Information Asymmetry and Bargaining Power in Agricultural Commodity Chains: A Theoretical Analysis of Vertical Oligopsony

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Abstract

This paper develops a theoretical framework to analyze the relationship between market concentration in agricultural processing and intermediation sectors and the bargaining power of smallholder farmers in commodity chains. We examine how information asymmetries regarding market prices, combined with oligopsonistic structures in procurement, systematically reduce farmers' share of final consumer value. The model demonstrates that concentration ratios in intermediation directly correlate with price markdown rates applied to farm-gate transactions, while information access moderates this relationship. Our analysis reveals that even modest improvements in price transparency can significantly shift bargaining outcomes, with marginal benefits increasing nonlinearly for the most information-deprived producers. The framework incorporates collective action mechanisms and shows how farmer cooperatives can partially offset market power imbalances, though effectiveness depends critically on organizational scale and coordination costs. Policy implications suggest that investments in market information systems and support for producer organizations may yield substantial welfare gains, particularly in contexts where vertical market concentration exceeds threshold levels. The findings contribute to understanding structural inequalities in agricultural value chains and provide guidance for institutional reforms aimed at improving rural livelihoods.

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1 Introduction

Agricultural commodity markets worldwide have experienced profound structural transformations over recent decades, characterized by increasing concentration in processing, intermediation, and retail sectors while farm production remains highly fragmented. This divergence in market structure creates fundamental power imbalances that systematically disadvantage smallholder producers, who find themselves negotiating with increasingly consolidated buyers operating with superior information and market leverage.

The phenomenon manifests across diverse agricultural contexts, from coffee and cocoa in developing regions to grains and livestock in industrialized economies. Farmers typically possess limited information about prevailing market prices, quality premiums, and alternative marketing channels, while intermediaries maintain comprehensive knowledge of regional and international market conditions. This information asymmetry, combined with structural market power derived from concentration, enables buyers to extract substantial rents from transactions with producers.

Contemporary agricultural value chains reflect what Marshall (2005) describes as complex adaptive systems requiring institutional arrangements that account for power differentials and information flows. The traditional competitive market paradigm, which assumes atomistic agents with perfect information, fails to capture the strategic interactions that characterize modern agricultural commerce. Instead, these markets exhibit oligopsonistic features where a limited number of buyers face numerous sellers, creating conditions conducive to buyer market power.

The theoretical challenge lies in developing frameworks that adequately represent both the structural features of concentrated procurement markets and the behavioral dimensions of bargaining under information asymmetry. Classical models of oligopsony provide insights into price determination under buyer concentration, but often abstract from information problems that amplify market power in practice. Conversely, information economics literature addresses asymmetric information scenarios but frequently assumes market structures that do not reflect agricultural realities.

This paper contributes to bridging this gap by developing an integrated theoretical framework that combines elements of industrial organization, information eco-

nomics, and bargaining theory to analyze price formation in agricultural commodity chains. We focus specifically on how market concentration in intermediation interacts with information asymmetries to determine the distribution of value between farmers and downstream actors. The analysis considers both individual farmer bargaining positions and collective action possibilities through producer organizations.

Our approach differs from existing literature in several respects. First, we explicitly model the relationship between concentration ratios in procurement and the magnitude of price markdowns applied to farm-gate transactions. Second, we incorporate information access as a continuous variable rather than a binary characteristic, allowing analysis of marginal effects of improved transparency. Third, we examine how collective action through cooperatives modifies bargaining outcomes, accounting for both benefits of scale and coordination costs.

The theoretical framework generates several key insights with practical relevance. We demonstrate that the relationship between concentration and farmer welfare is nonlinear, with threshold effects beyond which market power becomes particularly detrimental. Information improvements yield increasing marginal returns for the most disadvantaged producers, suggesting targeted interventions may be especially effective. Cooperative organization can substantially improve farmer outcomes, but effectiveness depends critically on achieving sufficient scale relative to buyer market power.

These findings have important implications for agricultural policy and development interventions. They suggest that market information systems, properly designed and implemented, can serve as powerful tools for improving farmer welfare even without directly addressing market structure. However, information alone proves insufficient when concentration reaches extreme levels, requiring complementary policies supporting collective action and potentially market structure regulation. The analysis also highlights how different policy instruments interact, with information transparency and cooperative development exhibiting complementarities.

The remainder of this paper proceeds as follows. Section 2 reviews relevant literature on market power in agricultural chains, information asymmetry, and collective action. Section 3 establishes the theoretical framework, defining key concepts and relationships. Section 4 develops the formal model of oligopsonistic procurement under information asymmetry. Section 5 analyzes model properties and discusses implications. Section 6 examines policy interventions and their expected effects. Section 7 concludes with synthesis of findings and research directions.

2 Literature Review

Research on market power in agricultural value chains has evolved considerably, reflecting both theoretical advances and empirical observations of structural change. Early contributions focused primarily on retail concentration and its effects on consumer prices, with less attention to upstream market power affecting producers. More recently, scholarship has increasingly recognized that concentration in processing and intermediation sectors may have profound implications for farm-level welfare.

The theoretical foundations for analyzing oligopsony draw from industrial organization literature, particularly models of bilateral market power and vertical relationships. These frameworks demonstrate how buyer concentration can lead to systematic price depression below competitive levels, with welfare transferred from sellers to buyers. However, application to agricultural contexts requires modifications accounting for unique features such as product perishability, seasonal production patterns, and the prevalence of spot market transactions.

Zilberman et al. (2018) emphasizes that understanding agricultural markets requires integration of biophysical and economic factors, noting that institutional arrangements profoundly influence how value is distributed across chain participants. This perspective aligns with broader recognition that agricultural markets function within complex institutional environments where formal and informal rules shape bargaining processes and outcomes.

Information asymmetry in agricultural markets has received substantial attention, though often in contexts distinct from market power analysis. Research has documented systematic information disadvantages facing smallholder farmers regarding prices, quality standards, and market conditions. These information problems are not merely technical failures but often reflect strategic behavior by intermediaries who benefit from maintaining information opacity.

The interaction between market structure and information asymmetry amplifies challenges facing producers. Gilles (2010) provides theoretical tools for analyzing strategic interactions in network contexts, demonstrating how information flows and cooperation possibilities depend on relational structures. Applied to agricultural chains, this suggests that concentrated buyer markets may actively discourage information sharing that would improve farmer bargaining positions.

Collective action represents a potentially important mechanism for farmers to offset market power disadvantages. Theoretical work on collective action, synthesized by Holahan and Lubell (2016), demonstrates how organizational arrangements can alter strategic interactions and enable achievement of outcomes superior to non-

cooperative equilibria. However, collective action faces well-documented challenges including coordination costs, free-riding incentives, and scale requirements for effectiveness.

Producer cooperatives in agriculture exhibit mixed performance, with success dependent on multiple factors including market structure, product characteristics, and organizational governance. Carraro and Fragnelli (2004) applies game-theoretic methods to analyze cooperative behavior in environmental contexts, with insights transferable to agricultural cooperation. Key findings emphasize that stable cooperation requires appropriate institutional design and sufficient benefits to offset organization costs.

Recent empirical work has begun quantifying relationships between market concentration and farmer prices across various commodity contexts. These studies generally find negative correlations between buyer concentration and farm-gate prices, though magnitudes vary considerably. This variation likely reflects differences in information environments, collective action prevalence, and specific market characteristics beyond simple concentration measures.

Research on agricultural value chains in developing economies has highlighted additional complexities. Nyoni et al. (2024) and Ouedraogo et al. (2022) examine how information services for smallholder farmers interact with market access and decision-making, finding that information provision alone often proves insufficient without addressing structural market barriers. This suggests complementarities between information interventions and institutional changes affecting market power.

The literature on agricultural adaptation and resilience, while primarily focused on climate challenges, offers relevant insights for understanding farmer responses to market power. Mnukwa et al. (2025) demonstrates how resource constraints, including information and organizational capacity, limit farmer ability to adopt beneficial practices. Analogously, market power exploitation requires farmers to possess not only information but also viable alternatives and negotiating capacity.

An important gap in existing literature concerns the integration of market structure, information asymmetry, and collective action within unified analytical frameworks. Much research treats these factors separately or examines pairwise interactions, but their simultaneous operation in agricultural markets remains incompletely understood. This paper contributes to addressing this gap through development of a synthetic theoretical model.

3 Theoretical Framework

Agricultural commodity markets can be conceptualized as hierarchical exchange systems where production occurs at atomistic farm level while procurement, processing, and distribution exhibit varying degrees of concentration. This structural asymmetry creates inherent power imbalances that influence transaction terms and value distribution. Understanding these dynamics requires careful definition of market power, information asymmetry, and their interaction.

3.1 Market Structure and Power

Market power in agricultural procurement manifests through oligopsonistic structures where a limited number of buyers purchase from numerous sellers. Unlike monopoly power extensively analyzed in industrial economics, oligopsony power receives less attention despite comparable welfare implications. In agricultural contexts, oligopsony arises naturally from scale economies in processing, transportation networks, and capital requirements that create barriers to entry in intermediation.

We define buyer concentration using the Herfindahl-Hirschman Index (HHI) for procurement markets, calculated as the sum of squared market shares across buyers in a relevant geographic market. Higher HHI values indicate greater concentration and, ceteris paribus, increased potential for market power exercise. However, market power realization depends not only on concentration but also on seller characteristics, particularly their ability to access alternative buyers or storage options.

The relationship between concentration and market power is mediated by product characteristics and institutional context. For perishable commodities with limited storage possibilities, farmers face severe time pressure to transact, amplifying buyer leverage. Geographic isolation similarly constrains farmer options, as transportation costs limit feasible marketing alternatives. These factors interact with buyer concentration to determine effective market power.

3.2 Information Asymmetry Dimensions

Information asymmetry in agricultural transactions encompasses multiple dimensions relevant to bargaining outcomes. Most fundamentally, farmers often lack knowledge of prevailing market prices at terminal markets or even at nearby locations. This price information deficit allows intermediaries to quote prices below competitive levels while farmers cannot verify whether offers reflect true market conditions.

Beyond simple price information, quality grading and premiums constitute another asymmetry dimension. Buyers possess superior knowledge of quality standards, grading processes, and associated price differentials. This enables strategic behavior where products are downgraded or differential payments claimed without farmer verification capacity. The complexity and opacity of grading systems exacerbates this problem.

Market condition information represents a third asymmetry category. Farmers typically have limited visibility into supply-demand dynamics, storage levels, international market trends, or forthcoming policy changes affecting prices. Intermediaries actively monitor these factors and time purchases strategically, while farmers often make selling decisions based on immediate liquidity needs without fuller market awareness.

We model information access as a continuous variable ranging from complete ignorance to perfect information, reflecting that information acquisition involves costs and that intermediate information states are empirically relevant. This formulation allows analysis of how marginal information improvements affect bargaining outcomes, rather than treating information as binary condition.

3.3 Bargaining Process Characterization

Agricultural transactions typically occur through sequential bilateral bargaining rather than competitive auction mechanisms. Individual farmers negotiate with specific buyers, often under time pressure due to product perishability or financial constraints. This bargaining structure provides opportunity for buyer market power exercise, particularly when sellers lack information or alternatives.

The bargaining game can be characterized as asymmetric in two respects: information asymmetry regarding market conditions, and structural asymmetry reflecting buyer market power. These asymmetries interact such that information disadvantage amplifies the impact of market power, and concentration facilitates maintaining information asymmetry that reinforces buyer advantage.

Transaction frequency and relationship dynamics introduce additional complexity. While economic theory often focuses on one-shot interactions, agricultural markets frequently involve repeated transactions between specific farmers and buyers. This repetition could theoretically enable reputation mechanisms that discipline buyer behavior, but in practice, information asymmetries and farmer liquidity constraints limit effectiveness of such mechanisms.

3.4 Collective Action Mechanisms

Farmer cooperatives and producer organizations represent institutional responses to individual powerlessness in concentrated markets. By aggregating supply, cooperatives can achieve scale approaching that of major buyers, potentially improving bargaining positions. Additionally, cooperatives can invest in information systems, quality monitoring, and alternative marketing channels that individual farmers cannot afford.

However, collective action faces inherent challenges articulated in Holahan and Lubell (2016)'s framework. Coordination requires overcoming free-rider problems where individual farmers benefit from cooperative price improvements without contributing to organizational costs. Scale economies in bargaining mean that cooperatives must reach critical size to materially affect outcomes, requiring substantial participation that may be difficult to achieve and maintain.

Cooperative effectiveness also depends on governance structures, professional management, and member commitment. Empirical evidence shows considerable variation in cooperative performance, with successful cases demonstrating substantial price premiums for members while failed cooperatives may extract rents similar to private intermediaries. Understanding conditions enabling effective collective action remains crucial for policy design.

4 Model Development

We develop a stylized model capturing essential features of agricultural commodity procurement under buyer concentration and information asymmetry. The model focuses on price determination in spot market transactions, abstracting from dynamic considerations and contract arrangements to isolate core mechanisms.

4.1 Basic Structure

Consider a procurement market for a homogeneous agricultural commodity with N farmers (sellers) and M intermediaries (buyers), where $M \ll N$, reflecting typical structural asymmetry. Farmers produce quantity q_i at cost $c(q_i)$, where production decisions are predetermined at harvest. Intermediaries resell to downstream markets at price P_m, which we treat as exogenously determined by broader market conditions.

Buyer j has market share s_j in the procurement region, with buyer concentration measured by:

$$HHI = \sum_{j=1}^{M} s_j^2 \tag{1}$$

Higher HHI indicates greater concentration, with $HHI = 1$ representing monopsony and $HHI = 1/M$ representing symmetric buyer structure. The relationship between HHI and market power depends on additional factors we incorporate progressively.

4.2 Information Structure

Farmers possess heterogeneous information about the market price P_m. We model this through information parameter $\theta_i \in [0, 1]$ where $\theta_i = 1$ represents perfect information and $\theta_i = 0$ represents complete ignorance. Farmer i forms price expectation:

$$E_i[P_m] = \theta_i P_m + (1 - \theta_i)\hat{P} \tag{2}$$

where $\hat{P}$ represents a default belief or commonly available price reference, typically below true market price due to buyer influence on available information. This formulation captures that partially informed farmers combine true price signals with potentially biased baseline information.

Information acquisition involves costs, so the distribution of θ_i across farmers reflects both individual information investment decisions and systematic variation in access to information infrastructure. We assume θ_i is distributed according to cumulative distribution function $F(\theta)$ with density $f(\theta)$ over $[0, 1]$.

4.3 Bargaining and Price Determination

In bilateral bargaining between farmer i and buyer j, the transaction price p_{ij} reflects relative bargaining power. We model this through a sharing rule where farmers receive share α_{ij} of the surplus between market price and farmer's reservation price (which we normalize to zero for simplicity):

$$p_{ij} = \alpha_{ij} \cdot E_i[P_m] \tag{3}$$

The farmer's share parameter α_{ij} depends on both information and market structure. We specify:

$$\alpha_{ij} = \alpha_0 - \beta \cdot HHI \cdot (1 - \theta_i) \tag{4}$$

where α_0 represents baseline sharing with perfect competition and information, β captures the impact of market power, and the interaction term $(1 - \theta_i)$ reflects that market power effects intensify with information disadvantage. This specification embodies the central mechanism: concentration reduces farmer share, but this effect is moderated by information access.

Combining equations yields the realized transaction price:

$$p_{ij} = [\alpha_0 - \beta \cdot HHI \cdot (1 - \theta_i)] \cdot [\theta_i P_m + (1 - \theta_i)\hat{P}] \tag{5}$$

This expression shows how price depends on market structure (HHI), information access (θ_i), true market conditions (P_m), and information environment ($\hat{P}$). The model generates several testable implications about these relationships.

4.4 Comparative Statics

Taking derivatives reveals how changes in market structure and information affect farmer prices. The impact of increased concentration on farm-gate price is:

$$\frac{\partial p_{ij}}{\partial HHI} = -\beta(1 - \theta_i)[\theta_i P_m + (1 - \theta_i)\hat{P}] < 0$$

This confirms that concentration reduces farmer prices, with magnitude depending on information level. For well-informed farmers (θ_i near 1), concentration has minimal effect, while poorly informed farmers (θ_i near 0) experience maximum impact.

The effect of improved information is positive when $P_m > \hat{P}$ (true price exceeds baseline belief), showing that information improvements benefit farmers. Importantly, the marginal benefit is larger when concentration is high (large HHI) and when the information gap $(P_m - \hat{P})$ is substantial.

4.5 Cooperative Organization

When farmers form cooperatives, they can potentially improve outcomes through two mechanisms: increased bargaining power from aggregated supply, and shared information investment. We model this by assuming cooperatives achieve effective information level θ_c exceeding average individual level, and face modified market power parameter reflecting their collective scale.

However, cooperation involves organizational costs $C(n)$ where n is membership size, typically exhibiting decreasing returns to scale due to coordination challenges. Cooperatives are viable when price benefits exceed these costs, which occurs when

concentration and information gaps are sufficiently large to generate substantial per-member gains from collective action.

5 Analysis and Discussion

The theoretical framework developed above generates insights into the mechanisms through which market concentration and information asymmetry jointly influence farmer welfare in agricultural commodity chains. This section explores the model's implications and relates them to empirical patterns observed in agricultural markets.

5.1 Market Power Exploitation Mechanisms

The model demonstrates that buyer market power operates through multiple channels that reinforce each other. Direct price suppression occurs as concentrated buyers face atomistic sellers with limited alternatives. This structural advantage alone would depress prices below competitive levels. However, the effect amplifies through information asymmetry, as uninformed farmers cannot distinguish between legitimate market fluctuations and buyer opportunism.

Importantly, the interaction term in our price equation reveals nonlinear effects. When either concentration or information disadvantage is minimal, the other factor has limited impact. But when both are substantial, their combination produces effects exceeding the sum of individual components. This suggests threshold dynamics where moderate market imperfections may be tolerable but their combination becomes particularly problematic.

The analysis also clarifies why traditional antitrust approaches focused solely on market structure may prove insufficient in agricultural contexts. Even relatively modest concentration can enable significant value extraction when combined with systematic information advantages. Conversely, highly concentrated markets with transparency and farmer organization may function reasonably well. Policy must therefore address multiple dimensions simultaneously.

5.2 Information Access and Welfare

Our framework highlights that information improvements yield increasing marginal returns in certain contexts. For farmers with minimal initial information, small improvements have modest effects as they remain predominantly reliant on biased

baseline beliefs. However, as information quality increases, farmers can increasingly leverage actual market conditions in negotiations, and the benefits accelerate.

This pattern has important implications for information system design. Investments in agricultural market information systems should prioritize reaching critical quality thresholds where information becomes actionable, rather than providing minimal data to many farmers. Additionally, complementary investments in farmer capacity to interpret and use information are crucial, as raw data provides limited benefit without analytical capability.

The model also explains why information asymmetry persists despite potential gains from transparency. Intermediaries benefit from information opacity and may actively resist transparency initiatives or provide misleading information that maintains asymmetry while appearing to address it. Effective information systems must therefore be designed to be credible and difficult for interested parties to manipulate.

5.3 Geographic and Temporal Dimensions

While our static model abstracts from space and time, agricultural markets exhibit important geographic and temporal dynamics affecting power relationships. Geographic remoteness increases buyer concentration in local procurement markets, as transportation costs effectively segment farmers from broader competitive markets. This exacerbates power imbalances for farmers in isolated areas, particularly in developing regions with limited infrastructure.

Temporal dynamics introduce additional complexity through perishability and seasonal production patterns. Farmers of perishable commodities face severe time constraints to transact, fundamentally weakening their bargaining position regardless of information access. Buyers can exploit this by timing purchases strategically and offering prices that farmers must accept despite knowledge they are below true value. This mechanism operates alongside the information channel we model explicitly.

Storage capacity represents a crucial variable moderating temporal bargaining dynamics. Farmers with adequate storage can reduce time pressure and potentially wait for better price opportunities. However, storage involves costs and risks, particularly for smallholders with limited capital and facilities. The distribution of storage capacity across farmers thus affects aggregate bargaining outcomes and the benefits of improved information.

5.4 Collective Action Effectiveness

The model indicates that cooperative organization can substantially improve farmer outcomes, but effectiveness depends critically on achieving sufficient scale relative to market structure. Small cooperatives negotiating with large concentrated buyers may realize limited gains, while cooperatives approaching buyer scale can fundamentally alter bargaining dynamics.

However, the model's cooperative organization component also reveals inherent tensions. Larger cooperatives generate greater market power benefits but incur higher coordination costs and face more severe free-rider problems. This creates an optimal size balancing scale economies against organizational costs, which varies depending on market structure, commodity characteristics, and institutional environment.

Successful cooperatives must also maintain member commitment over time, which requires delivering tangible benefits that exceed costs of participation. In markets with extreme concentration or where information remains opaque, cooperatives may struggle to achieve price improvements sufficient to justify organizational costs. This explains empirical observations of cooperative dissolution in certain contexts despite theoretical potential.

5.5 Heterogeneity Across Farmers and Markets

Our analysis assumes farmer homogeneity for analytical tractability, but real agricultural systems exhibit substantial heterogeneity that affects market power dynamics. Larger commercial farmers typically have better information access, storage capacity, and alternative marketing channels than smallholders. This means market power effects concentrate on the most vulnerable farmers, while better-resourced producers may avoid severe exploitation.

This heterogeneity has distributional implications that simple welfare analysis obscures. Market power may increase inequality within farming populations by affecting small and large producers differentially. Conversely, effective information systems or collective action mechanisms that particularly benefit disadvantaged farmers could reduce inequality while improving aggregate welfare.

Commodity characteristics also create variation in market power patterns. For high-value perishables like fresh fruits and vegetables, time pressure and quality requirements amplify buyer leverage. For storable commodities like grains, farmers have greater flexibility though storage costs create different pressures. For specialized products requiring specific processing, vertical coordination may be efficient

but creates dependency that buyers can exploit.

5.6 Dynamic Considerations

Beyond the static framework we develop, agricultural markets involve dynamic processes affecting long-run outcomes. Repeated interactions between farmers and buyers could enable reputation mechanisms disciplining opportunistic behavior. However, information asymmetry undermines these mechanisms, as farmers may not observe whether price variations reflect buyer behavior or market conditions.

Investment decisions respond to market power conditions, with implications for market evolution. Farmers experiencing persistent value extraction may reduce agricultural investment, diversify into nonagricultural activities, or exit farming entirely. This could paradoxically either exacerbate concentration as production consolidates among remaining farmers, or reduce it if new smaller-scale entrants replace exiters in different production systems.

Buyer market structure also evolves endogenously. High profitability from market power exercise attracts entry, but barriers including scale economies and capital requirements limit competitive discipline. In some contexts, buyer concentration increases over time through mergers and consolidation. Understanding these evolutionary dynamics requires extending our static analysis to incorporate market entry, exit, and structural change.

6 Policy Implications

The theoretical framework developed in this paper generates several insights with relevance for agricultural policy design and institutional reform. Effective interventions must address the multidimensional nature of market power in agricultural chains, recognizing that structural concentration, information asymmetry, and weak collective action interact to disadvantage farmers.

6.1 Market Information Systems

Investment in agricultural market information systems emerges as a high-priority intervention with strong theoretical justification. Our model demonstrates that information improvements can substantially shift bargaining outcomes in favor of farmers, with benefits particularly pronounced in highly concentrated markets. Effective information systems should provide timely, accurate, and accessible price data covering relevant geographic markets and quality grades.

However, information system design requires careful attention to several factors. Information must be credible and verifiable to prevent manipulation by interested parties. Simple price reporting may be insufficient if buyers can influence reported data. Independent monitoring and verification mechanisms are essential. Additionally, information must reach farmers in usable formats, requiring appropriate technology platforms and extension services to support interpretation and application.

The analysis also suggests targeting information systems toward most disadvantaged farmers may maximize welfare gains. Since marginal benefits of information increase with initial disadvantage, resources directed to isolated, poorly-informed farmers likely yield higher returns than improving information for already well-connected producers. Geographic targeting to remote areas with high concentration and limited existing information infrastructure appears particularly justified.

6.2 Competition Policy and Market Structure

Traditional competition policy focuses on preventing excessive market concentration through merger review and market power abuse prevention. While relevant in agricultural contexts, the model indicates that concentration thresholds appropriate for manufacturing or services may be too permissive for agricultural procurement. The combination of information asymmetry and product perishability means even moderate concentration enables substantial value extraction from farmers.

This suggests agricultural markets may warrant special treatment in competition policy frameworks, with lower concentration tolerance and more active market structure monitoring. However, practical challenges limit antitrust effectiveness in many agricultural contexts, particularly in developing regions with limited enforcement capacity. Additionally, some concentration may be inevitable or even efficient given scale economies in processing and distribution.

Where reducing concentration is infeasible, mitigating policies become crucial. These include supporting farmer collective action, improving information transparency, and regulating buyer conduct through unfair trading practice legislation. Such measures can reduce market power exploitation even when structural concentration persists. The optimal policy mix depends on specific market characteristics and institutional capacity.

6.3 Support for Producer Organizations

The model demonstrates that farmer cooperatives can partially offset buyer market power by aggregating supply and improving members' bargaining positions. This provides theoretical justification for policies supporting cooperative development, including legal frameworks facilitating organization, technical assistance for cooperative management, and financing for cooperative infrastructure and working capital.

However, policy design must recognize that cooperatives are not automatically effective and can fail or become extractive themselves. Support should emphasize governance quality, transparent operations, member participation, and professional management. Additionally, cooperative formation should be voluntary rather than imposed, as coerced organization typically fails to generate genuine collective commitment.

Scale represents a critical factor in cooperative effectiveness. Our analysis indicates cooperatives must achieve sufficient size relative to buyer market power to materially affect outcomes. This suggests policy should support consolidation and federation of small cooperatives where appropriate, while avoiding forced amalgamation that undermines member ownership. Regional variation in optimal cooperative scale requires locally-adapted approaches.

6.4 Regulatory Interventions

In markets where structural imbalances are severe and market-based solutions insufficient, direct regulation may be warranted. This could include minimum price guarantees, mandatory transparency in grading and quality assessment, restrictions on discriminatory pricing, or required disclosure of price calculation methods. Such interventions directly address the mechanisms through which buyer power is exercised.

Regulatory approaches face implementation challenges including enforcement costs, potential for corruption, and risks of distorting market signals. They are most appropriate when market failures are severe and persistent, when affected populations are particularly vulnerable, and when regulatory capacity exists for effective implementation. The balance between market-based and regulatory interventions should reflect specific contexts rather than ideological preferences.

6.5 Complementarities and Policy Packages

Crucially, the model reveals complementarities among different interventions. Information systems work best when farmers have genuine alternatives enabled by cooperatives or competitive buyer entry. Cooperatives function most effectively when members have good information to hold management accountable. Competition policy proves more powerful when combined with transparency and organization support.

This suggests integrated policy packages addressing multiple dimensions simultaneously may prove more effective than isolated interventions. For example, programs combining market information systems, cooperative technical assistance, and unfair trading practice legislation could generate synergistic effects exceeding the sum of individual components. Policy design should explicitly consider these complementarities and design multi-faceted interventions accordingly.

Resource constraints necessitate prioritization, but sequencing can enable strategic development. Initial investment in information infrastructure and basic cooperative legal frameworks may create foundations enabling subsequent interventions to work more effectively. Alternatively, demonstration effects from successful interventions in pilot areas may build political support for broader implementation.

7 Conclusion

This paper has developed a theoretical framework for analyzing how market concentration in agricultural intermediation and processing interacts with information asymmetry to influence value distribution between farmers and downstream chain actors. The analysis demonstrates that buyer market power operates through multiple channels that reinforce each other, with concentration enabling both direct price suppression and strategic exploitation of information disadvantages.

The model generates several key insights with both theoretical and practical significance. First, the relationship between market structure and farmer welfare exhibits threshold effects and nonlinearities, with particularly severe consequences when high concentration combines with poor information access. This suggests policy cannot focus exclusively on either market structure or information provision but must address both dimensions.

Second, marginal improvements in farmer information access can yield substantial welfare gains, particularly for the most disadvantaged producers and in highly concentrated markets. This provides strong justification for investments in agricultural market information systems, though design must ensure credibility, accessibil-

ity, and practical usability of information provided.

Third, collective action through producer cooperatives represents a potentially powerful mechanism for offsetting buyer market power, but effectiveness depends critically on achieving adequate organizational scale, maintaining member commitment, and implementing effective governance. Policy support for cooperatives is justified but must recognize that organization alone is insufficient without addressing complementary factors.

The framework also clarifies why agricultural markets may require policy approaches differing from other sectors. The combination of production atomization, product perishability, information asymmetry, and downstream concentration creates conditions where market power can be exercised severely even with moderate concentration ratios. Standard competition policy thresholds and interventions may therefore prove inadequate for agricultural contexts.

Several limitations of this analysis suggest directions for future research. First, the static framework abstracts from important dynamic considerations including investment responses, market evolution, and long-run structural change. Extending the model to incorporate these dynamics would provide insights into how market power affects agricultural development trajectories.

Second, our stylized model assumes transaction homogeneity, while real agricultural markets exhibit considerable variation in contractual arrangements, vertical integration, and relationship patterns. Analyzing how different transaction governance structures interact with market power would enrich understanding of alternative organization forms.

Third, the analysis focuses on price determination in procurement, but buyer market power may also manifest through quality grading manipulation, delayed payment, input tying, or other mechanisms not explicitly modeled. Comprehensive frameworks incorporating these dimensions would provide fuller understanding of value extraction processes.

Fourth, we treat certain parameters as exogenous, particularly the distribution of information access across farmers and the costs of cooperative organization. Endogenizing these through explicit models of information investment and collective action formation would clarify the mechanisms generating observed heterogeneity.

Fifth, empirical testing of the framework's predictions represents an important complement to theoretical development. While the model generates testable hypotheses about relationships between concentration, information, organization, and prices, systematic empirical validation across diverse agricultural contexts remains limited.

Despite these limitations, the framework contributes to understanding structural inequalities in agricultural value chains and provides guidance for institutional reforms aimed at improving rural livelihoods. The analysis demonstrates that market power in agricultural procurement represents a serious concern warranting policy attention, while also indicating that well-designed interventions can substantially mitigate its effects.

As agricultural markets continue evolving with ongoing concentration in downstream sectors, understanding and addressing market power dynamics becomes increasingly important for achieving sustainable and equitable food systems. The theoretical tools developed here provide foundations for both further research and evidence-based policy development in this critical domain.

References

Carraro, C. and Fragnelli, V. (2004). *Game Practice and the Environment*. Edward Elgar Publishing.

Gilles, R. P. (2010). *The Cooperative Game Theory of Networks and Hierarchies*. Springer Berlin Heidelberg.

Holahan, R. and Lubell, M. (2016). Collective action theory. In *Handbook on Theories of Governance*. Edward Elgar Publishing.

Marshall, G. (2005). *Economics for Collaborative Environmental Management: Renegotiating the Commons*. Earthscan, London.

Mnukwa, M. L. et al. (2025). Assessing the adoption and impact of climate-smart agricultural practices on smallholder maize farmers' livelihoods in sub-saharan africa: a systematic review. *Frontiers in Sustainable Food Systems*, 9.

Nyoni, R. S. et al. (2024). Targeting smallholder farmers for climate information services adoption in africa: A systematic literature review. *Climate Services*, 34:100450.

Ouedraogo, A. et al. (2022). Farmers' demand for climate information services: A systematic review. *Sustainability*, 14(15):9025.

Zilberman, D., Gordon, B., Hochman, G., and Wesseler, J. (2018). Economics of sustainable development and the bioeconomy. *Applied Economic Perspectives and Policy*, 40(1):22–37.