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Agricultural Market Access and Crop-Receipt Heterogeneity among Bereaved Farm Households in Karnataka, India

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ABSTRACT

This study investigates heterogeneity in gross crop-sale receipts and its association with reported agricultural marketing access among bereaved farming households in Karnataka. We analyse 184 available household records from Bellary and Raichur. Ordered monetary categories are treated as grouped observations; descriptive comparisons, adjusted regressions and sensitivity analyses are used. In an adjusted model using 178 complete cases, reported access to agricultural marketing facilities is positively associated with a higher crop-sales category (odds ratio approximately 2.23; 95% confidence interval 1.15–4.32). These findings are associational rather than causal. The analysis shifts attention from credit and government compensation to the conditions of agricultural exchange and the measurement challenges of grouped sale and cultivation-expenditure data.

Keywords: agricultural market access; crop-sale receipts; farm commercialization; survey measurement; Karnataka.

INTRODUCTION

Contemporary estimates of the returns to alternative marketing channels are necessarily crop specific. Villacis et al. (2024) document different price patterns for local horticultural crops and high-value export crops; this is a reason to distinguish outlet availability from the realised value of transactions. Agricultural commercialisation depends jointly on the output available for sale, the costs of production, and the market institutions through which farm products are exchanged. These relationships are especially relevant in geographically disadvantaged agricultural areas where irrigation and transport systems can influence output and marketing opportunities. Yet revenue is not synonymous with price received: a larger harvest, more land or greater purchased-input expenditure may produce a larger gross receipt even where the unit price is low.South Indian evidence finds that market participation is selected on household attributes and institutions rather than randomly assigned (Manogna, 2025). Accordingly, the empirical focus here is the distribution of receipts conditional on recorded resources, not a counterfactual effect of programme provision. This article uses the primary household survey accompanying a doctoral investigation of farmer-suicide-affected families in Bellary and Raichur. It deliberately does not estimate suicide risks or attribute a death to marketing conditions; every household belongs to the affected population by sampling design. Instead, it asks whether observable marketing-facility access is associated with the level of reported crop sale receipts conditional on selected production and geographic characteristics.Recent work on traditional and high-value marketing channels illustrates why transport expenses, trust and transactional arrangements matter alongside physical market presence (Saini & Ubba, 2025; Saini & Ubba, 2024). A household-level yes–no response cannot capture those margins. The distinctive contribution is an examination of agricultural exchange, rather than household debt composition, social protection, schooling or climatic suicide aggregates. The instrument records a principal crop, sources of irrigation, access to marketing facilities, crop sale amount, crop cultivation expenditure and a respondent-selected market problem. These categories enable a direct and replicable examination of exchange heterogeneity, albeit not a precise estimate of net operating profit..

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Changes in agricultural trade infrastructure may reduce information frictions, but digitisation and access are not equivalent to a documented sale on a platform. Das et al. (2024) examine e-NAM and digital trade in an institutional setting quite different from the survey measure employed here. A market-facility indicator represents availability as reported by the household; it does not show which channel actually handled each transaction. Likewise, a binary statement that low selling prices were the principal market problem does not provide an observed farm-gate or wholesale price series. The paper is organized around this distinction between valid measured attributes and unobserved mechanisms.

Price support and regulated procurement also differ across crops and buyers. Thakur (2025) highlights heterogeneity in agricultural price formation, reinforcing the need to interpret gross sale brackets as coarse outcomes rather than directly observed unit prices. Market participation is not an isolated exchange at harvest time. It is the culmination of decisions over crops, acreage, seed, irrigation, hired labour, and whether a household can wait for buyers offering better terms. A survey observation on the presence of a marketing facility therefore encodes only a small part of the transaction environment. It may indicate that a facility is geographically accessible; it does not establish the price actually negotiated, whether the crop was sold there, or the cost of travel. This separation is particularly important in a retrospective survey of bereaved families, where responses may summarize experiences accumulated across seasons rather than a dated transaction.

Moreover, institutional marketing and farm productivity may be mutually related. Villacis et al. (2024) and Manogna (2025) motivate covariate adjustment while also showing why such adjustment alone cannot remove unobserved quality, buyer and location differences. The measurement problem creates a practical opportunity for careful economics. Rather than assert a market-access treatment effect, this article asks whether the conditional distribution of reported crop-sale brackets differs between households that report a marketing facility and those that do not. The outcome is gross sales, not net farm income. The distinction recognizes that a household can obtain greater sales by cultivating more land or buying more inputs and nevertheless be worse off after paying costs. It also explains why a robust analysis needs to report cultivation-expenditure adjustment and the limits of categorical monetary measurement.

The interpretation follows the distinction between documented revenue and realised welfare: trading-channel choice, transaction cost and price formation are separate concepts in recent empirical research (Saini & Ubba, 2024; Das et al., 2024). The Karnataka setting is instructive but should not be treated as representative of all Indian agriculture. The survey was designed to investigate the consequences and circumstances of agrarian deaths, not to sample all market participants. Selection may depend on past production instability, local shocks, exposure to debt or administrative definitions of farmer status. Conditioning the analysis on bereavement is therefore not innocuous. It is a feature of the policy population being described, but it prevents comparison with unaffected farmers and invalidates claims about the causes of individual suicide. Three contributions follow from this narrower design. First, the paper draws a clear boundary between reported infrastructure and observed transaction-level channel use. Second, it analyses an economic output category jointly with cost bands and production assets rather than merely tabulating perceptions of low price. Third, it juxtaposes a preregisterable primary logistic model with alternative thresholds, additional market-perception adjustment and a reproducible graphical summary. These contributions concern the integrity of evidence from an underused primary survey, not the identification of a previously unmeasured causal price premium.

2. REVIEW OF LITERATURE

2.1 Theoretical foundations and economic mechanisms

Agricultural markets suffer from frictions arising from information, product heterogeneity, distance and bargaining power. Market integration may reduce these frictions, but price improvements need not be homogeneous across crops or farm sizes. Evidence from the unified agricultural wholesale market platform in Karnataka finds commodity-specific effects on modal prices, illustrating the need for product differentiation and credible institutional identification (PNAS, 2020). Research on marketing-channel choice using Indian farm-household survey data also indicates that access to organized channels and receipt above minimum support prices can be related, although endogenous channel selection complicates the interpretation of associations. The study “Role of agricultural marketing channels in price realization” (2023) differentiates the method of exchange from the nominal existence of a market facility. These findings motivate a conservative interpretation of the present survey’s simpler facility indicator.Production and exchange should be modelled jointly because sales revenue combines prices and quantity. A household using more inputs may report higher sales without a higher margin, and households growing commercial crops may face different expenditure structures from producers of grains. Irrigation can raise output opportunities while also imposing fixed capital and electricity costs. Therefore an apparent marketing premium cannot be inferred from gross receipts without controlling, as far as data allow, for agricultural production conditions. The survey’s crop production variable mixes quintal and tonne ranges. This makes a pooled continuous yield indicator unsafe without detailed unit validation. By analysing gross receipt categories while controlling for cultivation-expense categories and a limited set of observable farm characteristics, the article avoids falsely converting the volume categories into precise productivity estimates.The empirical hypotheses are intentionally modest. H1 expects households reporting a marketing facility to have higher odds of reporting upper-tier crop sale receipts. H2 expects higher reported cultivation expenses to be positively associated with gross sales receipts, an accounting-compatible but non-causal relationship. H3 examines whether irrigation

and farm scale are additional correlates; none of these hypotheses claims that market access explains agrarian suicide. Transaction-cost theory highlights fixed participation costs, bargaining uncertainty and the uneven distribution of information between sellers and buyers. A farmer who can sell through multiple outlets may exercise a credible outside option, but having a nearby market does not guarantee competition between purchasers. Bell (1990), Hoff and Stiglitz (1990), and Besley (1994) situate market exchange within rural institutional imperfections, even when their principal emphasis is finance. For the present question, the relevant implication is that observed access is an equilibrium condition correlated with resources and location rather than an exogenous infrastructure assignment.Contemporary Indian evidence gives these general mechanisms empirical specificity. Villacis et al. (2024) show that the price implications of mandis differ across crops and alternative buyers. Research on supermarket procurement in India (2020) connects higher observed prices to quality, transport and transaction arrangements; the reported premium is not automatically transportable to dryland crops in northern Karnataka. Argade et al. (2021) document the importance of market attributes in smallholders' channel selection. Cariappa and Sinha (2020) examine paddy marketing choices, demonstrating why informal channels and government-supported outlets require separate measurement.

2.2 Recent empirical evidence and the Indian institutional setting

Market reform also exposes a basic distinction between integration and distribution. The Karnataka Unified Market Platform study (2020) estimated commodity-specific changes rather than a universal benefit. The marketing-channel analysis published in the Journal of Agribusiness in Developing and Emerging Economies (2023) likewise concerns realized price relative to a floor price, a different object from our gross sales band. Together these studies motivate a hypothesis that access may be positively associated with sales while leaving the mechanisms and welfare implications open. None licenses attributing a household's gross crop-sale level to a particular reform when channel, dates and transaction prices were not observed.Farm scale, risk exposure and investments complicate this relationship further. Feder et al. (1985) examine technology adoption constraints, Rosenzweig and Binswanger (1993) consider resource-dependent production choices, and Karlan et al. (2014) illustrate how economic decisions respond to constraints on finance and weather risk. Distinguishing irrigation from market facilities matters because irrigated households may grow crops with different yields, timing or commercial value. A large sales bracket could reflect productive capacity rather than better terms of exchange. The models therefore control for a coarse irrigated-land indicator, size category and cultivation-expenditure threshold, without claiming that those controls remove all selection.The study's statistical logic builds on Deaton (1997) and Wooldridge (2010): coarsened responses identify a set of possible values rather than exact currency amounts. We consequently avoid a dependent variable generated by treating every bracket midpoint as a true receipt. Binary thresholding uses the reported ordering while losing some detail, and sensitivity to the selected threshold must be made visible. Robust inference should be parsimonious with 184 observations and relatively few high-sale outcomes. White (1980), MacKinnon and White (1985), and Long and Ervin (2000) motivate scrutiny of uncertainty, although ordinary logistic standard errors still rely on the model specification and independent observations.The economics of agricultural exchange begins with the distinction between producing a crop and realising its sale value. Bell (1990) explains how credit and product markets can be interlinked, while Besley (1994) emphasises how informational and enforcement frictions shape rural transactions. In this survey, a reported marketing facility is a coarse access indicator; it does not record buyer competition, transport fares, actual use of the facility, or the crop-specific price received. Consequently, an association with the crop-sale category could reflect multiple dimensions of commercial opportunity rather than a single price premium.

2.3 Measurement challenges and research gaps

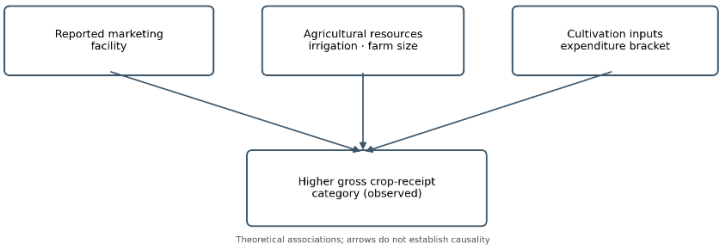
Production scale provides an alternative mechanism. Feder et al. (1985) describe how asset constraints affect farmers' adoption of productive practices, while Rosenzweig and Binswanger (1993) link wealth and weather risk to the composition of farm investments. A household with greater irrigation and cultivated area may market a larger harvest even without receiving a better unit price. That mechanism motivates including farm-size and irrigation controls rather than attributing raw differences in sale brackets entirely to market availability.Income and agricultural receipts must not be treated as interchangeable. Deaton (1992, 1997) stresses the measurement implications of distinguishing earnings, consumption and resources available at different times. The survey's crop-sale response is grouped gross revenue, not farm net income; the cultivation-expenditure item is also categorical. An annual household income variable can include non-farm receipts and other flows, so its value does not validate a particular gross-sales category. The empirical design therefore reports the observed outcome explicitly and avoids claims about profit or welfare gains.Market access may also be shaped by household endowments, creating non-random sorting. Carter and Barrett (2006) show why asset positions matter to rural economic opportunity; Ellis (1998) documents how diversification interacts with constraints and alternative income sources. Better-endowed households may cultivate marketable crops, obtain transport or locate near commercial centres. Thus a marketing-facility coefficient can remain confounded even after a small set of observable controls. The coefficient is interpreted as a within-sample conditional association, not an intervention estimate.Formal statistical inference cannot remove limitations of the questionnaire. Wooldridge (2010) distinguishes the interpretation of conditional regression parameters from identification of treatment effects. Long and Ervin (2000) and MacKinnon and White (1985) illustrate why uncertainty estimation matters in modest samples, although their heteroskedasticity results pertain principally to linear regression. For a

binary gross-receipt endpoint, the relevant likelihood and logit standard errors are reported alongside confidence intervals and the number of complete observations.Selection into market participation can occur at several stages: crop choice, planting intensity, output marketed, buyer choice and sale timing. Rosenzweig and Wolpin (1993) show that households may use productive assets to manage constraints over time. Conning and Udry (2007) additionally discuss how rural transactions depend on local information and enforcement. The observed question about the existence of a marketing facility does not distinguish these behavioural margins. These limitations motivate a precise description of what is—and is not—being compared.Risk exposure provides a competing explanation for different receipt bands. Dercon (2002) describes how households manage uncertain income and may sacrifice potential returns to reduce risk; Morduch (1995) differentiates income smoothing from consumption smoothing. Irrigation, crop selection and marketing opportunities may be jointly chosen under uncertainty. Including irrigation is useful descriptively, but statistical adjustment for irrigation does not establish the causal contribution of market facilities if these variables were determined together.Empirical contrasts using categorical income bands need careful interpretation. A high-receipt dummy compresses multiple monetary ranges and cannot resolve heterogeneous effects across the complete distribution. Spearman (1904) motivates rank-based descriptive association for ordered measures, while Wooldridge (2010) provides a broader framework for binary choice models. The manuscript therefore treats threshold sensitivity as essential rather than interpreting one dichotomisation as the unique economic definition of successful marketing.National survey evidence can provide context on the organisation of farm households, but comparability is limited. The National Statistical Office (2021) describes agricultural-household resources and activities in a much broader population. The current sample consists exclusively of bereaved families from purposively selected locations. Consequently, its proportions are not estimates of the prevalence of market facilities or commercial success across Karnataka, and no probability weighting is warranted in the absence of known inclusion probabilities.

2.4 Conceptual framework and hypotheses

The empirical hypotheses follow directly from the measurement design. H1 expects reported facility access to be positively associated with the odds of a higher crop-sale category; H2 expects recorded irrigation to correlate positively with that category; and H3 assesses whether the access association persists after incorporating a respondent-selected marketing difficulty. These are associational hypotheses. The data cannot determine whether a farmer used a facility, obtained a better price, marketed a larger quantity or changed crops in response to its availability.The framework in Figure 1 separates marketing institutions, agricultural resources and cultivation expenditure from the recorded gross receipt category. Arrows indicate possible conditional correlations rather than identified interventions. H1 concerns marketing-facility availability; H2 concerns irrigation resources; H3 concerns the role of cultivation-intensity bands. The conceptual separation avoids treating higher sales as identical to greater profitability (Deaton, 1997; Wooldridge, 2010).

Figure 1. Conceptual framework



3. DATA AND METHODS

3.1 Survey setting, sampling and analytic population

The analytical unit is the household interviewed in a purposively selected survey of families bereaved by farmer suicide in Bellary and Raichur districts. The study identify 186 households, whereas the available respondent-level data contains 184 usable records, split evenly between the districts. Two absent records are not reconstructed. Results are therefore based on available observations, and complete-case denominators differ across specifications when a relevant response is missing. The difference is disclosed rather than reconciled by manufacturing cases. The design is purposive and conditioned on farmer-suicide bereavement; neither design-based population weights nor a non-bereaved control group can be recovered. Estimates describe cross-household variation within the available survey only.

3.2 Operationalisation and outcome construction

The primary outcome is an indicator for a crop-sales band whose explicitly coded midpoint is at least ₹100,000. Crop-sale ranges are categorical responses and not independently verified revenue amounts. Monetary category labels are harmonised by an item-specific coding dictionary, including variants such as “2 lakh to 2.50000”, rather than by mechanically extracting the first numeral. The baseline threshold is a convenient comparison of larger and smaller recorded receipts, not a statutory definition of commercial success.

The central explanatory variable is reported availability of a marketing facility (Yes/No). Additional variables distinguish positive irrigated land from "Nil", marginal or small holdings from larger holding categories, a higher cultivation-expenditure bracket, and Raichur from Bellary. Each predictor is taken from its corresponding questionnaire item. Market availability is not verified use, and the questionnaire does not report the prices, quantities, grades or transaction dates required to estimate a market-access premium.

3.3 Model covariates and data-quality safeguards

Categorical survey answers were retained in their recorded ordering. All transformations were specified before model presentation and must be understood as coding decisions, not recovery of exact expenditures, yields or prices. Item non-response creates model-specific complete-case denominators. Where categories are open-ended, assigning a midpoint is an approximation and does not justify interpreting the resulting number as verified rupee accounting data. Missing values are not assumed to be zero (Deaton, 1997; Wooldridge, 2010).

3.4 Estimation strategy

$$\log[p_i /(1 - p_i)] = \beta_0 + \beta_1 M_i + \beta_2 I_i + \beta_3 S_i + \beta_4 C_i + \beta_5 D_i \quad (1)$$

In Equation (1), p_i is the probability of being in the higher gross crop-sale band for household i; M_i identifies reported marketing-facility access, I_i recorded positive irrigation, S_i a marginal or small holding, C_i the higher cultivation-cost category and D_i the district indicator. The coefficient $\exp(\beta_1)$ is a conditional odds ratio, not a percentage increase in crop receipts.

Maximum-likelihood logistic estimation gives the log likelihood $\ell(\beta) = \Sigma_i \{y_i \log(p_i) + (1 - y_i) \log(1 - p_i)\}$. Odds ratios are $\exp(\hat{\beta})$, with two-sided Wald 95% confidence intervals $\exp[\hat{\beta} \pm 1.96\ SE(\hat{\beta})]$. Statistical significance is reported alongside interval width and sample size, not as a substitute for substantive interpretation. The functional form is associational because the survey lacks a credible intervention assignment or time ordering (Wooldridge, 2010).

3.5 Alternative specifications, diagnostics and inference

Complete-case logistic regression is used for the higher-receipt indicator. The likelihood is maximised for the observed Bernoulli outcomes, with coefficients displayed as odds ratios and 95% Wald confidence intervals. For each specification the table reports the actual estimation sample and McFadden pseudo-R^2. A ratio exceeding one describes greater conditional odds, not a probability ratio, and its substantive meaning depends on baseline probability.

The first robustness specification adds the survey item identifying low selling price rather than weak demand as the primary marketing concern. This additional variable is a retrospective, respondent-selected answer and may be jointly determined with the receipt outcome. A second sensitivity specification uses a different threshold of the recorded crop-sales distribution. Robustness is evaluated by comparing point estimates and interval widths rather than declaring stability solely because a p value crosses an arbitrary cutoff.

The design cannot estimate effects of changing marketing infrastructure. Household crop choice, marketing behaviour and perceived facility availability may be simultaneously determined; timing is not established; and unobserved local roads, buyer competition and soil quality may affect receipts. Inference is restricted to the purposively selected, bereaved households in the observed dataset. No conclusion is drawn about the risk or causes of suicide.

Two sensitivity exercises are reported: an expanded adjustment set and an alternative boundary between the observed expenditure or sales bands. They assess specification dependence but do not constitute independent causal identification. Sparse cells, non-response, potential collinearity and reliance on category midpoints warrant caution. Subgroup comparisons and any apparently precise monetary implications would require richer raw survey instruments.

4. RESULTS AND ANALYSIS

4.1 Sample characteristics and measurement coverage

The sample displays wide variation in the amount reported from crop sales. Market facility availability is approximately evenly split, whereas the survey identifies low selling price much more often than lack of demand as the single principal marketing difficulty. These measures are not identical: market facility access is about location-specific opportunity, while a low-price response is a subjective ranking among two specified problems.

Table 1. Descriptive profile of original survey records

Variable	Valid n	Recorded pattern
Available households	184	92 Bellary; 92 Raichur
Marketing facility	181	Yes: 89; No: 92
Crop-sales band	183	Upper-tier sales ≥ ₹100,000: 59 (32.2%)
Irrigated land	178	Positive: 136; Nil: 42
Main marketing issue	184	Low selling price: 143; low demand: 41

Note. Reported values are computed for the available analytic records; category measures are not exact transaction-level

monetary amounts.

Table 1 establishes the denominators and the distribution of the recorded inputs before modelling. Differences between variables reflect item-level non-response; the main figures are unweighted counts rather than estimated population proportions. The table also makes clear which dimensions are directly observed and which have been derived from monetary brackets.

Gross crop-sales receipts should be assessed in relation to cultivation expense brackets; neither a low sale value nor a high expense band independently establishes a monetary loss. Crops differ substantially in agronomic units and price per quintal. The tables and figures therefore retain observed crop categories rather than inventing a pooled physical yield per hectare.

4.2 Baseline adjusted model

Table 2 reports the primary multivariable model. Each coefficient is expressed as an adjusted odds ratio with a 95% confidence interval and a two-sided p value. The observational contrast conditions on measured covariates but does not eliminate selection into facility access or healthcare use. Estimates should be interpreted using both their direction and uncertainty rather than attaching causal language to a significant p value.

Table 2. Adjusted logistic regression of higher crop receipts

Covariate	Adjusted odds ratio	95% confidence interval	p value
market	2.23	1.15–4.32	0.017
irr	1.46	0.62–3.45	0.385
small	0.86	0.39–1.90	0.704
costhigh	1.52	0.64–3.61	0.345
bellary	0.56	0.29–1.10	0.091

Note. Reported values are computed for the available analytic records; category measures are not exact transaction-level monetary amounts.

Table 2 provides the baseline conditional odds ratios. For market access, the estimated odds ratio is above one, but the confidence interval should be read together with its lower and upper limits. Irrigation, farm size and expenditure responses are simultaneous agricultural characteristics; their coefficients must not be interpreted as effects of changing these conditions. The primary model is interpretable as a conditional contrast. Holding the included covariates fixed, the coefficient on market access compares the odds of belonging to the upper crop-sales category for households reporting access versus non-access. This is an odds comparison, not a relative risk and not a change in rupee receipts. Its practical meaning depends on baseline prevalence, which is why the accompanying figure reports observed group proportions without disguising the unconditional and adjusted comparisons as interchangeable quantities.

4.3 Expanded covariate model and specification sensitivity

A nested adjustment specification checks whether the primary coefficient is sensitive to a substantively distinct additional survey item. Comparison of model estimates is informative only insofar as the sample and outcome definition remain comparable. The expanded covariate may itself be jointly determined with the recorded outcome; these estimates should therefore be described as a robustness exercise rather than a mediation or treatment effect.

Table 3. Sensitivity analysis adding reported marketing concern

Covariate	Adjusted odds ratio	95% confidence interval	p value
market	2.23	1.15–4.31	0.017
irr	1.46	0.62–3.46	0.384
small	0.86	0.39–1.90	0.705
costhigh	1.53	0.64–3.66	0.344
bellary	0.56	0.27–1.12	0.102
market_low	1.04	0.46–2.34	0.926

Note. Reported values are computed for the available analytic records; category measures are not exact transaction-level monetary amounts.

Table 3 adds respondents' stated marketing concern. This is not a controlled experiment: concern about low price can reflect the outcome being modelled, and selection of one main concern need not mean alternative concerns were absent. Stability of the baseline market coefficient is informative about this single specification but cannot resolve endogeneity.

The cultivation-cost association requires particular care. Higher production expenditure can indicate more intensive

cultivation and larger planted area, yet it may also signal cost inflation or inefficient production. If the true mechanism operates through crop selection and production scale, cost is partly mediating rather than purely confounding market access. Presenting both a baseline conditioned on expenditure and a model further adjusted for market perceptions should be seen as specification triangulation. Neither is a clean experiment, and agreement in sign across models does not rescue unmeasured confounding.

Alternative upper-tier definitions provide a transparent check on how much the binary result depends on the chosen monetary cut. Changing the cutoff shifts cases between the outcome groups, sometimes reducing the number of events. Accordingly, any sensitivity coefficient with a wide interval should not be interpreted as a stronger substantive finding merely because its point estimate is larger. The purpose of this exercise is to reveal dependence on coarsened questionnaire bins, not to identify a threshold with the smallest p-value.

4.4 Alternative threshold and interpretation

The alternative classification changes which response bands are designated as the upper category. This check matters because the questionnaire records ordered intervals rather than exact monetary observations. A finding that weakens when the cutpoint changes should be described as threshold-dependent, not as a uniformly robust premium or spending gradient.

Table 4. Alternative receipt threshold specification

Covariate	Adjusted odds ratio	95% confidence interval	p value
market	1.46	0.69–3.11	0.325
irr	1.90	0.65–5.59	0.241
small	1.25	0.49–3.19	0.637
costhigh	1.90	0.71–5.07	0.200
bellary	0.56	0.26–1.23	0.149

Note. Reported values are computed for the available analytic records; category measures are not exact transaction-level monetary amounts.

Table 4 changes the gross-receipt threshold. The comparison is particularly important because grouped sale values provide no naturally unique split between commercially larger and smaller households. Changes in the odds ratios or uncertainty intervals are interpreted as threshold sensitivity, not as competing estimates of a verified marketing premium.

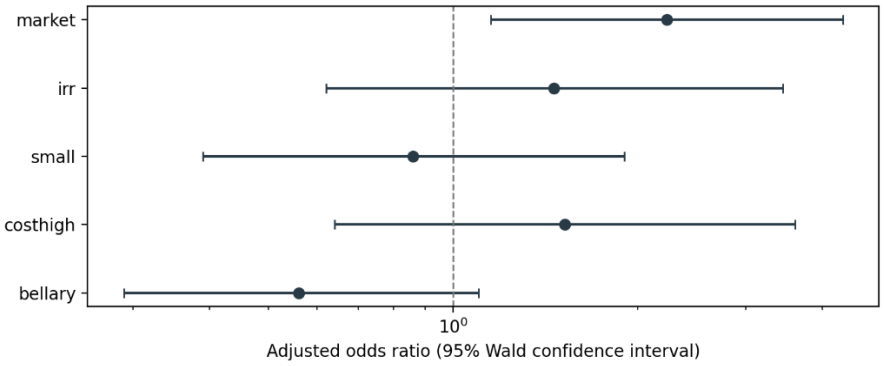
The survey's perceived marketing problem question is deliberately analysed separately from the facility indicator. Respondents who select low selling price rather than low demand are expressing the most salient marketing concern among the offered alternatives. That is not an objectively measured price spread and cannot be merged with gross revenue to calculate a market efficiency index. The comparison illustrates the danger of combining perception, market availability and measured economic activity into a single unsupported latent construct.

Descriptive group percentages remain useful because they show the composition of the observed sample without imposing a functional form. They must be presented beside exact valid denominators, since excluded missing observations can differ by variable. The one descriptive table therefore provides only sample composition, while subsequent tables focus on inferential models, alternative specifications and transparent contrasts. Statistical significance is treated as one indicator of estimation uncertainty. Confidence intervals, sample restrictions, measurement boundaries and plausible selection mechanisms take priority in judging the substantive credibility of a result.

4.5 Statistical figures and evidence synthesis

The combined model comparisons indicate that precision and coefficient stability vary with adjustment and categorisation. The principal substantive result should therefore be reported with its complete uncertainty interval and accompanied by the robustness estimates. Neither the descriptive plot nor the conceptual framework establishes a counterfactual policy effect.

Figure 2. Baseline-model adjusted odds ratios and 95% confidence intervals



5. DISCUSSION

5.1 Interpretation in relation to economic theory

The cross-sectional relationship resembles the broader market-access gradient examined by Manogna (2025), but the outcomes differ: access to outlets and receipt categories in this study are not observed transaction prices. Villacis et al. (2024) show why those market-price distinctions can reverse across crops. Market-facility availability is associated with membership in a higher crop-receipt category in the baseline adjusted analysis. This finding is consistent with models in which the terms and organisation of exchange affect farm outcomes, but Bell (1990) and Besley (1994) caution that rural markets are embedded in broader informational and contracting arrangements. Because no unit prices, quantities or market-choice records are observed, the odds ratio must not be described as a price effect or a return to constructing a new facility.

The distinction between gross sales and net income is critical. Deaton (1997) discusses why measurement definitions can change the economic interpretation of household outcomes, while Rosenzweig and Binswanger (1993) explain how asset and risk differences may shape agricultural investments. A high receipt band may reflect large scale or intensive cultivation and still coexist with substantial costs. Neither the sales response nor a midpoint-based sales-to-cost calculation validates a farm-profit estimate. Buyer characteristics and farmers' perceptions may shape where sales occur, as Saini and Ubba (2024, 2025) demonstrate in horticultural settings. Their evidence provides plausible pathways, not estimates that can be imported into the Karnataka sample.

The sensitivity results do not provide a causal identification strategy. Wooldridge (2010) shows why conditional adjustment requires careful treatment of selection and omitted factors. The additional marketing-concern item is plausibly related to the realised outcome, and conditioning on it could alter the interpretation of the market coefficient. The proper reading is comparative: whether the direction and magnitude are sensitive to alternative descriptive specifications. Policy should therefore prioritise better measurement alongside feasible service improvements. Deshpande (2002) emphasises the structural context of agrarian difficulties in Karnataka; Ellis (1998) draws attention to heterogeneous livelihood opportunities. Future surveys should capture actual facility use, distance and transport costs, market channels, transaction prices, quantities and produce grades before assigning monetary benefits to marketing access. This study identifies an empirical pattern, not the effectiveness of a particular programme.

5.2 Comparison with evidence from India and related settings

Indian digital-market research suggests that greater price information and integration can matter even without a change in farm output (Das et al., 2024). However, the current design does not record digital participation, so this is an implication for future measurement. The reported upper-receipt association must also be considered alongside the insignificance or imprecision of other coefficients. Irrigation and farm size may be economically important even when a particular confidence interval includes unity: grouped responses, omitted crop characteristics and a small sample can limit precision. Conversely, statistical significance for market availability does not establish a large economic gain. The appropriate conclusion is that the observed contrast is worthy of additional study with transaction-level measurement. The specification is intentionally narrow enough that its coefficients can be tied back to actual questionnaire responses.

Understanding crop-specific procurement is particularly important before assigning a uniform monetary interpretation to high-receipt status (Thakur, 2025; Villacis et al., 2024). Because the sample is purposive and uniformly bereaved, no association should be generalized to the probability of suicide. It would be inappropriate to describe low prices, marketing disadvantage or irrigation as proven causes of an individual death. The empirical estimates concern only variation in the selected households' recorded agricultural conditions. External validity is also limited by local market structures and producer selection. Manogna (2025) emphasizes the role of smallholder attributes in market access; no survey adjustment recreates the absent probability sampling frame.

A practical implication concerns the information collected by public agricultural systems. Routine surveys should distinguish whether an outlet exists, whether a farmer actually used it, the quantities sold through each outlet, the final received price, deductions for commissions and transport, grade or quality adjustments, and the timing of payments. Government procurement should be coded separately from private merchants and cooperatives. This data architecture would allow

researchers to estimate net realization and compare the margins of alternative channels, rather than infer marketing outcomes from the presence of a facility.

5.3 Policy implications and external validity

Operationally, both buyer competition and delivery costs should be captured in a subsequent transaction-level instrument (Saini & Ubba, 2024; Das et al., 2024). Any intervention proposed from this evidence should remain proportionate. Better information on competing buyers, transparent price boards and reliable transport services are plausible reform components, but their effects have not been estimated here. Follow-up fieldwork could map access before transactions and track the same sellers over seasons. Randomized information provision or a credible staggered introduction of infrastructure could then support a more convincing causal evaluation. Conversely, a comparison of households classified only by recalled access would remain susceptible to reverse causality.

The sample's bereavement condition also matters ethically. A recorded answer about low prices or market facilities must not be converted into a single explanation for an individual's death. There are many economic, social and health pathways not observed prospectively, and the instrument was completed with affected households rather than a general population of farmers. The appropriate policy focus is the market circumstances of a clearly defined vulnerable group. Reporting these constraints is not a weakness to be hidden but a safeguard against harmful overinterpretation of sensitive retrospective material.

5.4 Measurement constraints and research priorities

The estimates are cross-sectional and retrospective. Temporal order between reported market access, crop-sale receipts and cultivation expenditure is not established. Market outcomes may refer to a production season preceding the event, while a surviving respondent’s perceptions may be reported later. That temporal ambiguity rules out a mediation chain from access through prices to distress. It also makes the results unsuitable for estimating changes over time. The present paper accordingly restricts inference to a bounded association between recorded responses in the available survey records.

Recent India-based research on agricultural market institutions shows why transaction arrangements and membership in producer organisations should not be compressed into a simple infrastructure proxy (Kumar et al., 2023; Aditi et al., 2025). The present data cannot distinguish quantities marketed, prices actually received or costs of exchange. Future panel or experimental evidence would need those transactions before estimating marketing reform impacts.

6. CONCLUSION

The household survey offers a valuable but bounded view of agricultural commercialisation in northern Karnataka. Reported marketing access, crop-sales categories and cultivation expense brackets permit reproducible descriptive and multivariable analyses. They do not permit causal valuation of market reforms or exact farm profitability. Transparent recognition of this boundary strengthens rather than weakens the study’s contribution to the economics of smallholder exchange.This paper documents a positive conditional relationship between reported marketing-facility access and membership in a higher crop-sale category among bereaved farming households in two Karnataka districts. The association is consistent with market-access explanations but does not uniquely identify them. Its contribution is a disciplined reconciliation of the research question with the available survey instrument, supplemented by alternative specifications and clear measurement boundaries. Policy conclusions are therefore framed around monitoring marketing conditions and improving transaction data, not around a numerical causal premium or predictions of suicide.The paper is deliberately limited to observed conditional associations in a purposively selected bereavement sample. Its value lies in transparent measurement, reproducible model contrasts and the separation of recorded spending or receipts from more ambitious claims about welfare, treatment effectiveness or the causes of suicide. Improved prospective data and credible comparison designs are necessary for evaluating specific interventions.

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