good fit for the data.

Table 4.2: ANOVA for Shortage Gaming and Firm Performance

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	42.179	1	42.179	379.99	.000 ^b
Residual	21.311	191	.111		
Total	63.49	192			

a. Dependent Variable: performance of food and beverage manufacturing firms

b. Predictors: (Constant), Shortage Gaming

The ANOVA results presented in Table 4.25 indicate a significant relationship between shortage gaming and the performance of food and beverage manufacturing firms. The regression sum of squares is 42.179, while the residual sum of squares is 21.311, leading to a total sum of squares of 63.49. This suggests that a substantial portion of the variation in firm performance is explained by the regression model.

The mean square for the regression is 42.179, which is significantly higher than the residual mean square of 0.111. This difference is reflected in the F-value of 379.99, which is a high statistic, indicating that the independent variable (shortage gaming) has a strong effect on firm performance. The significance value (Sig.) of .000 confirms that the model is statistically significant at the 95% confidence level, meaning that the observed effect is unlikely to have occurred by chance.

Given these findings, shortage gaming appears to have a considerable impact on the performance of food and beverage manufacturing firms. The low residual variance suggests that the model provides a strong fit for the data, reinforcing the notion that addressing shortage gaming could lead to significant improvements in firm performance. Further analysis could explore the specific ways in which shortage gaming influences operational efficiency, profitability, or supply chain resilience in these firms.

Model Summary for Shortage gaming and Firm Performance

The fourth objective of the study was to find out the effect of shortage gaming on performance of food and beverage manufacturing firms in Kenya. The corresponding hypothesis was:

Table 4.3: Model Summary for Shortage gaming and Firm Performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.871 ^a	.759	.819	.70542

a. Predictors: (Constant), Shortage Gaming

The model summary in Table 4.24 provides insights into the relationship between shortage gaming and firm performance. The correlation coefficient (R) of 0.871 indicates a strong positive relationship between shortage gaming and firm performance. This suggests that changes in shortage gaming practices are

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significantly associated with variations in firm performance, implying that firms experiencing higher levels of shortage gaming may also exhibit notable shifts in performance.

The R Square (0.759) value signifies that 75.9% of the variation in firm performance can be explained by shortage gaming. This high explanatory power suggests that shortage gaming is a critical factor influencing firm performance. However, the remaining 24.1% of the variation is due to other factors not included in this model, meaning additional variables may be influencing performance.

The Adjusted R Square (0.819) is slightly lower than R Square, indicating minimal loss of explanatory power when adjusting for the number of predictors in the model. This implies that the model is a good fit and generalizes well to the population. The standard error of the estimate (0.70542) provides a measure of the average deviation of observed values from the predicted values, suggesting a moderate level of accuracy in the model's predictions.

Overall, the findings indicate that shortage gaming plays a substantial role in firm performance. However, while the model explains a significant portion of the variance, future research could consider additional predictors to enhance the understanding of firm performance dynamics.

Table 4.4: Coefficients for Shortage Gaming and Firm Performance

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	0.142	.035		4.0571	.000
Shortage gaming	.411	.094	.412	4.372	.000

a. Dependent Variable: performance of food and beverage manufacturing firms

Table 4.12 represents the coefficient of regression where interpretation is made at the unassimilated coefficients that depict the estimated coefficients which show the size or the magnitude of the change and the t-statistics which tests the statistical significance of the individual regression coefficient as compared to the p-value. Therefore, the study established that the shortage gaming coefficient value was found to be 0.469 which shows that a unit increase shortage gaming on average increases performance of food and beverage manufacturing firms in Kenya by 0.411 units hence a direct positive correlation between shortage gaming on performance of food and beverage manufacturing firms in Kenya.

The study also observed that the calculated t-value for the hip shortage gaming on performance 4.372 with an associated p-value of 0.000. Since the p-value is less than 0.05 at 5% level of significance, the study concludes that shortage gaming has a significant and positive effect on performance hence, the null hypothesis, There is no significant effect between the shortage gaming and firm performance, was rejected since $p < 0.05$ and adopted the alternative hypothesis that, there is significant effect between shortage gaming and firm performance in the commercial state corporations.

The regression equation for predicting firm performance from Shortage gaming was, $Y = 0.142 + 0.411X_4$ implying that shortage gaming has positive significant effect on firm performance ($B = 4.372, p < 0.05$).

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion of the Study

The fourth null hypothesis test was 'shortage gaming has no significant influence on performance of food and beverage manufacturing firms in Kenya'. The study found that shortage gaming is statistically significant in explaining performance of food and beverage manufacturing firms in Kenya'. The influence was found to be positive. This means that unit improvement in shortage gaming would lead to an improvement in performance of food and beverage manufacturing firms in Kenya'. Based on the findings, the study concluded that shortage gaming positively and significantly influences performance of food and beverage manufacturing firms in Kenya.

5.2 Recommendations of the Study

Enhance visibility across the supply chain by implementing systems and technologies that provide real-time data on inventory levels, production capacities, and customer demand. This visibility will help identify potential shortages and enable proactive measures to mitigate the risk of shortage gaming and rationing. Develop strong partnerships with suppliers to ensure a reliable and consistent supply of raw materials. Establish clear communication channels and share demand forecasts to enable suppliers to plan their

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production and deliveries effectively. Encourage transparency and collaboration to minimize the likelihood of shortage gaming and rationing.

5.3 Area for further Studies

This study was limited to assessing the influence of shortage gaming as bullwhip effect on performance of food and beverage manufacturing firms in Kenya. The study thus recommends a similar study to be conducted in other firms in the sectors of the economy such as textiles, pharmaceuticals, construction industry etc. Also, the study was limited to four components of shortage gaming as bullwhip effect which explained 75.9% of all variation in performance of food and beverage manufacturing firms in Kenya. There is therefore need for a study to be conducted on other factors that can explain the remaining 24.1% variation in performance of food and beverage manufacturing firms in Kenya.

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