From farm gate to market stall: How supply chain and macroeconomic conditions shape retail price adjustments among agri-food retailers in selected markets in Ghana's Central Region

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ABSTRACT

Retail food prices in Ghana are usually read as an echo of what happens on farms and in wholesale yards. The stall, however, is where costs, spoilage risk and customer resistance actually collide. Drawing on Price Transmission Theory, Transaction Cost Economics and bounded rationality, this study examined how supply chain and macroeconomic conditions shape retail adjustment in the Kasoa, Kotokuraba and Mankessim markets of Ghana's Central Region. A pragmatic multistrand design combined an unweighted survey of 450 retailers with six explanatory interviews and nine structured observation sessions. Retailers adjusted through a portfolio of price, quantity, grade, credit and margin responses rather than through price alone. Supply chain costs carried the strongest adjusted association with adjustment, and short shelf life and seasonal scarcity raised its urgency. Macroeconomic exposure remained significant after controls, yet reached retailers mainly through procurement, transport and weakened purchasing power. Market context did not moderate the cost relationship statistically, although it plainly shaped when and how retailers responded. Ghanaian agrifood retailers therefore act as constrained intermediaries who redistribute shocks across consumers, products and their own margins. Policy built on posted price monitoring alone will miss most of that adjustment.

Keywords: Agri-food Retailing; Ghana, Macroeconomic Conditions; Mixed Methods; Price Adjustment; Supply Chain Costs

I. INTRODUCTION

Food prices move through production, trade and retail systems, but the strength and timing of that movement remain stubbornly uneven. Across 23 developing and fragile economies, international cereal shocks reach domestic markets within two to three months, though the elasticity differs sharply between commodities (Emediegwu & Rogna, 2024). Perishable chains behave less tidily still, since wholesale increases pass through more readily than wholesale reductions (Harshana & Ratnasiri, 2023). Even in formal grocery retail, where measurement is easiest, firms manage perishability through timed markdowns rather than uniform pricing (Sanders, 2024). Price, in other words, records only part of what a retailer does. The tensions sharpen in African agrifood markets, where import exposure and currency instability meet fragmented transport and thin information. Panel estimates across 32 sub Saharan economies attribute food price inflation jointly to domestic supply shocks, depreciation and monetary expansion (Gizaw & Myrland, 2025), while integration studies in West Africa find convergence that stalls short of completion (Oloukoi, 2024). Global and national drivers also interact rather than act separately (Derindag et al., 2023). What none of this aggregate work can show is how a single trader, meeting several of these pressures on the same morning, decides what to change.

Ghanaian evidence confirms that retail price formation proceeds in layers. Threshold estimates for maize, cowpea and yam show incomplete vertical transmission, with transfer costs the binding constraint (Etuah et al., 2024). Spatial adjustment between market pairs depends on the quality of roads and telecommunications (Tsiboe et al., 2025), and oil price movements reach agricultural commodities with a sign and magnitude that shift across horizons (Oteng et al., 2024; Ussif, 2024). These studies establish that shocks arrive. They say very little about what happens next.

Evidence thins further once attention turns to retailers themselves, and thins again in the Central Region. Vegetable traders in Ghanaian markets work with little refrigeration or storage and carry spoilage as their heaviest trading cost (Kushitor et al., 2022). Smoked fish prices respond to purchase costs, transport, credit and competitive intensity (Osei et al., 2024), while fish trading rests on preservation skill and personalised credit (Overå et al., 2022; Ahwireng et al., 2024). Research in the region's largest market has concentrated on redevelopment and trader displacement rather than on pricing (Asante, 2020). The region's mix of coastal fish systems, inland crop routes and dense urban retail therefore remains largely unexamined. The unresolved problem is how retailers in these markets interpret and respond to supply chain and macroeconomic pressures arriving at once. Price Transmission Theory anticipates linkage between market levels, Transaction Cost Economics anticipates a wedge that weakens it, and bounded rationality anticipates heuristics rather than optimisation (Etuah et al., 2024; Osei et al., 2024; Scheiterle &

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Birner, 2023). Used singly, each perspective explains a fragment. This study brings the three together and tests the combined account against retailer level evidence.

1.1 Statement of the Problem

Recent Ghanaian evidence establishes that producer, wholesale and retail prices are connected while transmission remains incomplete and uneven across commodities. Transfer costs and actor specific bargaining power constrain vertical adjustment (Etuah et al., 2024), infrastructure quality conditions spatial adjustment (Tsiboe et al., 2025), and fuel and currency shocks enter with uneven force (Oteng et al., 2024; Obeng et al., 2022). Together these studies describe the system in which retailers work. None describes the decision the retailer makes inside it. The literature also carries a contradiction it has not resolved. Weak storage, limited refrigeration and rapid deterioration all raise the cost of supplying food, which implies upward pressure on price (Kushitor et al., 2022; Sugri et al., 2021; Wongnaa et al., 2023). The same conditions force clearance once stock begins to fail, which implies downward pressure (Sanders, 2024; Harshana & Ratnasiri, 2023). Both claims rest on evidence. Both cannot be complete. Whether perishability raises prices, lowers them, or changes the instrument of adjustment altogether therefore remains open for informal African retail.

Existing designs are poorly placed to settle the matter because their evidence is fragmented across market levels, commodities and settings. Price series cannot record a smaller bowl, a downgraded fish or a withdrawn credit term (Etuah et al., 2024; Tsiboe et al., 2025). Commodity specific retailer studies capture such responses but seldom place crop and animal products within the same instrument (Osei et al., 2024; Kushitor et al., 2022). Evidence from the Central Region is scarcer again, since the work that exists addresses market governance rather than pricing (Asante, 2020). This study addressed those gaps by generating comparative retailer level evidence on how supply chain costs, product characteristics, macroeconomic conditions and market context shaped adjustment in three Central Region markets. Adjustment was treated as multidimensional rather than confined to the posted price. Survey, interview and observation evidence were combined so that what retailers reported doing could be read against how they explained it and against what could be seen at the stall.

1.2 Research Objectives

i. To identify the forms of retail adjustment used by agrifood retailers in the selected markets.
ii. To assess the relationship between supply chain costs and retail price adjustments.
iii. To examine how product characteristics shape retail price adjustments.
iv. To determine the relationship between macroeconomic conditions and retail price adjustments.
v. To analyse how market context conditions retailers' responses to cost changes.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Price Transmission Theory

Price Transmission Theory explains how a price change at one market level or location passes to another. It rests on market integration and on the expectation that arbitrage will prevent differences persisting beyond transfer costs, and it works through four constructs: magnitude, speed, completeness and asymmetry. The empirical record unsettles the assumption of smooth adjustment almost everywhere it has been tested. International cereal shocks reach developing markets within months, yet the elasticity varies by commodity (Emediegwu & Rogna, 2024). Perishable prices rise more readily than they fall (Harshana & Ratnasiri, 2023). Ghanaian threshold estimates report transmission that is incomplete, commodity dependent and constrained by transfer costs (Etuah et al., 2024). The theory survives these results, but only in a heavily qualified form.

Transmission was operationalised here through changes in procurement prices, fuel costs and macroeconomic conditions, with adjustment measured by direction, magnitude, frequency and timing. The theory anchors the second and fourth objectives and their hypotheses, and it anticipates association rather than proportional pass through, since infrastructure, commodity type and market structure can interrupt adjustment at several points (Tsiboe et al., 2025; Oteng et al., 2024; Emediegwu & Rogna, 2024). Its limitation here is evidential rather than conceptual. Co-movement between markets cannot reveal why one retailer raised a price while another held it, and Ghanaian actor level work keeps recovering reasoning that aggregate series cannot see (Onumah et al., 2022; Osei et al., 2024; Overå et al., 2022).

2.1.2 Transaction Cost Economics

Transaction Cost Economics treats the retail spread as far more than a margin. Searching for stock, negotiating, transporting, loading, storing, financing and managing loss all carry costs, and those costs climb where infrastructure and information are weak. This is why identical farm gate prices can end in different retail outcomes across locations

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and commodities. Smoked fish prices in Ghana track transport charges, storage costs, payment terms and competitive intensity (Osei et al., 2024). Vegetable traders carry spoilage as their single largest cost (Kushitor et al., 2022). Market connectivity then governs how quickly any of this becomes a price movement (Tsiboe et al., 2025).

The theory supplies the explanatory variables for the second objective: procurement, transport, handling, storage, market charges, information and working capital. Its strength is that it locates the wedge in exchange conditions rather than in trader power, which matters in a setting where associations are routinely assumed to behave as cartels. Its weakness is a tendency to fold trust, credit and association into efficiency calculations, when such institutions also provide security and mutual support that no cost function captures (Scheiterle & Birner, 2023). Ghanaian fish networks make the point, since personalised supplier relations work simultaneously as risk management, credit and quality assurance (Overå et al., 2022; Ahwireng et al., 2024). Measurable costs therefore had to be modelled alongside relationships and context.

2.1.3 Bounded Rationality Perspective

Bounded rationality begins from the observation that retailers rarely hold complete information, spare capital or time to optimise. They work instead from recent purchase prices, expected replacement costs, what the neighbouring stall is asking, and a practised sense of what customers can bear. Rules of this kind can be entirely sensible under uncertainty even where they depart from cost plus logic. Ghanaian fish traders blend experience, product knowledge, credit relations and preservation practice in ways that look heuristic rather than calculated (Overå et al., 2022; Osei et al., 2024), and associations appear to coordinate without setting prices centrally (Scheiterle & Birner, 2023).

This perspective anchors the first and fifth objectives, and it directs attention past the posted price to quantity, grade, discount, credit and margin. One difficulty attends it. Heuristics and rational adaptation to risk can produce identical behaviour, so observation alone cannot separate them. Pairing structured retailer data with transaction detail and recent price history narrows the ambiguity without closing it, and the analysis below treats that residue as a limit on interpretation rather than a problem solved. That perishable prices move systematically with remaining shelf life strengthens the case for watching practice instead of reading price series (Sanders, 2024; Harshana & Ratnasiri, 2023; Kushitor et al., 2022).

2.1.4 Integrated Theoretical Position

The three perspectives answer different parts of one question, and their integration is the study's theoretical position. Price Transmission Theory explains the linkage between market levels. Transaction Cost Economics explains the wedge that weakens and delays it. Bounded rationality explains how retailers read the resulting pressure and choose among the instruments available to them. Holding the three together avoids two unsatisfying extremes: the retailer as passive conduit, and the retailer as unconstrained price setter. The integrated position expects adjustment to depend on interaction among cost shocks, product risk, information and market context, which is what the variables, objectives and hypotheses set out above are built to test (Etuah et al., 2024; Osei et al., 2024; Scheiterle & Birner, 2023).

2.2 Empirical Review

Read against the study's objectives, the empirical literature is densest at the level of the market and thinnest at the level of the stall, which is where this study works. Consider the forms of adjustment first. Most transmission research measures the posted price and treats the rest as noise, so aggregate series for Ghana and the wider region record direction and speed while remaining blind to a reduced portion or a withdrawn credit term (Etuah et al., 2024; Tsiboe et al., 2025; Oloukoi, 2024). Structural work in formal grocery retail shows that non price response is neither marginal nor accidental, since timed markdowns cut waste by roughly a fifth while lifting gross margins (Sanders, 2024). The contrast is instructive. One literature assumes the price is the response; the other demonstrates that it is one instrument among several.

Ghanaian retailer studies keep encountering those other instruments without setting out to measure them. Vegetable traders sort and grade in response to handling constraints (Kushitor et al., 2022), fish traders vary preservation, mobility and credit as conditions shift (Overå et al., 2022; Ahwireng et al., 2024), and smoked fish markets move between competitive and weakly oligopolistic behaviour across seasons (Osei et al., 2024). Taken together these accounts describe a repertoire rather than a lever. Yet none of them catalogues that repertoire or records how often each instrument is used, which leaves the first objective without a direct precedent.

On supply chain costs the literature converges on importance and divides on mechanism. Threshold estimates identify transfer costs as the main obstacle to complete vertical transmission in Ghana (Etuah et al., 2024), while spatial analysis attributes uneven adjustment between market pairs to road and telecommunication quality (Tsiboe et al., 2025). Both infer cost effects from price behaviour rather than measuring costs where they are incurred. Retailer studies invert that logic and find procurement, transport, storage and finance operating together (Osei et al., 2024; Kushitor et al., 2022; Sugri et al., 2021). The methodological difference produces a substantive one. Aggregate work implies a fairly

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stable wedge that slows transmission uniformly, whereas retailer work suggests a wedge that shifts with commodity, season and credit arrangement. Ghanaian post harvest research leans towards the second reading, reporting losses that vary considerably by crop and by storage technology (Sugri et al., 2021; Wongnaa et al., 2023). No study has yet estimated the relationship between reported cost burden and adjustment behaviour within a single retailer sample.

Product characteristics generate the sharpest disagreement of all. One line of evidence treats perishability as a cost that pushes prices up, since deterioration, weak storage and limited refrigeration raise the expense of supply and traders build expected loss into what they charge (Kushitor et al., 2022; Sugri et al., 2021; Wongnaa et al., 2023). Another treats it as a constraint that pushes prices down, because stock near the end of its life has to move (Sanders, 2024; Harshana & Ratnasiri, 2023). The most plausible reconciliation is that the two forces act at different moments within the same stock cycle, and asymmetric transmission along perishable chains hints as much (Harshana & Ratnasiri, 2023; Emediegwu & Rogna, 2024). Testing that proposition calls for crop and animal products under one instrument, which the commodity specific Ghanaian studies cannot supply (Osei et al., 2024; Ahwireng et al., 2024; Kushitor et al., 2022).

Macroeconomic evidence for Ghana and the region is plentiful and almost entirely aggregate. Panel estimates attribute food price inflation to domestic supply shocks, currency movements and monetary expansion (Gizaw & Myrland, 2025), quantile and wavelet analysis shows global and national drivers acting jointly (Derindag et al., 2023), and Ghanaian work establishes asymmetric exchange rate pass through (Obeng et al., 2022), cointegration with world rice markets (Onumah et al., 2022) and oil effects that change sign across horizons (Oteng et al., 2024; Ussif, 2024). Demonstrating that depreciation lifts the consumer price index is one thing. Showing that a retailer recognises depreciation as the reason for a revised supplier quotation is quite another. Fisheries research offers a partial bridge by tracing fuel increases into operating costs rather than price announcements (Owusu, 2025), but the pathway from macroeconomic shock to retail decision is generally assumed rather than observed.

Market context appears in Ghanaian research mainly as backdrop. Work on market leadership disputes the assumption that associations dictate prices, arguing that their social, credit and coordinating roles matter more (Scheiterle & Birner, 2023). Fish trading studies document supplier relations that double as risk management and quality assurance (Overå et al., 2022; Ahwireng et al., 2024), and smoked fish markets show competitive structure shifting by season (Osei et al., 2024). These accounts establish that context varies. They do not test whether the variation changes the strength of any cost to price relationship. The Central Region illustrates the shortfall well: research on Kotokuraba has examined redevelopment, participation and displacement, reporting that 1,567 traders were relocated into a facility offering less trading space than they required (Asante, 2020), while infrastructure work stops at the market rather than the stall (Tsiboe et al., 2025) and loss studies concentrate on farmers (Wongnaa et al., 2023; Sugri et al., 2021).

Four gaps follow from this reading. The first is theoretical. The anchoring perspectives are applied one at a time, so transmission studies treat the retailer as a conduit while trader studies treat market conditions as scenery, and no Ghanaian study has yet specified and tested the integrated position (Etuah et al., 2024; Osei et al., 2024; Overå et al., 2022). A second gap is empirical and follows from measurement. Because most designs record posted prices, the quantity, grade, credit and margin responses that retailers describe so consistently have never been treated as outcomes in their own right, which is precisely why the perishability contradiction persists (Sanders, 2024; Kushitor et al., 2022; Harshana & Ratnasiri, 2023). Third, and methodologically, aggregate series yield patterns without motives while small qualitative studies yield motives without comparative estimates. Neither can establish whether reported practice matches visible practice (Emediegwu & Rogna, 2024; Osei et al., 2024; Draucker et al., 2020). The last gap is contextual. National studies rely on aggregation that cannot represent a region combining coastal fish systems, inland crop routes and dense urban retail, even though post harvest fish flows are known to differ between coastal and inland destinations (Ahwireng et al., 2024; Tsiboe et al., 2025; Asante, 2020). The design described below was built to address all four.

III. METHODOLOGY

3.1 Research Design

Design followed a pragmatic multistrand logic, with an explanatory sequence closing in a structured observation strand. The survey first estimated the forms and correlates of adjustment. Six follow up interviews then explained why retailers under broadly comparable pressure transmitted, delayed or absorbed costs differently. Structured nonparticipant observation finally asked whether reported practice was visible in everyday trading. Integration ran through connected sampling, objective based matrices and a joint display that recorded convergence, complementarity, divergence and silence (Draucker et al., 2020; Fetters & Tajima, 2022). The sequence matched the five objectives while accepting a trade off, since mixed methods buy explanatory depth rather than population representativeness.

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3.2 Study setting and Unit of Analysis

Fieldwork covered the Kasoa, Kotokuraba and Mankessim markets in Ghana's Central Region, which represent respectively a large peri-urban commercial centre, a metropolitan market and an agrifood assembly point. Precise counts of active traders were unavailable for Kasoa and Mankessim, since trading spills well beyond fixed stalls and swells on market days. Municipal and trader union records place Kotokuraba's registered core at roughly 1,567 to 1,670 traders, while the redeveloped facility holds more than 2,500 stalls; the lower figure corresponds to those relocated during redevelopment (Asante, 2020). Such numbers describe capacity and registration rather than a census of active retailers. Site selection sought analytical variation in customer base, transport links and commodity flows, not proportionate representation of the region. The unit of analysis was the adult crop or animal product retailer who personally set, negotiated or approved selling prices. Where one decision maker governed several stalls, those stalls counted once; independently managed outlets could enter separately.

3.3 Population, Sample and Sampling

Fixed, temporary, mobile and seasonal agrifood retailers active in the three markets during sampled periods formed the target population. A conventional register was unsuitable: trader lists were incomplete, attendance varied by market day and season, and some retailers rotated between sites. Stratified multistage time location sampling replaced it. Commodity sections and venue day time units were mapped within each market and sampled across trading periods, and enumerators used a random start within each selected unit before screening every kth eligible retailer. Market and commodity strata were retained in the dataset. Attendance frequency was recorded as a respondent characteristic, but the data held none of the venue attendance probabilities needed to construct defensible weights, so every quantitative estimate reported here is unweighted. Table 1 summarises the resulting allocation across markets and evidence strands.

Table 1

Sample Size for the Study

Market	Survey participants	Qualitative coverage	Observation sessions
Kasoa	150	Included	3
Kotokuraba	150	Included	3
Mankessim	150	Included	3
Total	**450**	**6 interviews**	**9**

A base large population estimate of 384 was raised to 450 to support balanced market comparisons and absorb incomplete responses. Comparable population totals were unavailable, so the survey was allocated equally rather than proportionately, with 150 respondents in each market. Every site therefore carries the same analytical weight, which is a design choice rather than a claim that the three trader populations are of equal size. Recruitment retained crop and animal product strata wherever attendance allowed. The qualitative strand comprised six information rich cases selected for contrasting adjustment patterns, and the observation strand nine sessions spread evenly across the three markets.

3.4 Eligibility and Research Instruments

Participants were eligible if they were at least 18 years old, sold crop or animal food products in a selected market, had completed six cumulative months or one seasonal trading cycle, exercised pricing authority and provided informed consent. Assistants without pricing authority, nonfood traders, one off sellers, repeat participants and persons unable to consent were excluded. These rules retained seasonal traders while protecting the pricing decision maker as the analytical unit.

Three instruments generated the evidence. An orally administered electronic questionnaire measured the direction, frequency, magnitude and timing of adjustment, alongside supply chain costs, commodity conditions, perceived exposure to exchange rate, fuel and inflation pressure, and the context items covering competition, demand, credit and supplier relations. A semi structured guide explored recent adjustment episodes and the reasoning behind transmission, delay, non price adjustment and margin absorption. A structured checklist recorded what could be seen at the stall: stall type, price display, measurement, quality sorting, storage, deterioration, loading, bargaining, discounts, credit and congestion. Observation reached public behaviour and physical conditions, but not private costs, intentions or macroeconomic exposure, and that boundary was carried into every integrated inference rather than quietly forgotten.

3.5 Instrument Development and Quality Assurance

Construct domains were derived from recent Ghanaian evidence on fuel price transmission, replacement costs, post harvest deterioration and market adjustment (Ussif, 2024; Obeng et al., 2022; Osei et al., 2024; Sugri et al., 2021). Items were shortened, converted into familiar market language and read in English, Fante, Twi or another approved language in which a trained fieldworker was competent. Forward translation, independent meaning checks and cognitive

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interviews tested terms such as margin, replacement cost and bumper season. Specialists in agrifood marketing, economics and mixed methods reviewed content coverage. A pilot conducted outside the study markets tested flow, completion time and response variation, and composite scores were retained only where dimensionality and McDonald's omega supported their use (Hayes & Coutts, 2020).

3.6 Data Collection

Fieldwork opened with rapid mapping of market sections, peak days and trading times. Market leaders and assembly officers supported access but took no part in selecting participants. Within each sampled venue, day and time unit, trained enumerators screened every kth eligible retailer after a random start, explained the study and administered the questionnaire on a tablet in the participant's preferred language. The team recorded refusals without identifiers, monitored recruitment by market and commodity group, and reviewed synchronised data daily for missing fields, duplicates, implausible values and enumerator effects.

Preliminary survey results guided maximum variation selection for six follow up interviews spanning the three markets, both commodity groups, fixed and mobile trading, and contrasting adjustment patterns. This connecting strategy follows established practice for explanatory sequential designs, in which numeric results determine who is interviewed and why (Draucker et al., 2020). Interviews were conducted privately near the markets, audio recorded with separate permission and supported by field notes. The observation record covered 28 May to 20 July 2026 and comprised three sessions per market, each lasting 60 to 90 minutes during peak trading between 9.00 am and 4.00 pm. Dated field summaries from one session in each market were retained as exemplars within the consolidated market records, and observers kept factual checklist evidence separate from interpretive reflection.

3.7 Ethics and Data Management

Only data collected after institutional ethics clearance and market authorisation were eligible for analysis. Study information and consent were communicated orally in the preferred language, and signature or thumbprint consent was documented with an impartial witness where required. Participation was voluntary, audio consent was obtained separately, and market leaders were absent during recruitment. Because prices, suppliers, credit terms and margins are commercially sensitive, interviews avoided unnecessary tax or registration detail and quotations were screened for deductive identification, following empirically validated de-identification practice for narrative data (Campbell et al., 2023). Records complied with Ghana's Data Protection Act, 2012 (Act 843). Survey files were encrypted, contact and consent files were stored separately, audio and transcripts used pseudonymous codes, access was role based, and cleaning decisions were logged in line with repository based qualitative data management guidance (Antonio et al., 2020).

3.8 Data Preparation and Analysis

Questionnaire records were checked for duplicate identifiers, eligibility failures, range errors, skip inconsistencies and missingness. The imported SPSS file contained one duplicated header row, which was excluded before analysis, leaving 450 unique respondents. Ninety-eight missing cells, 0.47% of the 20,700 analytical cells, were treated before modelling. Missing commodity, gender and age categories were replaced with the modal category within the respondent's market, and missing ordinal responses with the respondent's mean across available items in the same question block, rounded to the nearest valid Likert category. An imputation log was retained and no missing values remained. Given how sparse the missingness was, single imputation preserved the full balanced sample, though sensitivity checks against complete case estimates would have strengthened confidence in that decision and their absence is acknowledged as a limitation.

Outcomes covered the form, direction, frequency, magnitude and timing of adjustment. Where a defensible index was obtained, the principal model was specified as follows.

$$Y_i = \beta_0 + \beta_1 SC_i + \beta_2 PC_i + \beta_3 MC_i + \beta_4 CTX_i + \beta_5 (SC \times CTX)_i + \gamma X_i + \mu market + \varepsilon_i$$

In this specification, SC denotes supply chain costs, PC product conditions, MC macroeconomic exposure, CTX market context, and X retailer and business controls. Ordinal, binary or multinomial models replaced linear regression wherever the outcome scale required them. Table 2 sets out how each objective was matched to its constructs, evidence sources and analytical procedure.

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Table 2

Data Analysis Plan

Objective	Main constructs	Evidence	Analysis
1. Identify forms of retail adjustment	Price, quantity, quality, discount, credit, margin absorption; timing and frequency	Survey; interviews; observation	Unweighted frequencies, proportions and adjustment profiles; market and commodity cross-tabulations
2. Assess supply-chain cost relationships	Purchase/replacement, transport, handling, tolls, storage, losses and finance	Survey; interviews; contextual observation	Multivariable regression with market and retailer controls; adjusted effects; qualitative explanation of transmission or absorption
3. Examine product characteristics	Crop/animal category, perishability, quality decline, seasonal supply	Survey; interviews; observation	Product contrasts; interaction terms; adjusted marginal effects; cross-case qualitative comparison
4. Determine macroeconomic relationships	Perceived exchange-rate, fuel and general inflation exposure	Survey; interviews; contextual observation	Hierarchical models after retailer, product and market controls; pathway-focused thematic analysis
5. Analyse market-context conditioning	Competition, demand, customer purchasing power, credit, supplier ties and mobility	Survey; interviews; observation	Cost×context interactions, market fixed effects and predicted margins; joint comparison across markets

Note: The achieved sample comprised 150 respondents from each market. Equal allocation supported comparative precision but was not proportionate to market population. Estimates are unweighted because selection probabilities for venue attendance were not available.

3.9 Qualitative Analysis and Integration

Interview recordings were transcribed, checked against the audio and translated through meaning based comparison where necessary. Reflexive thematic analysis combined deductive categories drawn from the framework with inductive attention to mechanisms the survey had missed, following the procedural guidance and quality criteria set out for that approach (Braun & Clarke, 2021; Byrne, 2022). Observation records were reduced into market profiles and an objective based matrix, and counts refer only to the stalls and transactions encountered during scheduled sessions rather than to prevalence. Integration compared convergence, complementarity, divergence and silence across the three strands through joint displays, and an inference was retained only where its source and evidential boundary could be stated (Fetters & Tajima, 2022).

3.10 Statistical Inference and Design Limitations

Results are reported as unweighted estimates, effect sizes and 95% confidence intervals, with two sided tests evaluated at 5%. Market fixed effects and relevant respondent and trading controls were retained where model form and diagnostic checks supported them, and coding rules, exclusion decisions, imputation and sensitivity analyses were documented in reproducible syntax. The design estimated conditional associations and plausible mechanisms rather than causal effects. Its inferential scope extends to the 450 retailers sampled in the selected market section day time units and no further; it yields no prevalence estimate for all traders in the three markets, let alone the Central Region. Recall error, perceived rather than measured macroeconomic exposure, and mobility related selection may all persist despite oral administration and qualitative follow up. These limits were carried into interpretation rather than treated as problems that mixed methods dissolve on their own.

IV FINDINGS & DISCUSSION

4.1 Demographic Characteristics

Table 3 describes a sample rooted in established trading practice. Almost two thirds of respondents had traded for at least 17 years, 68.4% worked full time, and daily and market day traders together accounted for 74.7%. These were not occasional observers of price formation. Most had lived through repeated procurement shifts, customer bargaining and seasonal swings, which fits the study's bounded rationality argument that pricing knowledge accumulates through experience and familiar market signals rather than through formal calculation. Similar profiles recur in Ghanaian fish and market leadership research, where experience and personalised trading relations carry much of the commercial judgement (Osei et al., 2024; Overå et al., 2022; Scheiterle & Birner, 2023).

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Several characteristics held remarkably steady across markets. Commodity group, gender, experience and employment status differed negligibly or slightly. Crop traders formed a modest majority and women accounted for 58.4% of the sample. That stability supports comparison across the three sites, since later differences are unlikely to be artefacts of radically different commodity or gender compositions. The crop majority still matters analytically. Product group belongs in the adjusted models, because crops and animal products face different storage, deterioration and replacement cost pressures, a distinction that Ghanaian evidence on vegetable spoilage and post harvest loss valuation supports (Kushitor et al., 2022; Wongnaa et al., 2023; Sugri et al., 2021).

Age breaks that balance. Respondents aged 35 years or above formed the largest overall group, but age varied strongly across markets, V = .583. Education also differed, though far more modestly, V = .154. Market history, entry routes or local trading opportunities could each explain the pattern, and the present data cannot adjudicate between them. Age and education therefore enter as controls. Without that adjustment, an apparent market effect may be carrying differences in experience, information use or business capacity rather than anything about the market itself. Six interviews added explanatory texture without amounting to demographic triangulation. They included men and women aged 28 to 61, covered both commodity groups and reached all three markets, and their accounts ranged across fixed and mobile trading. One older trader linked advancing age to reduced mobility, which complements the survey age pattern, although a single account establishes no mechanism. Education and experience were not recorded for interview participants, so convergence on those characteristics could not be assessed at all.

Respondents are best understood as experienced but socially varied pricing decision makers rather than as a uniform retailer group. Their coverage across markets, commodities, gender and trading arrangements supports comparative analysis. It demonstrates neither population representativeness nor construct reliability, both of which would require defensible sampling probabilities and separate testing. What the profile does more narrowly is confirm that the study reached the intended actors, and expose the demographic differences the later models must accommodate.

Table 3

Demographic Characteristics

Characteristic	Category	Frequency	Percentage	Market comparison, p	Cramér's V
Market	Kasoa	150	33.3	Not applicable	Not applicable
	Kotokuraba	150	33.3		
	Mankessim	150	33.3		
Commodity	Crop products	252	56	0.897	0.022
	Animal products	198	44		
Gender	Male	187	41.6	0.991	0.006
	Female	263	58.4		
Age	18 to 23 years	66	14.7	< .001	0.583
	24 to 29 years	83	18.4		
	30 to 34 years	129	28.7		
	35 years or above	172	38.2		
Market attendance	Daily	188	41.8	0.081	0.112
	Not regular	25	5.6		
	Market days	148	32.9		
	Special occasions	89	19.8		
Trading experience	5 to 10 years	102	22.7	0.346	0.087
	11 to 16 years	53	11.8		
	17 to 22 years	143	31.8		
	23 years or above	152	33.8		
Education	Basic education	127	28.2	0.002	0.154
	Secondary or diploma	81	18		
	Tertiary education	41	9.1		
	No formal education	201	44.7		
Employment status	Full time	308	68.4	0.96	0.014
	Part time	142	31.6		

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4.2 Observation Profile of the Three Markets

Observation revealed three distinct trading environments, summarised in Table 4. Counts describe only the stalls and transactions met during scheduled sessions, and they work as contextual indicators rather than prevalence estimates.

Table 4

Observation profile of the three markets

Dimension	Kasoa	Kotokuraba	Mankessim
Transaction pattern	Mixed household and commuter trade; several purchases of 2 to 4 bowls	Urban, student and civil servant trade; mainly small purchases and extensive comparison	Bulk bags and bunches; stronger wholesale and relationship trading
Visible adjustment	Oral prices; bargaining in 12 of 18 observed transactions; quality sorting and some discounts	Bargaining in 22 of 30 transactions; freshness sorting and late morning fish discounts	Oral prices; bargaining in 4 of 14 transactions; more stable bulk and relationship terms
Product and infrastructure risk	Limited shade and ice; tomato and fish deterioration visible	More ice and some freezers, but the greatest visible fish and tomato deterioration	No refrigeration; temporary displays and grain exposure to moisture and weevils
Competitive setting	Six tomato sellers within 10 metres; moderate congestion	Twelve fish and eight tomato sellers within 10 metres; high congestion	Three to four sellers within 10 metres; steadier customer flow

Those differences help explain why an identical cost pressure could surface as a negotiated price in one market, a changed quantity in another and a quality discount or delayed response in a third. They also separate the presence of infrastructure from its adequacy: the site best equipped for preservation was also the site where spoilage was most evident.

4.3 Forms of Retail Adjustment

Adjustment, as Table 5 shows, worked through a portfolio of price and non price responses rather than a single pricing decision. Almost every respondent changed selling prices frequently, 98.7%, while 96.4% accepted a smaller margin, 69.3% altered the quantity supplied for the same money and around half changed grade, discount or credit terms. Every respondent reported using a non price response when the price itself could not move. The posted price is therefore one instrument among several, not the channel of adjustment (Sanders, 2024; Kushitor et al., 2022; Harshana & Ratnasiri, 2023). Interviews showed how several of these could occur inside one transaction. Retailers described changing size or grade while holding the stated price, then trimming the margin when customers resisted, and finally discounting stock whose quality had started to slip. Instruments were rationed according to what the customer would accept and how much saleable life the stock retained.

Across the strands, adjustment proved partial and sequential rather than immediate and complete. Only 43.3% reported that adjustments covered most of a cost increase, yet margin absorption was near universal. A retailer might raise the price first, alter quantity or grade when customers pushed back, and discount deteriorating stock at the end. The combination suits both bounded rationality and Transaction Cost Economics, since traders appeared to weigh replacement cost, saleable life, repayment pressure and customer retention rather than apply a fixed mark up (Osei et al., 2024; Kushitor et al., 2022; Overå et al., 2022). Asymmetry was present but not straightforward. Only 0.9% reported reducing prices after costs fell, whereas interviews and observation both recorded reductions when quality declined or unsold fish neared the end of its saleable life. The tension is analytically useful rather than contradictory. Cost based downward adjustment was rare; loss avoiding clearance was plainly visible. A posted price series would capture neither the reduced quantities nor the quality driven discounts, which is exactly what dynamic pricing research in formal retail would predict for perishable stock (Sanders, 2024; Kushitor et al., 2022; Harshana & Ratnasiri, 2023).

All three markets shared the repertoire and expressed it differently. Survey results showed more quantity adjustment in Mankessim and slower immediate change in Kotokuraba, and observation supplied the context. Kotokuraba's dense competition and easy price comparison encouraged bargaining and time sensitive discounts, while Mankessim's bulk and relationship trading coincided with fewer observed bargains. These are contextual explanations, not evidence that each market follows a fixed pricing culture, and the distinction matters for the moderation results reported later.

Commodity differences ran deeper than market differences. Animal product retailers reported more quantity and credit adjustment; crop retailers reported more grade changes. Interviews traced these choices to divisibility and saleable life, and observation showed fish differentiated by size and freshness, tomatoes by ripeness, grain by dryness. The convergence supports a commodity sensitive reading consistent with evidence that fish and vegetable trading operate under different preservation and turnover constraints (Osei et al., 2024; Ahwireng et al., 2024; Kushitor et al.,

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2022). The unusually sharp survey separation of some responses nonetheless warrants coding and measurement checks before the magnitudes are pressed further. What this objective contributes is a view of adjustment as a commodity sensitive portfolio rather than a single price decision. Price, quantity, quality, credit and margin changes distribute one shock across different stages of the same stock cycle. For the consumer, an unchanged nominal price can conceal a smaller portion or a lower grade. For the retailer, a lower observed price may signal loss avoidance rather than any easing of upstream cost.

Table 5

Forms, timing and direction of retail adjustment

Adjustment indicator	Mean	SD	High response, %	Kasoa, %	Kotokuraba, %	Mankessim, %	Crop, %	Animal, %
Selling price changed	4.48	0.53	98.7	100	96	100	97.6	100
Quantity changed for the same amount	4.08	0.83	69.3	64	62.7	81.3	45.2	100
Grade or quality changed	3.38	0.84	48.9	47.3	49.3	50	87.3	0
Discount or credit terms changed	3.2	0.88	50	48.7	51.3	50	11.5	99
Smaller profit margin accepted	4.39	0.56	96.4	100	92.7	96.7	93.7	100
Selling price adjusted quickly	4.32	0.68	88.2	98.7	75.3	90.7	79	100
Adjustment covered most of the cost increase	3.43	0.5	43.3	46.7	33.3	50	9.1	86.9
Price reduced when cost later fell	2.51	0.55	0.9	2.7	0	0	0	2
Non price response used when price could not change	4.53	0.5	100	100	100	100	100	100

4.3.1 Relationship between Supply Chain Costs and Retail Price Adjustments

Table 6 summarises procurement, transport, handling, storage, spoilage and financing costs. The supply chain cost and adjustment composites showed strong internal consistency, with Cronbach's alpha values of .860 and .934. An unweighted multivariable linear regression with HC3 robust standard errors estimated the adjusted relationship while controlling for market, commodity, gender, age, attendance, experience, education and employment status.

$$RPA_i = \beta_0 + \beta_1 SCC_i + \gamma X_i + \mu market + \varepsilon_i$$

Here RPA denotes the retail adjustment composite, SCC the supply chain cost composite, X the recorded retailer controls and μmarket the market fixed effects. Supply chain costs carried a positive and significant adjusted coefficient, B = 1.001, robust SE = 0.071, 95% CI [0.860, 1.142], $p < .001$, so H01 was rejected. A one point increase in the composite cost score corresponded to an estimated 1.001 point increase in adjustment, and the model explained 91.5% of observed variation, adjusted $R^2 = .912$. That fit calls for caution rather than celebration. Predictor and outcome scores came from the same questionnaire and may share response method variance, so what the estimate establishes is a strong conditional association in cross sectional data, not a causal effect.

Cost pressure concentrated in supplier prices, spoilage and transport, not in packaging or tolls. Interviews explained the sequence. Procurement set the initial pressure; transport and handling raised landed cost; storage and spoilage altered the risk of waiting; finance decided how long a shock could be held. Observation added material context without measuring costs directly. Vehicles, porters and manual loading were visible in all three markets, while limited shade and evident deterioration exposed the conditions from which the reported costs arose. This layered structure matches threshold estimates that identify transfer costs as the main obstacle to complete vertical transmission in Ghanaian markets (Etuah et al., 2024; Osei et al., 2024; Kushitor et al., 2022).

Transport could intensify transmission or delay it. Interviewees reported rising delivery charges, yet one maize trader postponed adjustment because competitors still held stock bought under earlier transport conditions. The

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observation record showed the highest unloading activity at Kotokuraba, followed by Kasoa, though these counts represent trading throughput during observed periods rather than cost magnitude. Taken together, the strands indicate that transport pressure reaches prices through replacement cycles and competitive timing rather than through an automatic same day response, which fits evidence that infrastructure quality conditions the speed of spatial adjustment in Ghana (Tsiboe et al., 2025; Ussif, 2024; Oteng et al., 2024).

Storage and spoilage pulled in two directions at once. Survey ratings placed expected spoilage almost level with supplier price as an influence on adjustment. Interviewees described preservation spending that raised the price they needed to obtain, and discounts when deterioration threatened total loss. Observation supported the tension instructively. Kotokuraba displayed the most visible spoilage despite having more ice chests and a few freezers, Kasoa showed tomato and fish deterioration under limited shade, and Mankessim faced moisture and weevil exposure rather than refrigeration failure. Infrastructure changed the capacity to wait without guaranteeing preservation, which aligns with findings that market infrastructure access shapes handling outcomes without determining them (Kushitor et al., 2022; Sugri et al., 2021; Wongnaa et al., 2023).

Financing added pressure of its own, even though its survey ratings sat below procurement, spoilage and transport. A smoked fish trader put it concretely: “I took GH¢500 and the interest was GH¢50 for two weeks. That adds to my cost” (R006, 12 June 2026). The maize trader reported borrowing at 10% per month. Interest entered the effective cost of stock and shortened the window in which that stock had to sell. It did not reliably produce a higher price, however, since R006 sometimes cut prices in order to meet repayment. Credit can raise the price required for cost recovery while weakening the retailer's capacity to wait for it, a double bind that fish trading research has also observed in personalised credit relations (Overå et al., 2022; Osei et al., 2024; Scheiterle & Birner, 2023).

Taken together, the strands point to staged and incomplete transmission. Supply chain costs strongly predicted adjustment, yet retailers passed on neither every increase nor any increase in full. R006 explained it plainly: “I can't pass all of this on at once. Customers will complain. So, I absorb some and increase a little” (12 June 2026). Upstream costs clearly reached retail decisions, which converges with Price Transmission Theory, but customer resistance, competing stock, perishability and repayment deadlines each interrupted full transmission. Observation confirmed the material setting of those mechanisms while remaining silent on private margins and borrowing costs. The findings align with Ghanaian evidence that procurement, transport, storage and payment arrangements shape retail prices, and they add retailer level evidence on why timing and direction stay uneven (Etuah et al., 2024; Osei et al., 2024; Tsiboe et al., 2025).

Table 6

Supply chain costs and their relationship with retail price adjustment

Supply chain cost indicator	Mean	SD	Strong influence, %
Supplier or wholesaler price	4.47	0.5	100
Cost of replacing stock	3.67	0.48	66.7
Supplier credit or delayed payment cost	3.51	0.5	51.3
Transport or delivery charges	3.95	0.26	94
Loading, offloading and handling	3.5	0.5	49.8
Packaging and market tolls	3.25	0.43	25.1
Storage, refrigeration, ice or electricity	3.84	0.37	84
Expected spoilage or unsold stock	4.2	0.45	98
Borrowing or working capital cost	3.52	0.52	50.9
Composite supply chain cost score	3.77	0.31	Not applicable
Adjusted regression result	**B = 1.00**	**SE = 0.07**	**p < .001**

Note: N = 450. Strong influence represents responses of 4 or 5. Supply chain costs and retail adjustment were positively correlated, r = .893, p < .001. In the adjusted model, B = 1.001, 95% CI [0.860, 1.142], p < .001. Model R^2 = .915 and adjusted R^2 = .912. Estimates are unweighted.

4.3.2 Product Characteristics and Retail Price Adjustments

Table 7 reports six product conditions retained as separate predictors, because they did not form a reliable single scale. HC3 models controlled for supply chain costs, market and respondent characteristics, while commodity contrasts and interaction terms assessed differences between crop and animal products.

$$RPA_i = \beta_0 + \beta_1 SC_i + \Sigma \beta k PCk_i + \theta COM_i + \Sigma \delta k(PCk_i \times COM_i) + \gamma X_i + \mu market + \varepsilon_i$$

Product characteristics made a significant but comparatively modest contribution once supply chain costs and retailer characteristics were controlled. The six indicators added 2.4 percentage points to explained variation, supporting rejection of H02. Short shelf life, declining quality and lean season scarcity were associated with greater adjustment,

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bumper supply with less. The size of that contribution suggests product characteristics influenced how cost pressures were managed without displacing procurement, transport, storage and financing from the centre of the account. Product risk conditions transmission rather than running a pricing system of its own, which is consistent with commodity dependent transmission estimates for Ghana (Etuah et al., 2024; Emediegwu & Rogna, 2024; Harshana & Ratnasiri, 2023).

Perishability created urgency without fixing direction. Interviewees described smaller portions when customers resisted increases, and outright reductions when ageing stock threatened working capital. Observation made the sequence visible: Kotokuraba fish sellers reduced prices towards late morning, while tomato sellers in all three markets sorted by ripeness and discounted deteriorating produce. The strands converge on product risk as a trigger while separating initial cost recovery from later clearance pricing, which mirrors both the handling constraints documented for vegetable traders and the markdown logic identified in formal perishable retail (Kushitor et al., 2022; Sanders, 2024; Wongnaa et al., 2023). This is where the contradiction identified earlier in the literature resolves: the two apparently opposed effects of perishability belong to different points in the same stock cycle.

Seasonal supply moved adjustment in a far more predictable direction. Lean season scarcity was positively associated with adjustment; bumper supply carried a negative coefficient. A plantain retailer put it plainly: “When it's bumper, I can't increase prices, customers know supply is high, they'll just go to the next seller. But when it's scarce, I can increase more” (R005, 10 June 2026). Both coefficients find direct qualitative support in that one sentence. Price Transmission Theory accounts for the movement from scarcity to higher retail pressure, while the account also shows competition limiting recovery when supply is abundant, which fits evidence that transmission varies across commodities and market conditions rather than proceeding at a uniform rate (Etuah et al., 2024; Tsiboe et al., 2025; Oloukoi, 2024).

A negative storage coefficient should not be read as evidence that storage requirements reduce costs. Interview accounts indicated that adequate drying or preservation extended waiting time, whereas moisture, weevils or freshness loss could force a sale abruptly. Observation supported that conditional reading, since fish depended on ice or freezers, tomatoes on shade and rapid sorting, and Mankessim grains on moisture protection. The coefficient may also absorb overlap between commodity group and product conditions, which are closely entangled in practice. Storage is better interpreted as contingent waiting capacity than as an independent price reducing mechanism, an interpretation supported by Ghanaian work on storage technology and post harvest loss (Sugri et al., 2021; Wongnaa et al., 2023; Kushitor et al., 2022).

Commodity comparison shows further that product effects were not uniform. After adjustment, animal product retailers recorded a higher predicted adjustment score than crop retailers, 3.79 against 3.63, supporting rejection of H03. Quality loss carried a positive marginal effect among animal retailers and a negative one among crop retailers, and bumper supply showed a stronger negative association among animal retailers. Variation in shelf life, divisibility and preservation requirements could account for these differences, though the data cannot establish the mechanisms conclusively. Several product indicators also displayed unusually restricted variation within commodity groups, including no variation at all in unexpected delivery responses among animal retailers. The interaction results and the adjusted commodity difference should therefore be reported, while strong claims about their magnitude await checks for coding, questionnaire administration and common response patterns.

A product risk account follows, organised around urgency, waiting capacity and commodity form. Short shelf life and quality decline accelerate adjustment, yet the response may surface as a price increase, a smaller quantity or a clearance reduction. Storage postpones adjustment until deterioration removes that flexibility, while seasonal abundance limits upward movement through competition. These findings refine a simple transmission model by showing that similar cost pressures generate different responses across grains, vegetables, fish and other animal products (Osei et al., 2024; Ahwireng et al., 2024; Sugri et al., 2021). Commodity specific interventions are consequently more defensible than a uniform storage policy: fresh fish and animal products need reliable ice, hygienic cold facilities and dependable electricity, grains need drying, ventilation and moisture control, and vegetables and plantain may benefit most from shade, better handling and rapid market information.

Table 7

Product characteristics and retail price adjustments

Product condition	Mean	SD	Strong influence, %	Adjusted B	95% CI	p
Short shelf life	4.22	0.85	72.9	0.125	0.083 to 0.167	< .001
Loss of freshness or quality	3.47	0.5	46.7	0.091	0.032 to 0.149	0.002
Special storage needs	3.48	0.5	48.2	−0.229	−0.322 to −0.137	< .001

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Bumper supply	3.04	0.62	21.1	−0.160	−0.241 to −0.078	< .001
Lean season or shortage	3.65	0.77	50.2	0.121	0.034 to 0.208	0.006
Unexpected delivery changes	3.56	0.5	56.2	0.023	−0.034 to 0.079	0.431
Product condition	**Crop products, B**	**Animal products, B**	**Difference, B**	**Interaction p**		
Short shelf life	0.089	0.114	0.026	0.849		
Loss of freshness or quality	−0.110	0.265	0.375	< .001		
Special storage needs	−0.272	−0.362	−0.090	0.175		
Bumper supply	−0.062	−0.248	−0.186	0.016		
Lean season or shortage	0.106	0.132	0.026	0.804		
Unexpected delivery changes	0.015	−0.158	−0.173	0.462		
Comparison	**Crop adjusted mean**	**Animal adjusted mean**	**Adjusted difference**	**95% CI**	**p**	
Retail price adjustment	3.63	3.79	0.165	0.095 to 0.235	< .001	

*Note: N = 450. Strong influence combines responses of 4 and 5. In Panel A, the product block was jointly significant, Wald $\chi^2(6) = 118.45$, $p < .001$. Its inclusion increased R^2 from .915 to .939, $\Delta R^2 = .024$. In Panel B, the interaction block was jointly significant, Wald $\chi^2(6) = 82.29$, $p < .001$, but increased R^2 by only .007. Positive co*efficients indicate greater adjustment responsiveness. All estimates control for the variables specified above.

4.3.3 Macroeconomic conditions and retail price adjustments

Table 8 reports perceived exposure to changes in the cedi, fuel prices and the general price level. The macroeconomic exposure score showed strong internal consistency, Cronbach's alpha = .965. Hierarchical regression with HC3 robust standard errors controlled for supply chain costs, product conditions, varying market context indicators, commodity, respondent characteristics and market fixed effects.

$$RPA_i = \beta_0 + \beta_1 SC_i + \Sigma\beta k PCk_i + \Sigma\beta j CTXj_i + \beta MC_i + \gamma X_i + \mu market + \varepsilon_i$$

Macroeconomic exposure kept a positive relationship with adjustment after the full set of controls entered. A one point increase in exposure corresponded to an estimated 0.509 point increase in the adjustment score, with the confidence interval excluding zero, so H04 was rejected. Exposure nonetheless added only 0.5 percentage points to explained variation, because supply chain, product and market variables had already captured much of the same pressure. Macroeconomic conditions appear to influence adjustment partly through procurement, transport, storage and consumer demand rather than as a separate pricing force. Once again the very high model fit warrants caution. All the variables came from a single questionnaire and may share common response patterns, so what is reported here is an adjusted association rather than evidence of causation.

Fuel was the most visible route from the wider economy into procurement, transport, processing, ice and electricity, and on this point interview evidence and the strong survey exposure ratings agreed. Structured observation could verify neither fuel nor exchange rate effects directly. What it documented instead were the transport, preservation and handling systems through which those pressures could plausibly travel. The evidential boundary matters for how much weight each strand carries: observation supports the plausibility of the pathway, while the statistical association and retailer accounts carry the substantive claim. Ghanaian macroeconomic work supports the same channel, reporting that higher crude prices depress agri-food output over the long run and that oil shocks reach agricultural commodities with varying sign and magnitude (Ussif, 2024; Oteng et al., 2024; Owusu, 2025).

Exchange rate exposure proved less direct. Fewer than half of respondents rated cedi movements strongly, and the cedi coefficient lost significance once fuel and inflation entered together. This is not proof that exchange rates were irrelevant, since the items were highly correlated and their individual effects overlap. The interviews reveal the indirect pathway more clearly than the coefficients do. R002 explained, *"I don't buy foreign things directly, but the people I buy from do"* (3 June 2026), while R006 stated, *"I don't see the dollar. What I see is: the wholesaler says, 'The fish is more expensive now'"* (12 June 2026). Currency changes reached retailers through imported fishing inputs, supplier quotations, fuel and replacement costs. Price Transmission Theory anticipates the movement, and Transaction Cost Economics clarifies why retailers perceive the supplier's revised price rather than the original currency shock, a pattern

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consistent with evidence of incomplete and asymmetric pass through in Ghana (Obeng et al., 2022; Osei et al., 2024; Onumah et al., 2022).

General inflation worked through paired pressures: higher business costs and weaker purchasing power. Survey and interview evidence converged on that tension without difficulty. Observation offered indirect support only, since extensive price comparison and bargaining, particularly among Kotokuraba's student and urban customers, demonstrated affordability pressure in transactions but could not identify inflation as its cause. The combined inference is that macroeconomic shocks reach retailers indirectly and are then filtered through immediate demand signals, which helps explain why pass through stays incomplete even where exposure is widely reported (Gizaw & Myrland, 2025; Derindag et al., 2023; Obeng et al., 2022).

Adjustment was strongly asymmetric. Almost every respondent agreed that prices rose faster than they fell, while only about half reported passing on lasting increases and a similar proportion absorbed temporary ones. R002 observed, *"When the cedi drops, within two days, prices go up. But when the cedi recovers? Nothing. The price stays"* (3 June 2026). R006 added, *"When they say inflation is down? I don't see it"* (12 June 2026). These accounts converge with the survey evidence while placing asymmetry within replacement cost expectations, accumulated operating expenses and uncertainty about whether favourable movements will hold. The finding extends aggregate evidence by showing that incomplete downward adjustment may arise because several costs remain elevated even when one macroeconomic indicator improves, and it should not be read automatically as retailer opportunism or coordinated pricing (Obeng et al., 2022; Tsiboe et al., 2025; Scheiterle & Birner, 2023).

Together these strands produce a retailer level account of macroeconomic transmission operating through business cost escalation and declining customer purchasing power. Exchange rate movements were encountered mainly as supplier and replacement prices rather than as currency news, while fuel entered at several supply chain stages simultaneously. The modest gain in model fit after supply chain and product conditions were controlled is therefore theoretically coherent rather than disappointing. Much of the macroeconomic effect had already been embodied in everyday operating costs by the time it reached the pricing decision.

Table 8

Macroeconomic conditions and retail price adjustments

	Indicator	**Mean**	**SD**	**High response, %**	
	Changes in the value of the cedi	3.48	0.5	47.8	
	Changes in fuel prices	4.48	0.55	97.6	
	General rise in prices	4.48	0.5	100	
	Lasting cost increases passed to customers	3.54	0.52	52.9	
	Temporary cost increases absorbed	3.49	0.5	48.9	
	Prices rose faster than they fell	4.5	0.51	99.6	
	Similar prices used across outlets or markets	2.97	0.2	0.4	
	Customer resistance limited cost transmission	4.43	0.5	99.6	
Model	**Variables included**	**R^2**	**Adjusted R^2**	**Change in R^2**	
1	Retailer, commodity and market controls	0.845	0.839	Not applicable	
2	Supply chain costs, product conditions and market context	0.947	0.944	0.102	
3	Macroeconomic exposure added	0.953	0.95	0.005	
	Predictor	**B**	**Robust SE**	**95% CI**	**p**
	Composite macroeconomic exposure	0.509	0.077	0.357 to 0.662	< .001
	Macroeconomic indicator	**Adjusted B**	**p**	**Statistical decision**	
	Changes in fuel prices	0.163	< .001	Significant	
	General rise in prices	0.368	< .001	Significant	
	Changes in the value of the cedi	0.053	0.068	Not significant	

Note: N = 450. High response combines response categories 4 and 5. All regression estimates use HC3 robust standard errors and control for supply chain costs, product conditions, market context, commodity, gender, age, market attendance, trading experience, education, employment status and market effects. The composite macroeconomic exposure coefficient was statistically significant, B = 0.509, 95% CI [0.357, 0.662], p < .001. The null hypothesis was therefore rejected. The individual coefficients should be interpreted cautiously because the three macroeconomic indicators were strongly correlated.

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4.3.4 Market Context and Retailers' Responses to Cost Changes

Table 9 tests whether competitors' prices, customer demand and purchasing power, credit access, and supplier and customer relationships altered the relationship between supply chain costs and adjustment. Separate mean centred interaction terms were estimated with HC3 robust standard errors alongside product and macroeconomic conditions, commodity, respondent characteristics and market fixed effects. The invariant outlet price item was excluded.

$$RPA_i = \beta_0 + \beta_1 SC_i + \Sigma \beta j CTXj_i + \Sigma \delta j (SC_i \times CTXj_i) + \beta MC_i + \Sigma \beta k PCk_i + \gamma X_i + \mu market + \varepsilon_i$$

No interaction term reached significance, so H05 was not rejected. Market context did not demonstrably change the strength of the relationship between supply chain costs and adjustment. That is not the same as finding competition, demand or trading relationships unimportant. Their influence bore on the form and timing of adjustment rather than the overall magnitude of the cost response, a distinction the qualitative and observational strands make far clearer than the coefficients do.

Interview and observation evidence support the narrower interpretation. Retailers described competition, purchasing power and credit as constraints on when and how they responded rather than on whether they responded at all. Observation recorded the most intensive bargaining and seller density in Kotokuraba, moderate negotiation in Kasoa, and fewer bargains alongside bulk, relationship based transactions in Mankessim. These contrasts do not overturn the nonsignificant interaction tests. They indicate that context shaped the visible response options and the form of the transaction without demonstrably altering the underlying cost slope, which is consistent with evidence that relational and associational structures in Ghanaian markets govern coordination more than price levels (Scheiterle & Birner, 2023; Overå et al., 2022; Kushitor et al., 2022).

Market context acted as a decision filter, then, rather than as a uniform moderator. The distinction reconciles a quantitative null result with obvious qualitative and observational heterogeneity, and it cautions against treating contextual variation as evidence of a stronger or weaker causal effect. Restricted variation in several context indicators may also have limited the statistical power of the interaction tests, so the null is better read as inconclusive than as a demonstration that no moderation exists.

Table 9

Market context and retailers' responses to cost changes

Interaction variable	B	95% confidence interval	p value	Decision
Competitors' prices	0.14	Negative 0.18 to 0.47	0.39	Not significant
Customer demand and purchasing power	Negative 0.36	Negative 0.79 to 0.08	0.113	Not significant
Access to credit	Negative 0.04	Negative 0.53 to 0.44	0.856	Not significant
Supplier and customer relationships	0.3	Negative 0.23 to 0.84	0.266	Not significant

Note: N = 450. The model used HC3 robust standard errors and controlled for product conditions, macroeconomic exposure, commodity, retailer characteristics and market effects. All continuous predictors were centred around their means. Model R^2 = .954.

4.3.5 Integration of Quantitative, Qualitative and Observation Evidence

Table 10 brings the three strands together objective by objective. For each it records what the survey estimated, what the interviews explained, what observation could and could not corroborate, and the inference the study is prepared to defend on that combined basis. Reading across the rows shows where the strands converged, where they were complementary, and where one of them was necessarily silent.

Table 10

Joint display of evidence and integrated inferences

Objective	Quantitative evidence	Qualitative explanation	Observation evidence	Integrated inference
1. Adjustment forms	Price, quantity, quality, credit and margin responses were widespread	Responses were sequenced as customers resisted and stock aged	Oral prices, bargaining, varied measures, sorting and clearance discounts were visible	Transmission was partial, multidimensional and sometimes hidden from posted prices
2. Supply chain costs	Cost pressure strongly predicted adjustment	Procurement, transport, storage, loss and finance accumulated across the stock cycle	Loading, manual handling, weak storage and deterioration were visible; private costs were not	A material cost pathway is supported, but its magnitude remains survey based

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3. Product conditions	Short shelf life, quality loss and scarcity strengthened adjustment; bumper supply weakened it	Saleable life and waiting capacity changed timing and direction	Fish clearance, tomato sorting and grain moisture risks differentiated commodities	Product risk determined whether pressure became an increase, smaller unit or discount
4. Macroeconomic conditions	Composite exposure remained significant; the cedi effect was weak when separated	Fuel and inflation reached retailers through suppliers, transport and purchasing power	Macro shocks were not directly observable; bargaining showed affordability pressure only	Macroeconomic transmission was indirect and partly embodied in supply chain costs
5. Market context	No context interaction was statistically significant	Competition, demand, credit and relationships shaped available responses	Kotokuraba showed intense bargaining; Mankessim showed bulk, relationship trading; Kasoa was intermediate	Context filtered form and timing without demonstrably changing the cost response slope

Note: Observation refers to public behaviour and physical conditions recorded during the scheduled sessions. It does not independently establish motives, private costs, margins or macroeconomic causation.

4.4 Discussion

Read together, the evidence reframes retail price adjustment as shock redistribution rather than simple cost pass through. The survey established patterned associations, the interviews identified retailer reasoning, and observation showed how the selected responses appeared in public transactions. Supply chain costs created the immediate pressure. Product risk determined urgency and waiting capacity. Macroeconomic instability entered largely through those costs and through customer purchasing power, while market context shaped the response available at the moment of sale. Evidence was strongest where the strands converged on visible adjustment and more qualified where observation could not reach private or macroeconomic processes, which is a boundary of the design rather than a weakness of the finding (Fetters & Tajima, 2022; Draucker et al., 2020; Braun & Clarke, 2021).

Why practical judgement featured so prominently becomes clearer from the demographic profile. Most respondents were women, trading full time, with long experience and limited formal schooling. Their decisions drew on repeated supplier dealings, seasonal memory, product condition and immediate customer feedback. This supports bounded rationality without treating experience as a substitute for information, and it aligns with Ghanaian evidence that market women's commercial skill rests on accumulated relational and product knowledge (Overå et al., 2022; Scheiterle & Birner, 2023; Osei et al., 2024). It also raises a practical warning about interventions built solely around technical reports or complex digital tools, which risk bypassing the people who actually set daily food prices.

Across the first two objectives, retailers did not convert a single cost into a single price. Procurement, transport, handling, preservation, loss and finance accumulated, while customer resistance and competing stock interrupted recovery. Traders redistributed the burden instead, across price, quantity, quality, credit and margin. This supports Price Transmission Theory while rejecting a mechanical version of it, and it extends Ghanaian evidence on incomplete transmission by showing why a consumer may experience inflation as less food or lower quality even when the quoted price has not moved (Etuah et al., 2024; Osei et al., 2024; Tsiboe et al., 2025).

Objective three locates that incomplete transmission within the product cycle. Perishability and scarcity increased urgency, but deterioration could reverse the direction from cost recovery to clearance. Kotokuraba is instructive. It had more visible preservation equipment than the other sites, and also the greatest observed deterioration and the earliest fish discounts. Infrastructure appears to matter through effective capacity, throughput and timing rather than through mere presence, echoing findings that access to market infrastructure alone guarantees neither safe nor profitable handling (Kushitor et al., 2022; Sugri et al., 2021; Ahwireng et al., 2024). Transaction Cost Economics explains the preservation wedge; observation and interview evidence show the point at which that wedge becomes an unavoidable loss.

Objectives four and five clarify the wider environment. Macroeconomic exposure remained significant, yet its small additional explanatory contribution indicates that fuel, inflation and currency movements had already entered procurement, transport and replacement costs before reaching the pricing decision (Obeng et al., 2022; Ussif, 2024; Gizaw & Myrland, 2025). The context interactions were nonsignificant at the same time. A clear observational contrast between competitive Kotokuraba and relationship based Mankessim should therefore not be presented as statistical moderation. It shows instead that context filtered the timing and form of a response, a distinction that reconciles quantitative nonconfirmation with qualitative and observational heterogeneity.

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For Ghanaian consumers, the mechanism broadens what food affordability actually means. Welfare can decline through a smaller bowl, a reduced piece, a lower grade or withdrawn credit even where the headline price has not changed, and posted price monitoring detects none of it (Sanders, 2024; Kushitor et al., 2022; Harshana & Ratnasiri, 2023). For policy, the finding challenges production centred and posted price approaches. Price stability appears to require attention to distribution, preservation, market measurement, credit and the reversibility of favourable cost changes, with interventions adapted to commodity risk and to the social organisation of each market.

Theoretically, the study offers an integrated account of constrained retail intermediation. Price Transmission Theory explains the movement of shocks, Transaction Cost Economics locates the costs and losses that weaken or delay that movement, and bounded rationality explains the workable choices retailers make under limited information and capital (Etuah et al., 2024; Osei et al., 2024; Scheiterle & Birner, 2023). The pragmatic design strengthens the account by treating convergence, divergence and silence as findings rather than as nuisances to be reconciled. Retailers emerge neither as passive transmitters nor as unconstrained price setters, but as intermediaries who distribute pressure among consumers, products and their own margins.

V CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This study asked how supply chain and macroeconomic conditions shape retail adjustment in Kasoa, Kotokuraba and Mankessim, and the evidence answers each of its five objectives. Retailers did not treat price as their only instrument. They moved between price, quantity, grade, credit and margin according to what customers would accept and how much saleable life the stock still held, and every respondent reported using a non price response when the price itself could not move. Supply chain costs exerted the strongest immediate influence, and the association survived the full set of retailer and market controls. Product characteristics mattered less in magnitude but decisively in direction. Short shelf life, quality decline and lean season scarcity accelerated response, abundant supply suppressed it, and the same perishability that justified an opening increase later forced clearance. Macroeconomic exposure remained significant after controls yet added little to explained variation, because fuel, inflation and currency movements had already been absorbed into procurement, transport, preservation and replacement costs before they reached the pricing decision. Market context produced no significant moderation, although its influence on the timing and form of response was plain in the interview and observation records.

Most consequential is what conventional price monitoring cannot see. Adjustment frequently remained hidden inside quantity, grade, credit and margin, so a consumer could receive less food, of lower quality, or on withdrawn credit terms, while the quoted price stood still. Downward adjustment followed the same logic in reverse: reductions were rare when costs fell and common when stock began to deteriorate. Read alongside the strongly asymmetric responses recorded in all three markets, this supports the study's central position that Ghanaian agrifood retailers act as constrained intermediaries who redistribute shocks across consumers, products and their own margins rather than transmitting them intact or setting prices at will.

For the study area, the results show where avoidable cost accumulates before it reaches consumers. Kasoa needs shade, rapid handling and transparent measures for a growing mixed customer base. Kotokuraba needs effective cold chain management, congestion relief and transparent unit pricing under intense competition, since the site best equipped for preservation was also the site where spoilage was most evident. Mankessim needs moisture safe grain storage, better temporary trading spaces and support for bulk redistribution. These conclusions hold for the 450 retailers sampled in the three markets and extend to settings sharing their informal measurement, bargaining, fragmented transport, perishable stock and relationship based credit, rather than to Ghanaian food retail as a whole.

5.2 Recommendations

The Ministry of Food and Agriculture, the Ghana Statistical Service, the National Petroleum Authority and district assemblies could establish an integrated market information system covering wholesale prices, fuel movements, transport charges, seasonal supply and retail selling units. Information would need to reach traders through local radio, mobile messages, market notice boards and trader associations rather than through technical bulletins alone, given the education profile of the retailers who make daily pricing decisions. District assemblies and private operators should develop commodity appropriate preservation facilities rather than a single storage solution. Fish and other animal products require reliable cold storage and ice services, vegetables require shade, sorting space and rapid distribution, and grains require drying, ventilation and moisture control. The observed contrast at Kotokuraba, where preservation equipment coexisted with the highest visible spoilage, suggests that capacity, throughput and maintenance matter as much as the presence of equipment.

The Ghana Standards Authority and district assemblies should strengthen inspection of scales, bowls and other market measures. Because quantity and grade adjustment were widespread while posted prices often remained

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unchanged, linking prices to visible quantities and grades would allow consumers to recognise changes in value that nominal price monitoring currently conceals. Financial institutions and trader associations should provide short term working capital matched to commodity turnover and shelf life. The interview evidence indicated that repayment deadlines could force premature sales as readily as they could justify higher prices, so repayment arrangements need to allow retailers to manage temporary shocks without either outcome.

Market associations should coordinate bulk purchasing and shared transport where feasible. Transparent transport charges and consolidated deliveries could reduce repeated journeys, handling costs and the multiplication of fuel related expenses along the chain, which matters given how consistently fuel emerged as the most visible macroeconomic channel in this study. National food and agricultural policy would benefit from a specific retail resilience component. Its performance should be assessed using food loss, retailer margins, quantity stability, consumer affordability and downward price adjustment rather than production volume alone, since production growth on its own does not address the distribution and preservation costs identified here.Training should reflect the demographic composition of the markets. Local languages, visual records and practical demonstrations should accompany any digital tools, and women retailers and experienced traders should participate in designing and evaluating interventions rather than receiving them as finished products.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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