Working paper MOZ-25067 August 2026

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DIRECTED BY LSE UNIVERSITY OF OXFORD

FUNDED BY UKaid from the British people

Economic and Operational Efficiency of the Sugar Production and Distribution Model in Mozambique

Report on the Survey of Sugar-Consuming and Sugar-Reselling Firms

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Maputo

August 2026

Preface

This report presents the findings of the Survey of Sugar-Consuming and Sugar-Reselling Firms conducted in Mozambique in 2026. The study was undertaken in the context of recent regulatory changes affecting the production, distribution, and commercialization of sugar and was designed to provide firm-level evidence on how sugar is purchased, used, and resold across the country.

The research was implemented through collaboration between the Autoridade Reguladora da Concorrência (ARC), the Ministry of Economy, and the Centre for Economics and Management Studies at Eduardo Mondlane University (CEEG–UEM), with technical support from the International Growth Centre (IGC). The study combined a national telephone survey of firms identified through the 2022 Census of Enterprises with complementary face-to-face interviews conducted with a small group of larger businesses.

The authors would like to thank the firms and respondents who participated in the survey and shared information about their activities, sugar purchases, suppliers, prices, stockouts, transport conditions, and expectations regarding changes in the market. Their participation made it possible to document the experiences of businesses operating at different points of the downstream sugar value chain.

The authors also acknowledge the contribution of the field team, including the project coordinator, supervisors, quality-control personnel, appointment setters, and enumerators. Particular recognition is due to the economics students and graduates who served as enumerators and appointment setters, as well as the representatives of the ARC and government institutions who supported contact and field operations.

The report is intended to contribute to the understanding of competition, distribution, and supply conditions in the Mozambican sugar market. It provides a descriptive baseline that may support the implementation and monitoring of the new market arrangements and inform future regulatory analysis, policy discussion, and research. The findings and interpretations presented in the report remain those of the authors and should not necessarily be attributed to every institution participating in or supporting the study.

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Summary

This report presents findings from the 2026 Survey of Sugar-Consuming and Sugar-Reselling Firms in Mozambique, implemented by the Autoridade Reguladora da Concorrência (ARC), the Ministry of Economy, and CEEG–UEM, with technical support from the International Growth Centre. The study examines how downstream firms obtain, use, and commercialize sugar amid recent changes in market organization and regulation.

The main survey was conducted by telephone using establishments listed in CEMPRE 2022. Because many selected firms could not be reached, contact attempts were extended to all potentially eligible telephone numbers available in the national frame. The final analytical sample contains 225 firms, including six purposively selected larger businesses interviewed face-to-face. The results are descriptive and should not be interpreted as nationally representative.

Sugar is economically important to both productive users and resellers. About four-fifths of firms in each group described it as indispensable or important to their main activity. Changes in sugar prices or availability may therefore affect production costs, turnover, inventories, customer relationships, and final-product prices.

Firms used an average of 3 suppliers, but the principal supplier accounted for 62.8% of purchases. More than one-third relied on only one supplier, while 44.4% obtained at least three-quarters of their purchases from the principal source. Although most firms reported knowing alternative suppliers, some would require more than 30 days to replace their current supplier or would be unable to do so. Nominal supplier choice therefore does not always translate into effective access.

Most firms obtained sugar through wholesalers, retailers, and other intermediaries rather than directly from producers, refineries, or importers. These channels may improve access by offering smaller quantities and reducing transport needs, but they may also limit bargaining power and the independence of alternative supply sources.

The median purchase price was 85 MZN/kg, although meaningful price differences existed across suppliers. Transport costs were much more dispersed, and immediate payment was the dominant purchasing arrangement. The effective cost of sugar therefore includes not only the price per kilogram, but also transport, liquidity, delivery conditions, and supplier accessibility.

Stockouts affected 17.3% of firms and often had serious consequences, including reduced production or sales, temporary interruptions, emergency purchases, and customer losses.

Among firms with valid information, business activity was disrupted for an average of seven days. Supply reliability is therefore an important dimension of market performance.

Most firms were unwilling to pay an additional amount for guaranteed supply, although 37.3% expressed a positive willingness to pay. Fixed prices and guaranteed delivery were the most preferred contractual conditions, suggesting that firms value reliability through predictable agreements rather than substantially higher spot-market prices.

Higher sugar prices are likely to be passed on rapidly. Approximately 81.0% of firms expected to raise final-product prices, and 85.6% anticipated adjusting within one month. Other responses included reducing product size, absorbing costs temporarily, changing suppliers, modifying ingredients, or reducing activity.

Transport and physical access also shape purchasing conditions. Long travel times, poor roads, floods, and higher transport costs can raise restocking expenses and reduce firms' ability to respond when regular suppliers cannot deliver. Additional supplier entry may therefore have limited benefits where alternatives remain difficult or expensive to reach.

Awareness of the ARC decision was low: only 8.9% of firms had heard about it, although 62.5% expected the distribution system to change significantly by 2027. Firms supported greater price transparency and supplier entry but remained concerned about possible instability during the transition.

Overall, improving the sugar market requires more than increasing the formal number of suppliers. Effective competition depends on accessible alternatives, transparent prices and commercial conditions, reliable delivery, manageable payment requirements, and affordable transport. Implementation should therefore combine clear communication with systematic monitoring of supplier entry, purchase concentration, stockouts, payment terms, delivery reliability, and transport costs.

Main findings.

- Sugar is indispensable or important to the principal activity of approximately four-fifths of both productive users and resellers.
- Firms used an average of 3 suppliers, but the principal supplier accounted for 62.8% of purchases, and 44.4% of firms were highly dependent on that source.
- Nominal alternative suppliers were widely reported, but some firms would require more than 30 days to replace their current supplier or would be unable to do so.

- Most firms obtained sugar through wholesalers, retailers, and other downstream intermediaries rather than directly from producers, refineries, or importers.
- The median purchase price was 85 MZN/kg, while transport costs and purchasing conditions varied considerably. Immediate payment was the dominant arrangement.
- Stockouts affected 17.3% of firms and were associated with reduced production or sales, emergency purchases, temporary stoppages, and customer losses.
- Fixed prices and guaranteed delivery were the most preferred contractual conditions, although most firms were unwilling to pay a substantial premium for reliability.
- Approximately 81.0% of firms expected to respond to higher sugar prices by increasing final-product prices, and 85.6% expected to adjust within one month.
- Poor roads, floods, and increases in transport costs reduced access to suppliers and increased the effective cost of purchasing sugar.
- Only 8.9% of firms had heard about the ARC decision, demonstrating the need for clearer communication during the implementation of the new market arrangements.

1 Introduction

Sugar occupies an important position in Mozambique's agro-industrial and commercial economy. Its value chain connects agricultural production and industrial processing with transport, wholesale distribution, retail trade, food manufacturing, hospitality, and numerous small-scale businesses. The sector was substantially rehabilitated after the decline experienced during the post-independence period, with investment in commercial estates and processing facilities contributing to a rapid expansion of sugarcane production. Production has historically been concentrated around a small number of vertically integrated commercial operations located principally in Maputo and Sofala provinces (Food and Agriculture Organization e World Food Programme, 2010; World Bank, 2022). This concentration at the production stage makes the organization of distribution particularly important for determining how sugar reaches downstream firms and under what prices and commercial conditions.

The economic importance of the sugar market extends beyond producers and refineries. Sugar is an essential productive input for bakeries, confectioneries, beverage producers, restaurants, hotels, informal food businesses, and other firms. It is also an important sales product for grocery stores, kiosks, supermarkets, wholesalers, and other retailers. For these businesses, changes in sugar prices or availability may influence production costs, inventories, retail margins, product characteristics, customer demand, and the prices of final goods. The functioning of the distribution system can therefore have consequences throughout the value chain and ultimately affect consumers.

An efficiently functioning distribution system should enable firms to identify suppliers, compare prices and commercial terms, obtain appropriate quantities, and respond when their usual source is unable to supply. The formal existence of several suppliers does not necessarily guarantee effective competition. Firms may remain dependent on one supplier because alternatives are geographically distant, require larger minimum purchases, offer less favourable payment conditions, lack sufficient stocks, or cannot provide reliable delivery. Transport constraints, limited information, tied purchasing arrangements, and the time required to establish a new commercial relationship may further restrict firms' practical ability to switch suppliers.

Supplier concentration may be particularly consequential where firms hold limited inventories and depend on frequent purchases. A disruption affecting a principal supplier may result in stockouts, emergency purchases at higher prices, reduced production or sales, delayed orders, and customer losses. Likewise, immediate-payment requirements and

limited supplier credit may restrict the ability of smaller businesses to absorb price increases or purchase additional stocks. An assessment of market performance should therefore consider not only the price per kilogram, but also supply reliability, transport costs, payment conditions, access to alternatives, and the operational consequences of interruptions.

These issues have acquired particular relevance following the intervention of the Autoridade Reguladora da Concorrência (ARC) in the Mozambican sugar market. The ARC is responsible for applying the country's competition rules under Law No. 10/2013 of 11 April and for promoting competitive market conditions in the interests of economic efficiency and consumers (Republic of Mozambique, 2013; Competition Regulatory Authority, 2026b). In Case No. 04/2022, concerning the production, distribution, and sale of sugar, the ARC classified the conduct involving the Distribuidora Nacional de Açúcar and four sugar-producing companies as a prohibited horizontal agreement. The authority imposed a fine and measures intended to end the practice (Competition Regulatory Authority, 2022). The ARC has subsequently continued examining competition and regulation in the production and distribution of sugar through a sector-specific market study (Competition Regulatory Authority, 2026a).

The ARC intervention creates the possibility of changes in supplier entry, distribution channels, price formation, and firms' ability to purchase from alternative sources. In principle, greater competition may expand supplier choice, strengthen price transparency, improve commercial conditions, and reduce dependence on established distribution arrangements. The actual effects, however, will depend on how the new arrangements are implemented. New suppliers must be capable of obtaining and delivering sugar in commercially useful quantities, while downstream firms must receive sufficient information to identify and compare them. Competition at the formal or regulatory level may produce limited practical benefits when firms continue to face geographic isolation, poor transport infrastructure, liquidity constraints, or common upstream supply restrictions.

Market transitions may also involve short-run risks. Changes in established distribution relationships can generate uncertainty regarding prices, inventories, delivery responsibilities, product quality, and payment arrangements. Smaller firms may be especially vulnerable where they lack working capital, storage capacity, access to supplier credit, or the ability to purchase directly from producers. It is therefore important to examine firms' expectations regarding the reform as well as their concerns about possible instability. Awareness is itself part of implementation: businesses that do not know that the market structure is changing may be unable to search for new suppliers, compare offers, or exercise the opportunities created by the regulatory intervention.

Despite the importance of these questions, relatively little firm-level evidence is available on the purchasing conditions experienced by downstream sugar users and resellers in Mozambique. Existing sectoral information has generally focused on agricultural production, processing, investment, exports, and employment. Less is known about how firms further down the value chain source sugar, the prices and payment conditions they face, the degree to which they depend on their principal suppliers, the accessibility of alternatives, or the business consequences of stockouts and transport disruptions. This information is necessary both for establishing conditions before the full implementation of new market arrangements and for identifying indicators that should be monitored during the transition.

This report helps address that evidence gap using the Survey of Sugar-Consuming and Sugar-Reselling Firms conducted in 2026. The survey covers 225 firms that either use sugar as an input in production or service provision or purchase it for resale. Most interviews capture the experiences of grocery stores, kiosks, and other relatively small downstream businesses. The survey also includes six purposively selected larger firms interviewed face-to-face. Because these firms were not randomly selected, comparisons with the remaining businesses are descriptive and should not be interpreted as causal effects of firm size or interview mode.

The analysis addresses five closely connected dimensions of the market. First, it examines the economic importance of sugar to productive users and resellers. Second, it describes supplier structure, sourcing channels, concentration of purchases, and the availability of realistic alternatives. Third, it analyses purchase prices, payment terms, transport costs, stockouts, and the operational consequences of supply interruptions. Fourth, it considers firms' valuation of reliable supply, preferred contractual arrangements, and expected responses to sugar-price increases. Finally, it assesses awareness of the ARC decision, expectations regarding market change, and firms' views on price transparency, additional supplier entry, and possible instability.

The report is primarily descriptive. The survey was not designed to identify the causal effect of supplier concentration or the ARC decision, and several outcomes are observed only for conditionally routed subsamples. Its principal contribution is to provide a firm-level baseline against which future market developments may be assessed. The findings can inform the implementation and monitoring of the new distribution arrangements by identifying the dimensions of competition that matter most to downstream firms: effective supplier choice, transparent prices and commercial terms, reliable availability, manageable payment requirements, and affordable physical access to supply.

2 Methodology

This section describes the study population, the original sampling design, the adjustments made during field implementation, the organization and training of the field team, the questionnaire, and the procedures used to prepare the analytical dataset. The distinction between the intended sample design and the realized sample is important. The study was initially designed around a stratified probability sample drawn from the 2022 Census of Enterprises (*Censo de Empresas*, CEMPRE), but difficulties contacting firms and achieving the targeted number of completed interviews led the field team to attempt contact with all eligible telephone numbers available in the sampling frame. The resulting dataset should therefore be interpreted as a national firm survey based on the reachable and eligible CEMPRE establishments rather than as a strictly self-weighting probability sample of all sugar-related firms in Mozambique.

2.1 Target Population and Eligibility

The target population comprised establishments operating in Mozambique whose activities depended directly on the purchase, use, or commercialization of sugar. A firm was eligible when it either used sugar as an input in the production of goods or provision of services, or purchased sugar for resale. The first group includes businesses such as bakeries, confectioneries, beverage producers, restaurants, hotels, catering establishments, food processors, and other firms for which sugar enters the production process. The second group includes wholesalers, grocery stores, supermarkets, kiosks, informal retailers, and other establishments that purchase sugar primarily for commercialization.

The initial sampling frame was constructed from CEMPRE 2022, which provided the most comprehensive available listing of formally identified establishments and included information on location, economic activity, firm-size category, employment, and available contact details. The original design focused on sugar-related wholesale, retail, and hospitality activities in Maputo City, Maputo Province, Gaza, Sofala, Tete, and Nampula. These provinces were selected because of their economic importance and their connection to the principal sugar-producing and commercial centres. During implementation, however, telephone contact was extended to eligible establishments with available numbers in the full national CEMPRE frame. The realized survey consequently includes firms from all provinces represented by valid and reachable contacts.

Eligibility was confirmed at the beginning of each interview. Respondents were asked

whether the establishment used sugar in production or service provision, purchased sugar for resale, or performed both activities. Where both applied, classification followed the establishment's principal sugar-related activity. Interviews were conducted with owners, managers, or other respondents sufficiently familiar with the firm's purchases, prices, suppliers, sales, and operational decisions.

2.2 Sample Design and Realized Sample

The original design envisaged stratified random sampling using CEMPRE as the sampling frame. Establishments were to be stratified by province and firm-size category, distinguishing micro firms from small, medium, and large firms. Medium and large firms were combined with small firms because only a limited number of larger establishments were available in the frame. The proposed allocation sought to distribute a fixed sample across strata while accounting for differences in the number and characteristics of firms. Proportional allocation was considered alongside optimum allocation following the standard principles of stratified sampling (Cochran, 1977).

Under proportional allocation, the intended sample size in stratum h may be expressed as:

$$n_h = n\frac{N_h}{N}, \tag{1}$$

where n is the total intended sample size, N_h is the population of eligible establishments in stratum h, and N is the total population represented in the sampling frame. The sampling strategy initially produced a target of approximately 424 establishments distributed across the six selected provinces.

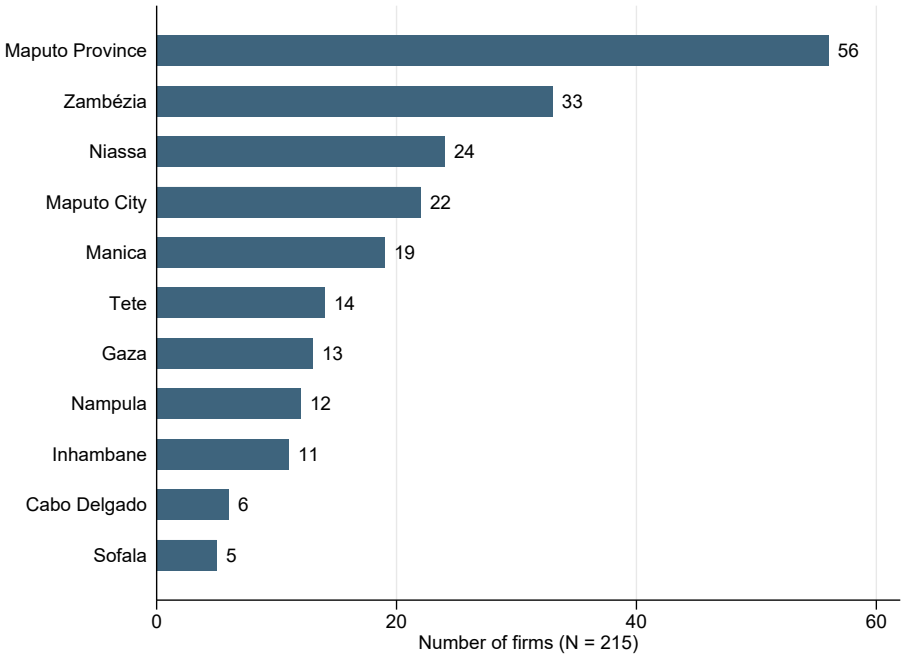
The field implementation departed from this original allocation because a substantial proportion of listed firms could not be reached. Contact difficulties included inactive or incorrect telephone numbers, unanswered calls, numbers belonging to persons no longer associated with the establishment, and firms that could not be confirmed as eligible. To increase the number and geographic coverage of completed interviews, the field team progressively attempted all available telephone numbers associated with potentially eligible sugar-consuming or sugar-reselling establishments in CEMPRE, including firms outside the six provinces identified in the original design.

The realized sample therefore reflects three successive conditions: inclusion in the available CEMPRE frame, the presence of a usable telephone number, and successful contact with an

eligible and consenting respondent. The final analytical sample contains 225 completed interviews. Of these, 215 had valid province information for the geographic distribution presented in Figure 1. The largest number of firms was recorded in Maputo Province, followed by Zambézia, Niassa, Maputo City, and Manica. Firms were also interviewed in Tete, Gaza, Nampula, Inhambane, Cabo Delgado, and Sofala.

Because the final contact strategy was expanded beyond the originally selected probability sample, conventional design weights based on the initial provincial allocation were not applied. The results are presented as descriptive statistics for the interviewed firms. They should not be interpreted as nationally representative estimates of all sugar-consuming or sugar-reselling establishments. This limitation is particularly important because establishments without valid CEMPRE telephone numbers, informal firms outside the census frame, and firms that could not be reached may differ systematically from respondents.

Figure 1: Number of surveyed firms by province



Notes: The figure reports the number of interviewed firms with valid province information. The geographic distribution is based on 215 firms; the remaining completed interviews lacked a valid province classification in the analytical dataset.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Table 1 distinguishes between firms using sugar as a productive input and firms purchasing it for resale. It also identifies the six larger establishments that were purposively interviewed face-to-face. These firms were included to provide complementary evidence on businesses

operating at a substantially greater scale than the predominantly small establishments reached through the telephone survey.

Table 1: Survey sample composition

Category	Number of firms	Percent
Productive-input users	31	13.8
Sugar resellers	194	86.2

Notes: Firms are classified according to their reported principal use of sugar: as a productive input or for resale. The six larger firms identified by a survey ID beginning with "P" were purposively interviewed face-to-face. Province and principal-activity distributions are reported separately in Figures 1 and 2. Comparisons involving the larger face-to-face firms are descriptive.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

2.3 Data Collection and Field Team

The main survey was administered by telephone using a computer-assisted telephone interviewing approach. Interviewers contacted firms using the telephone numbers recorded in CEMPRE, confirmed the identity and eligibility of the establishment, requested to speak with an owner or knowledgeable manager, obtained informed consent, and then administered the programmed questionnaire. Telephone interviewing made it possible to extend the operation across the country without requiring enumerators to travel to each establishment. It also facilitated centralized supervision and rapid reassignment of unsuccessful or scheduled calls.

Six purposively selected larger firms were interviewed face-to-face. These interviews were intended to complement the telephone data with information from firms whose employment, sugar requirements, procurement systems, and organizational structures differed substantially from those of the smaller establishments dominating the CEMPRE telephone sample. The mode indicator therefore identifies a distinct and purposively selected firm group and should not be interpreted as an independent interview-mode treatment.

The field structure comprised one project coordinator, two field supervisors, one quality controller, three appointment setters, and six enumerators. The enumerators were predominantly final-year undergraduate economics students and recent economics graduates. Appointment setters had similar academic profiles and included two staff members from

the ARC and one representative of the Ministry of Economy. Appointment setters were responsible for establishing initial contact, identifying an appropriate respondent, confirming eligibility where possible, explaining the study briefly, and scheduling interviews. Enumerators subsequently conducted the full interviews.

The project coordinator managed the overall field operation, daily targets, assignment of contacts, and communication among the implementing institutions. Supervisors monitored the performance of appointment setters and enumerators, listened to interviews where necessary, managed callbacks and rescheduling, and prepared daily field reports. The quality controller reviewed incoming submissions, implemented high-frequency checks, identified inconsistencies or suspicious patterns, and provided continuous feedback to the field team.

2.4 Training and Survey Protocols

All field-team members participated in a two-day training programme before data collection. The first day introduced the research objectives, the regulatory context of the sugar market, sources of survey error, standardized interviewing, the questionnaire, and the electronic data-collection platform. The second day focused on field protocols, full interview simulations, common interviewing errors, practical assessment, and debriefing.

Particular emphasis was placed on standardized interviewing. Enumerators were instructed to read questions exactly as written and in the programmed order, maintain a professional and neutral tone, use only non-directive probing, avoid suggesting answers, and record open-ended responses as stated by respondents. Training also covered the distinction between codable and non-codable responses, procedures for repeating questions or response options, the use of standardized definitions, and appropriate handling of "do not know" or refusal responses. These procedures were intended to reduce interviewer effects and measurement error.

The training addressed both unit and item non-response. When respondents were temporarily unavailable, the team was instructed to offer an appointment at a more convenient time rather than immediately classifying the contact as a refusal. When a respondent hesitated to answer a specific question, enumerators were required to restate the confidentiality protections without applying pressure or implying a preferred response. Ethical protocols included informed consent, voluntary participation, confidentiality, and the right to discontinue the interview or decline any question.

The questionnaire was programmed and administered using KoboCollect. The electronic form incorporated skip patterns, eligibility checks, response restrictions, and fields for operational information such as enumerator identity, call attempts, interview status, scheduling, and comments. Supervisors and the quality controller reviewed submissions during the data-collection period to detect incomplete records, implausible values, routing errors, unusually short interviews, repeated responses, and other potential quality concerns.

2.5 Questionnaire

The questionnaire was designed to capture both the commercial organization of the sugar market and the consequences of prevailing supply conditions for downstream firms. It began with interviewer identification, establishment information, informed consent, respondent selection, and eligibility screening. The substantive part collected information on the respondent's role and knowledge of the business; the use or resale of sugar; quantities, seasonality, and economic importance; awareness of the ARC decision; expectations regarding market change; supplier structure and dependence; purchase prices, payment terms, transport, and logistics; stockouts and operational consequences; willingness to pay for reliable supply; contractual preferences; responses to sugar-price increases; market access and external shocks; and general firm characteristics.

Separate questionnaire paths were applied to productive-input users and sugar resellers. Productive users were asked about sugar quantities used, the share of sugar in production costs, substitution possibilities, and adjustments to production or final products. Resellers were asked about quantities sold, the contribution of sugar to turnover, inventory and sales conditions, and responses affecting retail prices or quantities. Common modules captured supplier relationships, prices, stockouts, reliability, transport, and expectations regarding regulatory change.

The questionnaire included both closed and open-ended questions. Several questions allowed multiple responses, particularly those concerning the consequences of stockouts, reasons for changing suppliers, responses to price increases, and types of transport shock. Other questions used mutually exclusive categorical responses or requested exact numerical values. Where exact amounts were difficult to provide, the questionnaire sometimes recorded ordered intervals or the respondent's best estimate.

2.6 Data Preparation and Construction of Indicators

Data preparation began with the removal of test submissions and duplicate or incomplete records that did not satisfy the criteria for a completed interview. Survey identifiers, interviewer information, interview mode, province, district, economic activity, and eligibility classifications were standardized before the substantive variables were analysed. Firms were then classified as productive-input users or sugar resellers according to their principal reported use of sugar.

Non-substantive responses, including "do not know", "prefer not to answer", and questionnaire-specific missing-value codes, were converted to missing values. Consequently, the number of valid observations varies across tables, figures, and regression variables. All reported denominators refer to the observations with valid substantive responses for the corresponding outcome rather than automatically to the full sample of 225 firms.

Multiple-response questions were converted into separate binary indicators for each response option. Percentages derived from these variables may therefore sum to more than 100%. Mutually exclusive categorical questions were retained as single variables and reported as distributions summing to 100% within the relevant valid-response sample. Skip patterns and routing conditions were preserved in the analytical data. Percentages equal to 100% in routed follow-up questions should therefore not be interpreted as applying to the entire survey sample.

The larger face-to-face firm indicator identifies the six purposively selected businesses whose survey IDs begin with "P". The stockout indicator records whether the firm reported at least one sugar stockout during the survey reference period. A single-supplier firm is defined as a business reporting only one sugar supplier during the previous 12 months. High dependence on the principal supplier indicates that at least 75% of sugar purchases were obtained from that supplier. Availability of alternatives was measured using both the reported number of realistic alternative suppliers and an indicator for having at least one such alternative.

The analysis is primarily descriptive. Means, medians, percentiles, frequencies, and percentages are reported using variable-specific valid observations. Comparisons between the six larger face-to-face firms and the remaining surveyed firms are presented to highlight differences in scale and purchasing arrangements, but they are not interpreted as causal effects of firm size or interview mode.

3 Results

This section provides the analytical structure that will guide the production of the report outputs. The tables and figures listed below are proposed outputs; they are not inserted at this stage. They will be generated later from the cleaned survey data using separate Stata do-files for tables and figures.

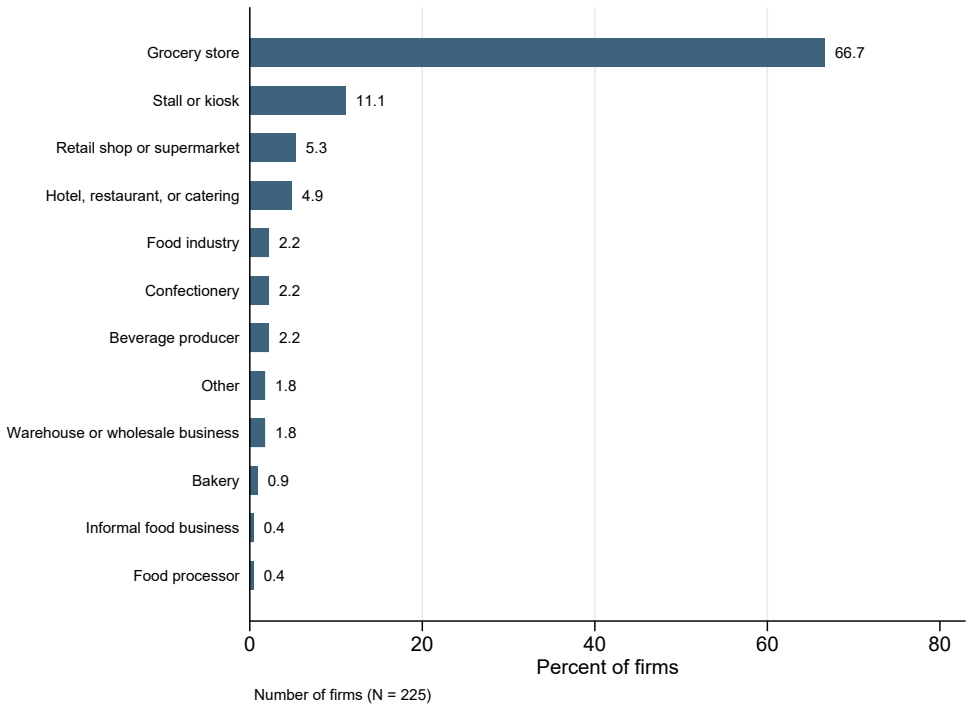
3.1 Characteristics of Firms and Respondents

Understanding the characteristics of the surveyed firms and the profile of the respondents is important for interpreting the results presented in the remainder of this report. The economic activity of a firm determines how sugar enters its business model, the quantities required, the regularity of purchases, and the potential consequences of changes in prices or supply conditions. At the same time, the reliability of the survey responses depends on whether the individuals interviewed are sufficiently familiar with the firm's operations, sugar purchases, selling prices, and supplier relationships. This subsection therefore examines the principal economic activities represented in the sample, differences in firm size, respondents' experience with their businesses, their involvement in key commercial decisions, and their knowledge of the sugar market.

Principal economic activity. Figure 2 shows that the sample is strongly concentrated among firms operating at the retail end of the sugar market. Grocery stores account for 66.7% of all surveyed firms, while stalls or kiosks represent a further 11.1%. Retail shops or supermarkets account for 5.3%, and hotels, restaurants, or catering businesses represent 4.9%. All remaining categories individually account for no more than 2.2% of the sample.

This distribution indicates that the survey predominantly captures the experiences of businesses that purchase sugar for direct resale or use it in relatively small-scale commercial activities. Larger food-processing, confectionery, beverage-producing, warehousing, and wholesale businesses are present in the sample, but in considerably smaller numbers. Consequently, the aggregate results reported in later sections will be influenced primarily by the conditions faced by grocery stores, kiosks, and other downstream retailers. Results for industrial or relatively large users should therefore be interpreted separately where the available sample permits such a distinction.

Figure 2: Principal economic activity of surveyed firms



Notes: The figure reports the percentage distribution of firms according to their reported principal economic activity. Categories are mutually exclusive and percentages are calculated over the 225 firms with a valid activity classification.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Firm size and respondent profile. Table 2 provides additional information on firm size and the characteristics of the respondents. Panel A shows that the average firm in the full sample employs 6.5 full-time workers. This average, however, conceals a substantial difference between the six larger firms interviewed face-to-face and the remaining surveyed firms. Other firms employ an average of 4.0 full-time workers, compared with 100.5 workers among the larger face-to-face firms. The size difference is therefore considerable and confirms that the face-to-face group represents a distinct segment of the sample rather than a random subsample of otherwise comparable businesses.

Respondents had been associated with their firms for an average of 11.9 years, suggesting substantial familiarity with the businesses on which they were reporting. The corresponding average is 12.0 years among other surveyed firms and 7.2 years among the larger face-to-face firms. The shorter average among the larger firms may reflect the fact that respondents in larger organizations need not be the original owners or long-standing operators, but may instead hold specialized managerial or administrative positions.

Among respondents with valid answers to the relevant questions, all reported being owners, participating in sugar-purchasing decisions, and being involved in the setting of selling prices. These results indicate that the interviews were generally conducted with individuals who were directly engaged in the commercial decisions covered by the questionnaire. Nevertheless, the number of valid responses differs substantially across these indicators, particularly among the six larger firms. For example, the purchasing-decision result for the larger face-to-face group is based on only one valid response. These percentages should therefore be read as descriptions of the respondents who answered each question, rather than as estimates applying with certainty to every firm in the group.

Panel B provides a more direct assessment of respondents' knowledge of the sugar market. In the full sample, 55.6% described themselves as very well informed, while a further 20.9% were moderately informed. Taken together, 76.5% of respondents therefore reported being at least moderately informed about the market. Another 16.9% considered themselves slightly informed, while only 6.7% reported that they were not informed.

The distribution is broadly similar between the two firm groups. Among the larger face-to-face firms, 66.7% of respondents were very well informed, compared with 55.3% among the remaining firms. None of the six larger firms reported being uninformed, although this result should be interpreted cautiously because of the small size of the group. Overall, the findings suggest that most interviews were conducted with respondents who possessed relevant knowledge of the sugar market and were sufficiently involved in their firms' commercial operations to provide meaningful information for the subsequent analysis.

Table 2: Firm size and respondent characteristics, by firm group

Panel A. Firm size and respondent characteristics

	Full sample	Other firms	Larger F2F firms
Full-time workers	6.5 (225)	4.0 (219)	100.5 (6)
Years with the firm	11.9 (223)	12.0 (217)	7.2 (6)
Respondent is an owner	100.0 (192)	100.0 (190)	100.0 (2)
Involved in sugar purchasing	100.0 (143)	100.0 (142)	100.0 (1)
Involved in price setting	100.0 (134)	100.0 (132)	100.0 (2)

Panel B. Respondents' knowledge of the sugar market

Category	Full sample	Other firms	Larger F2F firms
Very well informed	55.6	55.3	66.7
Moderately informed	20.9	21.0	16.7
Slightly informed	16.9	16.9	16.7
Not informed	6.7	6.8	0.0
N	225	219	6

Notes: Panel A reports means for continuous variables and percentages for binary indicators. Numbers in parentheses are the variable-specific numbers of valid observations. Panel B reports column percentages across mutually exclusive knowledge categories; the corresponding number of valid observations is reported in the final row. Non-substantive responses are excluded from all calculations. "Larger F2F firms" refers to the six purposively selected larger businesses interviewed face-to-face. Because these firms were not randomly selected, differences between them and the remaining surveyed firms are descriptive and should not be interpreted as causal effects of firm size or interview mode.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

3.2 Use and Economic Importance of Sugar

The role of sugar in a firm's business model determines how exposed that firm is to changes in sugar prices, product availability, supplier conditions, and interruptions in supply. For firms that use sugar as a productive input, these changes may affect production costs, output decisions, product quality, and selling prices. For firms that purchase sugar for resale, they may instead affect turnover, inventories, retail margins, and the ability to satisfy customer demand. This subsection therefore examines the quantities of sugar used or sold, its contribution to firms' costs or turnover, its perceived importance to the principal activity

of the business, and the factors responsible for seasonal variation.

Sugar used as a productive input. Table 3 presents the intensity and economic importance of sugar among firms that use it in production or service provision. Panel A indicates that these firms used an average of 6,124.9 kilograms of sugar per month. This estimate is based on 24 valid responses and should therefore be interpreted as describing the firms that were able to provide a usable monthly quantity rather than all productive-input users in the sample. The relatively large average may also reflect considerable variation in scale between small businesses and a limited number of larger industrial or commercial users.

Among the 16 firms that reported the share of sugar in their total input costs, sugar represented an average of 24.5%. This result indicates that sugar constitutes a substantial component of production costs for the reporting firms. Consequently, increases in sugar prices may create meaningful cost pressures, particularly where firms have limited possibilities to substitute sugar, reduce the quantity used, or pass the additional cost on to customers.

Panel B reinforces the economic importance of sugar to these businesses. More than half of productive-input users, 54.8%, described sugar as a primary input with no easy substitute. A further 25.8% considered sugar an important input but reported that they could make limited adjustments to its use—for example, by reducing the quantity used, modifying production, or changing the product mix. Taken together, 80.6% of firms therefore regarded sugar as either indispensable or highly important to their main activity. Only 3.2% described it as a secondary input, while 16.1% reported only occasional use.

These findings suggest that changes in sugar-market conditions are unlikely to be neutral for most productive-input users. For a large majority, sugar is not simply one input among many but an important determinant of their ability to produce and maintain their existing product mix. Supply interruptions or substantial price increases may therefore require firms to adjust production, alter recipes or product characteristics, increase selling prices, or reduce activity.

Table 3: Intensity and economic importance of sugar among productive-input users

Panel A. Sugar-use intensity

	Full sample
Monthly sugar used as input (kg)	6124.9 (24)
Sugar share of input costs (%)	24.5 (16)
Seasonal sugar use (%)	100.0 (27)

Panel B. Importance of sugar to the firm's main activity

Category	Full sample
Primary input with no easy substitute	54.8
Important input, but with some room for adjustment	25.8
Secondary input	3.2
Occasional use	16.1
N	31

Notes: The sample is restricted to firms that reported using sugar as an input in production or service provision. Panel A reports means for continuous variables and percentages for binary indicators; numbers in parentheses are the variable-specific numbers of valid observations. Panel B reports the percentage distribution of firms across mutually exclusive categories describing the importance of sugar to the firm's principal activity. Non-substantive responses are excluded. Because valid-response counts differ across variables, comparisons between rows should be made with caution.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Sugar purchased for resale. The second part of the analysis considers firms that purchase sugar for resale. As shown in Table 4, these firms sold an average of 1,757.2 kilograms of sugar per month, based on 112 valid responses. The average quantity is substantially lower than the amount reported by productive-input users, which is consistent with the predominance of grocery stores, kiosks, and other relatively small retail businesses in the sample.

Sugar accounted for an average of 28.7% of total turnover among the 80 resellers that provided a valid estimate. This share indicates that sugar represents a commercially important product for many retailers, even where it is sold alongside a wider range of food and household goods. Changes in sugar prices, availability, or delivery conditions may therefore have noticeable consequences for sales revenue, cash flow, inventory management,

and customer retention.

Panel B shows that 53.9% of resellers considered sugar their main product with no easy substitute. A further 26.9% described it as an important product with some room for adjustment. Thus, 80.8% of resellers viewed sugar as either their main product or an important component of their sales activity. Another 16.1% classified it as a secondary product, while only 3.1% reported selling it occasionally.

The similarity between productive-input users and resellers is notable. In both groups, slightly more than four-fifths of firms classified sugar as either essential or important to their principal activity. The economic channel differs, however: input users depend on sugar to produce other goods or services, whereas resellers depend on its availability and commercial attractiveness as a final product. These differences should be considered when interpreting firms' responses to price increases, stockouts, and changes in supplier arrangements.

Table 4: Intensity and economic importance of sugar among resellers

Panel A. Sugar-sales intensity

	Full sample
Monthly sugar sales (kg)	1757.2 (112)
Sugar share of turnover (%)	28.7 (80)
Seasonal sugar sales (%)	100.0 (162)

Panel B. Importance of sugar sales to the business

Category	Full sample
Main product with no easy substitute	53.9
Important product, but with some room for adjustment	26.9
Secondary product	16.1
Occasional product	3.1
N	193

Notes: The sample is restricted to firms that reported purchasing sugar for resale. Panel A reports means for continuous variables and percentages for binary indicators; numbers in parentheses are the variable-specific numbers of valid observations. Panel B reports the percentage distribution of firms across mutually exclusive categories describing the importance of sugar sales to the business. Non-substantive responses are excluded. Because valid-response counts differ across variables, comparisons between rows should be made with caution.

Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

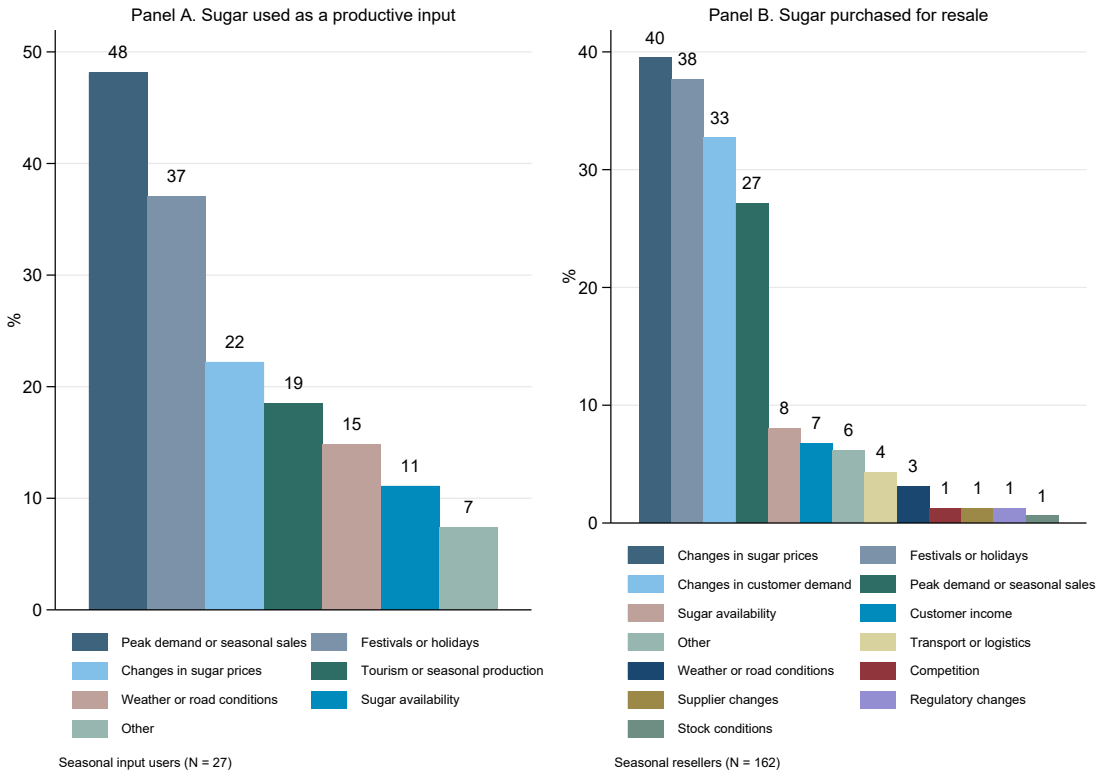
Seasonal variation in sugar use and sales. Seasonality provides an additional indication of firms' exposure to changing market conditions. Among firms with valid responses to the relevant questions, all 27 productive-input users and all 162 resellers reported that their sugar use or sales varied seasonally. These figures should be interpreted in light of the questionnaire routing, since the seasonality follow-up variables may only be observed for firms that reported seasonal variation.

Figure 3 shows that the reasons for seasonality differ between productive-input users and resellers. Among seasonal input users, the most frequently reported reason was peak demand or seasonal sales, selected by 48% of firms. Festivals or holidays were mentioned by 37%, while 22% identified changes in sugar prices. Tourism or seasonal production was reported by 19%, weather or road conditions by 15%, sugar availability by 11%, and other reasons by 7%.

For resellers, changes in sugar prices were the most frequently reported source of seasonal variation, mentioned by 40% of firms. Festivals or holidays followed closely at 38%, while 33% referred to changes in customer demand and 27% to peak demand or seasonal sales. Sugar availability was reported by 8%, customer income by 7%, and other reasons by 6%. Transport or logistics and weather or road conditions were less common, at 4% and 3%, respectively, while competition, supplier changes, regulatory changes, and stock conditions were each reported by approximately 1% of seasonal resellers.

The results suggest that seasonality reflects both demand-side and supply-side forces. Festivals, holidays, customer demand, and peak selling periods create predictable increases in demand, while changes in sugar prices and availability introduce additional uncertainty. The prominence of price changes among resellers is especially important because it indicates that fluctuations in sales may not be driven only by consumer demand but also by firms' purchasing conditions and their ability to maintain affordable stocks.

Figure 3: Main reasons for seasonal variation in sugar use and sales



Notes: Panel A is restricted to 27 firms reporting seasonal variation in sugar used as a productive input. Panel B is restricted to 162 firms reporting seasonal variation in sugar purchased for resale. Bars report the percentage of firms in each panel selecting the corresponding reason. Respondents could select more than one reason; consequently, percentages within each panel do not sum to 100.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

3.3 Awareness of the ARC Decision and Market Expectations

Firms' awareness of the ARC decision is important because the effects of a regulatory reform depend not only on the formal adoption of new market rules, but also on whether market participants understand that a change has occurred and how it may affect their commercial decisions. Firms that are unaware of the reform may be less able to identify new suppliers, negotiate alternative purchasing arrangements, compare prices, or adjust their expectations about future market conditions. This subsection therefore examines firms' awareness of the ARC decision, their expectations regarding changes in the sugar-distribution system, and their views on the potential benefits and risks associated with market reform.

Awareness of the ARC decision. Figure 4 shows that awareness of the ARC decision was very limited at the time of the survey. Only 8.9% of the 225 surveyed firms reported having heard about the decision, while 91.1% had not. This indicates that the regulatory change had not yet been widely communicated to the firms that purchase sugar for productive use or resale.

The low level of awareness is particularly important for the implementation of the reform. Firms cannot respond effectively to new opportunities for supplier entry, supplier switching, or price comparison when they are unaware that the institutional structure of the market is changing. Limited awareness may also reduce firms' ability to distinguish between temporary market disturbances and changes directly associated with the ARC decision.

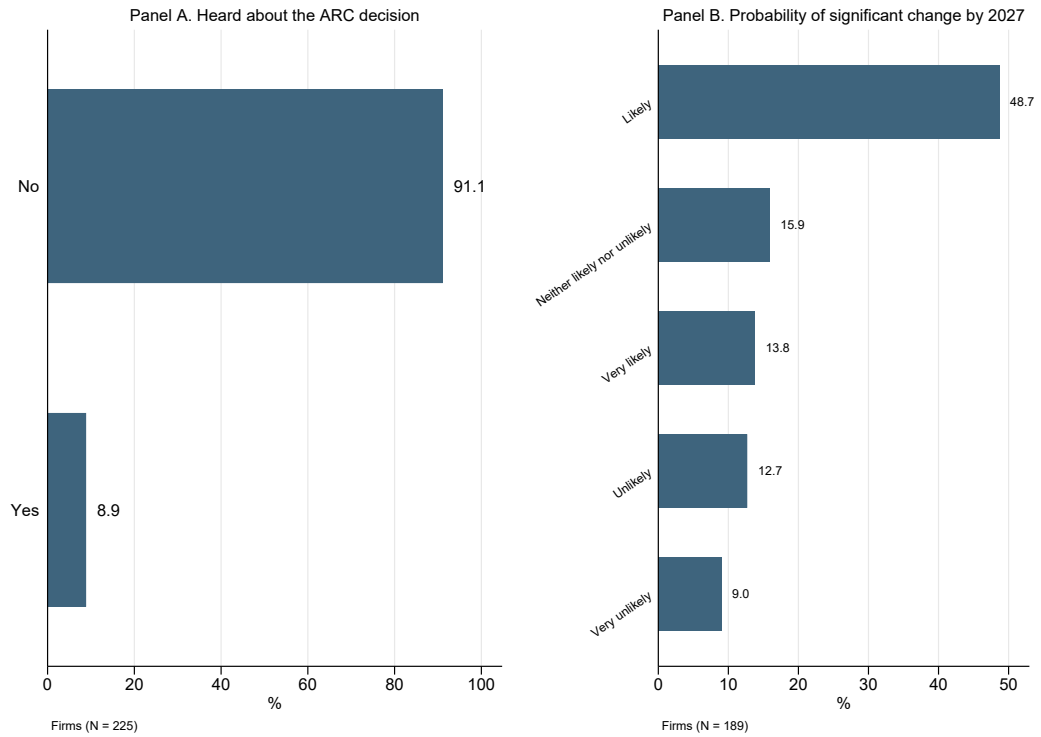
The result therefore points to a substantial information gap between the adoption of the regulatory decision and its diffusion among downstream market participants. This suggests that implementation may require a clear communication strategy explaining the content of the decision, its expected timing, the rights and opportunities available to firms, and the practical implications for purchasing sugar under the new market arrangements.

Expected changes in the market structure. Despite the low level of direct awareness, many firms expected the sugar market to change significantly by 2027. Among the 189 firms providing a valid response, 48.7% considered a significant change likely and 13.8% considered it very likely. Taken together, 62.5% of valid respondents therefore expected a substantial change in the market structure.

A further 15.9% considered significant change neither likely nor unlikely. By contrast, 12.7% regarded it as unlikely and 9.0% as very unlikely, meaning that 21.7% of respondents did not expect substantial change by 2027.

The contrast between low awareness of the specific ARC decision and relatively strong expectations of market change is noteworthy. It suggests that firms may be responding to broader information, market rumours, changes in supplier behaviour, or their own observations of the sugar-distribution system rather than to detailed knowledge of the regulatory decision itself. Expectations about reform therefore appear to be more widespread than formal awareness of the institutional process producing it.

Figure 4: Awareness of the ARC decision and expectations of significant market change



Notes: Panel A reports whether firms had heard about the decision of the Competition Regulatory Authority concerning the sugar market. Percentages are calculated over 225 firms with valid responses. Panel B reports firms' assessments of the probability that the sugar-distribution structure will change significantly by 2027. Percentages are calculated over 189 firms with valid substantive responses. Categories in each panel are mutually exclusive and sum to 100%.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Views on the potential effects of market reform. Figure 5 presents firms' views on three central dimensions of the proposed market reform: price transparency, supplier entry, and market stability. The results indicate broad support for reforms that could improve access to information and expand firms' choice of suppliers.

Regarding price transparency, 55.6% of firms agreed and 24.4% strongly agreed that greater transparency in prices and commercial conditions would be beneficial. Thus, 80.0% expressed a positive view of greater transparency. Only 7.6% disagreed or strongly disagreed, while 12.4% remained neutral.

Support for the entry of additional suppliers was even stronger. Approximately 56.9% agreed and 30.7% strongly agreed that having more suppliers would benefit their businesses. Taken together, 87.6% of firms therefore viewed expanded supplier choice positively. Only

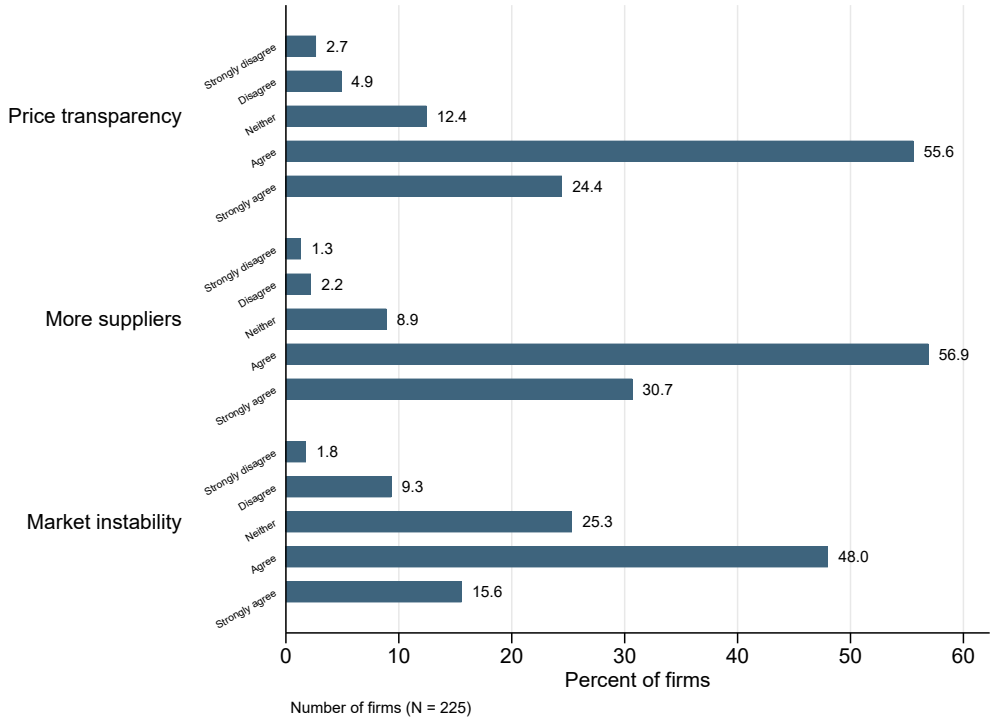
3.5% disagreed or strongly disagreed, while 8.9% expressed a neutral position.

These results suggest that firms perceive important limitations in the current market structure. Strong demand for additional suppliers may reflect restricted supplier choice, dependence on existing distribution channels, limited bargaining power, or difficulties finding realistic alternatives when the principal supplier cannot deliver. Similarly, the high value placed on price transparency indicates that firms may face incomplete information about prices, purchasing conditions, delivery arrangements, or differences across suppliers.

At the same time, firms did not view market reform as entirely free of risk. Approximately 48.0% agreed and 15.6% strongly agreed that market changes could increase instability, meaning that 63.6% expressed some concern about this possibility. A further 25.3% were neutral, while only 11.1% disagreed or strongly disagreed.

The results therefore reveal a balanced but cautious assessment of reform. Firms strongly support greater transparency and supplier choice, but many are simultaneously concerned that the transition could produce less predictable prices, interruptions in established supply relationships, or uncertainty about how the new distribution system will operate. Support for reform should therefore not be interpreted as an expectation that the transition will be frictionless. Rather, firms appear to favour the potential benefits of competition while recognizing the possibility of short-run adjustment costs and instability.

Figure 5: Firms' views on price transparency, supplier entry, and market stability



Notes: The figure reports the distribution of responses to three statements concerning potential changes in the sugar market. Percentages are calculated separately within each statement over 225 firms. The five response categories are mutually exclusive within each statement and sum to 100%. The statements assess whether greater price transparency would be beneficial, whether the entry of additional suppliers would benefit firms, and whether market changes could increase instability.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

3.4 Supplier Structure, Sourcing Channels, and Dependence

The structure of firms' supplier relationships is central to understanding how effectively the sugar market serves downstream businesses. Access to several suppliers can improve firms' ability to compare prices, negotiate purchasing conditions, and respond when one supplier is unable to deliver. By contrast, dependence on a single or dominant supplier may expose firms to stockouts, unfavourable prices, limited bargaining power, and interruptions in production or sales. This subsection therefore examines the number and type of suppliers used by firms, the concentration of purchases in the principal supplier, the availability of realistic alternatives, purchasing restrictions, and the reasons firms change suppliers.

Number of suppliers and dependence on the principal supplier. Table 5 shows that firms used an average of 2.9 sugar suppliers during the previous 12 months, based on 180 valid responses. The average is also 2.9 among the other surveyed firms and 2.4 among the five larger face-to-face firms with valid information. These averages suggest that many firms have contact with more than one supplier. However, the number of suppliers used does not necessarily indicate that purchases are evenly distributed across them or that all suppliers represent realistic alternatives.

Among the 124 firms that reported the share of sugar obtained from their principal supplier, an average of 62.8% of purchases came from that supplier. The corresponding share was 62.2% among the other surveyed firms and 78.0% among the five larger face-to-face firms with valid responses. Although the face-to-face group appears more concentrated, the small number of observations means that this difference should be interpreted descriptively.

The concentration indicators provide additional evidence of supplier dependence. Approximately 36.7% of firms with valid responses obtained sugar from only one supplier during the previous 12 months. Moreover, 44.4% obtained at least 75% of their sugar purchases from their principal supplier. This means that even some firms reporting more than one supplier remained highly dependent on a single source for most of their purchases.

At the same time, firms reported an average of 2.6 realistic alternative suppliers, and 92.6% of respondents indicated that at least one realistic alternative was available. This apparent contrast is important. A firm may be aware of alternative suppliers without using them regularly or without considering them equivalent to the principal supplier in terms of prices, product availability, payment conditions, transport costs, quantities supplied, or reliability. The results therefore suggest that the existence of nominal alternatives does not necessarily eliminate economic dependence on the principal supplier.

Table 5: Supplier structure and dependence, by firm group

	Full sample	Other firms	Larger F2F firms
Suppliers used in previous 12 months	2.9 (180)	2.9 (175)	2.4 (5)
Purchases from principal supplier (%)	62.8 (124)	62.2 (119)	78.0 (5)
Realistic alternative suppliers	2.6 (136)	2.5 (130)	5.3 (6)
Single-supplier firm (%)	36.7 (180)	37.1 (175)	20.0 (5)
Principal supplier provides at least 75% (%)	44.4 (124)	43.7 (119)	60.0 (5)
At least one realistic alternative supplier (%)	92.6 (136)	92.3 (130)	100.0 (6)
Exclusive purchasing requirement (%)	100.0 (13)	100.0 (13)	–
Tied purchasing arrangement (%)	100.0 (33)	100.0 (31)	100.0 (2)
Changed principal supplier in previous 12 months (%)	100.0 (49)	100.0 (48)	100.0 (1)

Notes: Means are reported for the number of suppliers, the share of purchases obtained from the principal supplier, and the number of realistic alternative suppliers. Binary indicators are reported as percentages. Numbers in parentheses are the variable-specific numbers of valid observations. A single-supplier firm used only one sugar supplier during the previous 12 months. High dependence is defined as obtaining at least 75% of sugar purchases from the principal supplier. Questions on exclusivity, tied purchasing, and supplier switching were answered only by the relevant routed subsamples; their percentages should therefore not be interpreted as applying to the full sample. "Larger F2F firms" refers to the six purposively selected larger firms interviewed face-to-face. Differences across firm groups are descriptive.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Principal suppliers and current sourcing channels. Figure 6 shows that sugar distribution is strongly concentrated in downstream commercial intermediaries. Retailers or wholesalers were identified as the principal supplier by 79.1% of firms. Informal traders represented 6.2%, direct purchases from producers 5.3%, and the Distribuidora Nacional de Açúcar 4.4%. Other suppliers accounted for 3.6%, while importers represented only 1.3%.

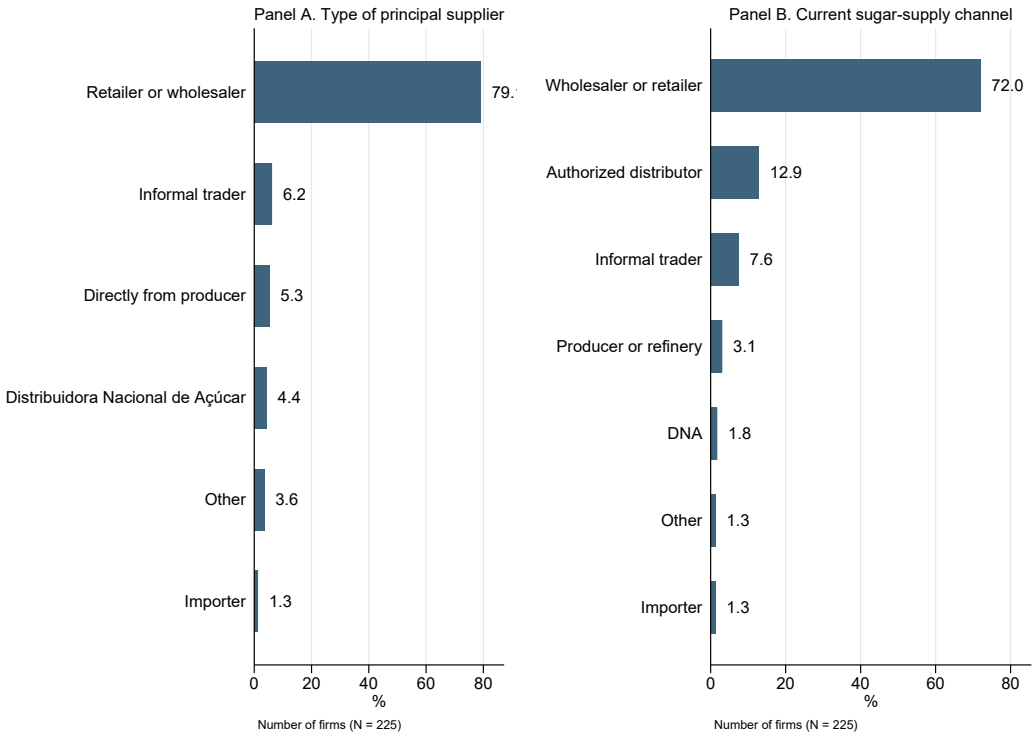
The distribution of current sourcing channels follows a similar pattern. Approximately 72.0% of firms obtained sugar through a wholesaler or retailer, while 12.9% used an authorized distributor. Informal traders accounted for 7.6%, producers or refineries for 3.1%, and the DNA for 1.8%. Importers and other channels each represented 1.3%.

These results indicate that most surveyed firms do not purchase directly from producers, refineries, or importers. Instead, they depend on intermediaries located further down the

distribution chain. These intermediaries may provide important advantages, including smaller purchase quantities, geographic proximity, flexible payment arrangements, and reduced transport requirements. However, reliance on several layers of distribution may also increase final purchase prices and reduce firms' direct access to information about upstream prices, stocks, and supply conditions.

The predominance of wholesalers and retailers also helps explain why firms may report several potential suppliers while remaining dependent on a narrow segment of the distribution system. Alternative suppliers may frequently be similar intermediaries operating under comparable upstream constraints rather than genuinely independent sources of sugar.

Figure 6: Principal suppliers and current supply channels



Notes: Panel A reports the percentage distribution of firms according to the type of their principal sugar supplier. Panel B reports the distribution of firms according to their current sugar-supply channel. Categories are mutually exclusive within each panel. Percentages are calculated over 225 firms with valid responses.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Exclusivity and tied purchasing arrangements. Table 5 also reports information on purchasing restrictions. All 13 firms with valid responses to the exclusivity question indicated that they were required to purchase sugar from a specified supplier. Similarly, all

33 firms answering the tied-purchasing question reported that access to sugar was linked to another purchase or commercial condition.

These percentages should not be interpreted as indicating that every firm in the survey faced exclusivity or tied-purchasing requirements. The questions were answered by small, conditionally selected subsamples. Nevertheless, the results show that such arrangements exist among surveyed firms and may restrict effective supplier choice for the businesses affected. A firm may therefore appear to have alternative suppliers in principle while being contractually or commercially constrained in its ability to use them.

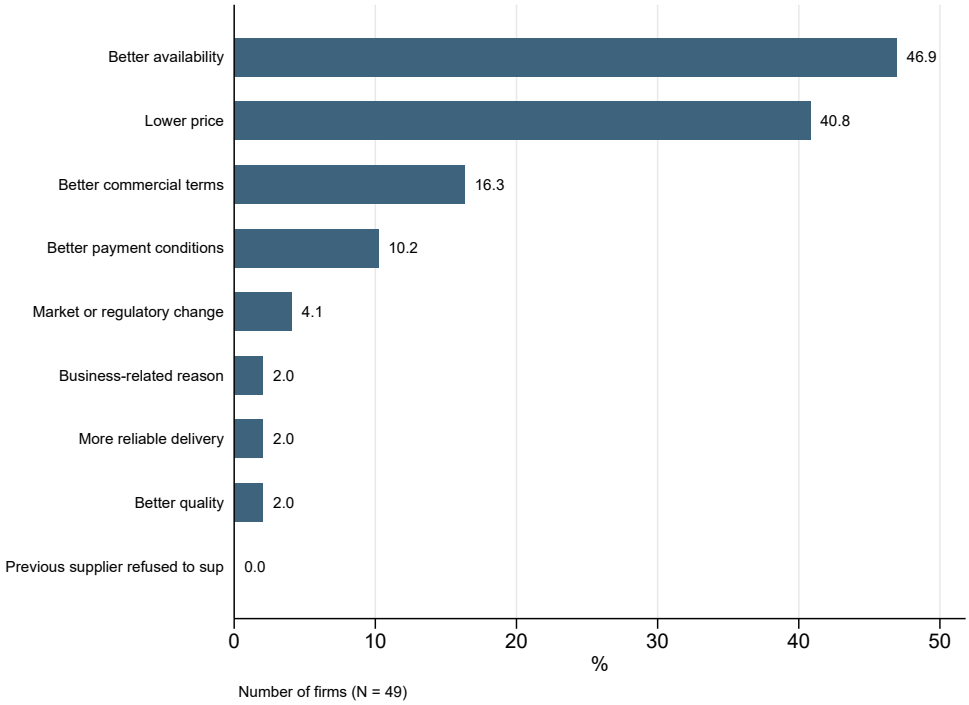
Supplier switching. A total of 49 firms provided information on reasons for changing their principal supplier. Figure 7 shows that better availability was the most frequently reported reason, selected by 46.9% of these firms. Lower prices followed closely at 40.8%. Better commercial terms were reported by 16.3%, while 10.2% changed suppliers in search of better payment conditions.

Market or regulatory change was mentioned by 4.1% of firms. Better quality, more reliable delivery, and business-related reasons were each reported by 2.0%. No firm in the relevant subsample reported changing because the previous supplier had refused to supply.

The predominance of availability and price indicates that supplier switching is driven primarily by firms' ability to obtain sugar when needed and at an acceptable cost. Availability was reported slightly more often than price, suggesting that supply continuity can be at least as important as obtaining the lowest possible price. This is consistent with the operational importance of sugar documented in the previous subsection: firms that depend heavily on sugar may prefer a supplier capable of maintaining stocks even when another supplier offers marginally better prices.

Commercial and payment conditions also influenced switching, although less frequently. These conditions may include minimum purchase quantities, access to credit, delivery arrangements, payment deadlines, and other terms affecting firms' cash flow and inventory management. Supplier competition should therefore be evaluated not only through posted prices but also through the broader package of conditions offered to firms.

Figure 7: Reasons for changing the principal supplier



Notes: The figure is restricted to 49 firms that reported changing their principal sugar supplier and provided valid information on the reasons for the change. Bars show the percentage of these firms selecting each reason. Respondents could report more than one reason; consequently, percentages do not sum to 100%.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

3.5 Purchase Prices and Purchasing Conditions

The prices and purchasing conditions faced by firms determine both the direct cost of acquiring sugar and the extent to which businesses can respond to changes in suppliers or market conditions. Purchase prices may differ because of location, supplier type, transport arrangements, quantities purchased, payment terms, or firms' bargaining power. It is therefore important to examine not only the average price paid, but also the distribution of prices, transport costs, differences across suppliers, payment arrangements, and the time firms would require to identify an alternative source of supply.

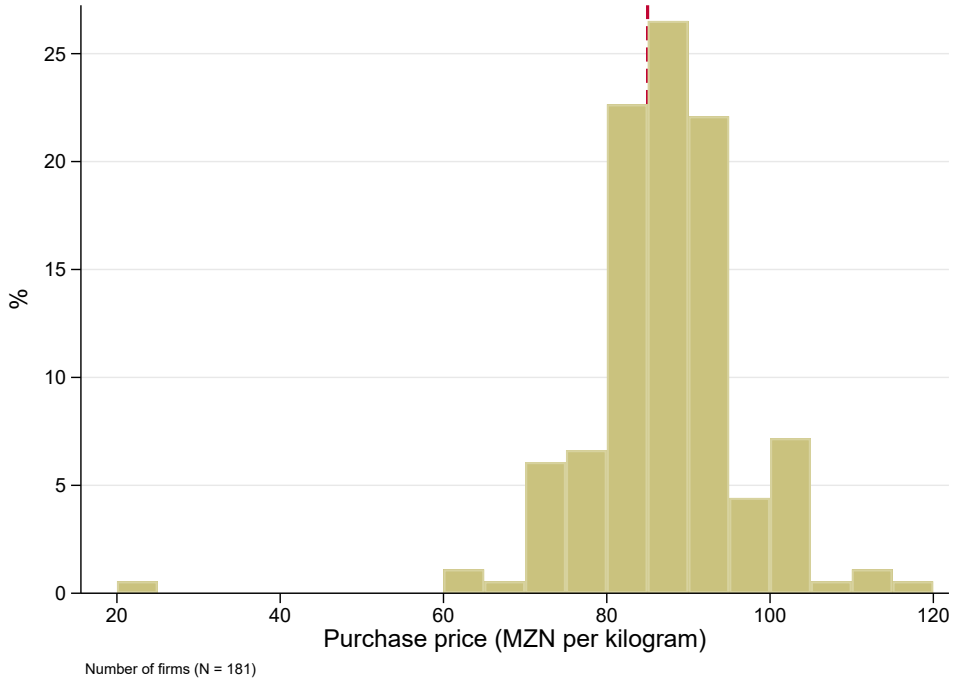
Purchase prices and price dispersion. Table 6, Panel A, shows that the average reported sugar purchase price was 85.68 MZN per kilogram among the 181 firms with valid price information. The median was 85.00 MZN/kg, while the middle half of observations ranged

from 83.00 to 90.00 MZN/kg. The close correspondence between the mean and median indicates that the central part of the price distribution is relatively concentrated.

Figure 8 confirms this pattern. Most firms reported prices between approximately 75 and 100 MZN/kg, with the highest concentration around 80–95 MZN/kg. Nevertheless, the distribution includes a small number of observations at substantially lower or higher prices, including values close to 20 MZN/kg and above 110 MZN/kg. These observations may reflect genuine differences in sugar type, purchase quantity, supplier channel, unit conversion, or data-reporting errors and should therefore be examined separately before being used in more detailed econometric analysis.

The reported minimum and maximum prices were 20 and 120 MZN/kg, respectively. The standard deviation of 9.68 MZN/kg is modest relative to the mean, but it is still economically meaningful for firms that purchase large quantities or operate with narrow retail or production margins. Even relatively small differences in the price per kilogram may translate into substantial monthly cost differences.

Figure 8: Distribution of reported sugar purchase prices



Notes: The figure reports the percentage distribution of valid sugar purchase prices, expressed in meticais per kilogram. The vertical dashed line indicates the median purchase price. The analytical sample contains 181 firms. Non-substantive and invalid responses are excluded.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

The table also provides two measures of price dispersion across suppliers. Absolute price dispersion is defined as the difference between the highest and lowest supplier prices reported by firm i:

$$\text{Absolute price dispersion}_i = P_i^{\max} - P_i^{\min}. \tag{2}$$

Relative price dispersion expresses the same difference as a percentage of the lowest reported price:

$$\text{Relative price dispersion}_i = \left(\frac{P_i^{\max} - P_i^{\min}}{P_i^{\min}} \right) \times 100. \tag{3}$$

Among the 163 firms with sufficient information to construct these measures, the average absolute price difference was 11.87 MZN/kg, while the median was 9.00 MZN/kg. Half of the observations were between 5.00 and 15.00 MZN/kg. These values indicate that firms may face materially different prices across potential suppliers even when the overall market-price distribution is concentrated.

The mean relative price dispersion was 77.44%, but the median was only 10.67%. This large difference is driven by extreme observations, including a maximum of 9,900%. Such values can arise when the lowest reported supplier price is unusually small, causing the percentage ratio to become extremely large. The median and interquartile range therefore provide a more representative description of the typical firm than the mean. For the median firm, the highest supplier price was approximately 10.7% above the lowest supplier price.

Transport costs and delivery conditions. Transport costs display considerably greater variation than purchase prices. Among 109 firms with valid information, the average reported transport cost was 1,487.09 MZN, while the median was 300 MZN. The middle half of observations ranged from 100 to 1,000 MZN, and the maximum reached 45,000 MZN. The large difference between the mean and median indicates that the distribution is strongly right-skewed and that a small number of very high transport-cost observations substantially increase the average. These figures should be interpreted carefully because the variable may represent the total cost of a purchasing trip or delivery rather than a standardized cost per kilogram.

Panel B indicates that all 64 firms with valid responses reported that transport was included in the purchase price. Similarly, all 51 firms answering the relevant question indicated

that prices varied across suppliers. These results apply only to the corresponding routed subsamples and should not be interpreted as showing that every firm in the full sample faced these conditions.

The reported variation across suppliers is consistent with the price-dispersion measures in Panel A. Firms may pay different prices because suppliers differ in transport inclusion, delivery distance, purchase quantities, payment terms, or reliability. A nominally higher sugar price may therefore include services that are charged separately by another supplier.

Payment terms. Panel C shows that payment at the time of purchase is by far the dominant arrangement, reported by 82.7% of firms. Only 4.9% reported payment within seven days, 2.2% within 14 days, and 6.7% within 30 days. A further 2.2% reported payment periods longer than 30 days, while 1.3% indicated another arrangement.

The predominance of immediate payment suggests that most firms have limited access to supplier credit. This may create cash-flow constraints, particularly for small retailers that must purchase stocks before generating sales revenue. Firms facing immediate-payment requirements may also be more vulnerable to sudden price increases or stockouts because they need sufficient liquidity to make emergency purchases or shift to another supplier.

Differences between the six larger face-to-face firms and the remaining firms are descriptive but suggest some variation in credit conditions. Among the larger firms, 66.7% paid at the time of purchase, while 16.7% reported payment within 14 days and another 16.7% within 30 days. By comparison, 83.1% of the remaining firms paid immediately. Larger firms may therefore have somewhat greater access to deferred payment, although the group contains only six observations and no strong inference should be drawn from these percentages.

Ability to find an alternative supplier. Panel D reports the time firms expected to require to find an alternative supplier. Only 21 firms provided valid responses to this question, indicating that it was administered to a restricted subsample. Among these firms, 38.1% stated that finding another supplier would take more than 30 days, while 61.9% reported that they would not be able to find an alternative supplier at all.

This result provides a more restrictive measure of effective supplier choice than the number of nominal or realistic alternatives reported earlier. A firm may know that other suppliers exist but still be unable to establish a new supply relationship within a commercially useful period. Geographic distance, minimum purchase quantities, payment requirements, limited stocks, transport arrangements, or existing commercial relationships may prevent a nominal

alternative from becoming an operational substitute.

The contrast is especially important for understanding supplier dependence. Although most firms reported at least one realistic alternative supplier, the firms answering this follow-up question generally expected either a substantial delay or complete inability to replace their current supplier. Effective competition therefore depends not merely on the number of suppliers present in the market, but on whether firms can access them quickly, under acceptable prices and commercial conditions.

Table 6: Purchase prices, transport costs, payment terms, and supplier-search conditions

Panel A. Purchase prices, transport costs, and price dispersion

Variable	N	Mean	SD	P25	Median	P75	Min	Max
Purchase price (MZN/kg)	181	85.68	9.68	83.00	85.00	90.00	20.00	120.00
Transport cost (MZN/kg)	109	1487.09	4920.17	100.00	300.00	1000.00	100.00	45000.00
Absolute price dispersion (MZN/kg)	163	11.87	12.86	5.00	9.00	15.00	0.00	99.00
Relative price dispersion (%)	163	77.44	775.03	5.56	10.67	17.65	0.00	9900.00

Panel B. Transport and delivery conditions

	Full sample	Other firms	Larger F2F firms
Transport included in purchase price (%)	100.0 (64)	100.0 (61)	100.0 (3)
Price varies across suppliers (%)	100.0 (51)	100.0 (49)	100.0 (2)

Panel C. Payment terms

Category	Full sample	Other firms	Larger F2F firms
Payment at the time of purchase	82.7	83.1	66.7
Payment within 7 days	4.9	5.0	0.0
Payment within 14 days	2.2	1.8	16.7
Payment within 30 days	6.7	6.4	16.7
More than 30 days	2.2	2.3	0.0
Other	1.3	1.4	0.0
N	225	219	6

Panel D. Time required to find an alternative supplier

Category	Full sample	Other firms	Larger F2F firms
More than 30 days	38.1	35.0	100.0
Would not be able to find an alternative supplier	61.9	65.0	0.0
N	21	20	1

Notes: Panel A reports the number of valid observations, mean, standard deviation, 25th percentile, median, 75th percentile, minimum, and maximum. Absolute price dispersion is the difference between the highest and lowest supplier prices reported by each firm. Relative price dispersion expresses this difference as a percentage of the lowest reported price. Panel B reports percentages for firms in the relevant routed subsamples. Panel C reports column percentages across mutually exclusive payment-term categories. Panel D is restricted to 21 firms with valid information on their ability to identify an alternative supplier. Non-substantive responses are excluded. Differences involving the six larger face-to-face firms are descriptive.

Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

The results show that most firms purchase sugar within a relatively narrow central price range, but economically important differences remain across suppliers. Transport costs are much more dispersed than purchase prices and may represent an important source of variation in firms' total acquisition costs. Immediate payment is the dominant purchasing arrangement, indicating limited supplier credit for most businesses. Moreover, among the restricted group asked about supplier replacement, most firms reported that they could not identify an alternative supplier or would need more than 30 days to do so.

Together, these findings suggest that the effective cost of purchasing sugar extends beyond the quoted price per kilogram. Transport requirements, payment conditions, supplier accessibility, and the time needed to establish an alternative supply relationship all shape firms' purchasing conditions and their ability to respond to market disruptions.

3.6 Stockouts and Operational Consequences

Reliable access to sugar is essential for firms that depend on it as a productive input or as a product for resale. A stockout may prevent a firm from maintaining normal production or sales, force it to purchase sugar urgently at a higher price, delay customer orders, or lead to the loss of customers. The incidence of stockouts therefore provides an important indication of the reliability of the sugar-supply system, while their duration and consequences show the economic costs imposed on affected firms. This subsection examines how frequently firms experienced sugar stockouts, how long normal activity was affected, and the measures firms adopted in response.

Incidence and frequency of stockouts. Table 7 shows that 17.3% of the 225 surveyed firms reported experiencing a sugar stockout during the reference period. The incidence was similar across the two firm groups: 17.4% among the other surveyed firms and 16.7% among the six larger firms interviewed face-to-face. This similarity suggests that supply interruptions were not confined to smaller businesses, although the estimate for the larger firms is based on only six observations.

The mean number of stockouts reported during the previous 30 days was 0.7 among the 164 firms with valid responses. The corresponding mean was also 0.7 among the other surveyed firms and 0.2 among the larger face-to-face firms. Because this variable includes firms reporting no stockout, the average should not be interpreted as the number of events experienced only by affected firms. Rather, it summarizes stockout frequency across all firms with valid information.

Among the 33 firms reporting the number of days during which normal activity was affected, the average disruption lasted 7.0 days. The corresponding mean was 7.2 days among the other surveyed firms. Only one larger face-to-face firm provided valid information for this variable and reported one affected day. These results indicate that, when stockouts disrupted business activity, their effects could persist for a meaningful period rather than being resolved immediately.

Operational severity and emergency purchases. Among the 39 firms with valid responses to the operational-disruption question, 74.4% reported that the stockout interfered with normal production or sales. This proportion was 73.7% among the other surveyed firms, while the only larger face-to-face firm with a valid response reported an operational disruption. Although the denominators are substantially smaller than the full sample, the result indicates that stockouts were economically consequential for many of the firms experiencing them.

All 43 firms in the relevant routed subsample reported making an emergency sugar purchase. This should not be interpreted as meaning that every firm experiencing a stockout necessarily made such a purchase, because the question has been presented only to firms satisfying additional survey conditions. Nevertheless, the result demonstrates that emergency purchasing was a common response among the firms asked about it.

The reported emergency-price premium averaged 89.0% among 38 firms with valid information. The median is not reported in this table, and the mean may be influenced by unusually large values. The estimate should therefore be interpreted as evidence that emergency purchases could be considerably more expensive than ordinary purchases, rather than as a precise measure of the premium faced by a typical affected firm. Among the other surveyed firms, the average premium was 91.1%, while the single larger face-to-face firm with valid information reported a premium of 10.0%.

Table 7: Incidence and severity of sugar stockouts, by firm group

	Full sample	Other firms	Larger F2F firms
Experienced a sugar stockout (%)	17.3 (225)	17.4 (219)	16.7 (6)
Number of stockouts in previous 30 days	0.7 (164)	0.7 (158)	0.2 (6)
Days normal activity was affected	7.0 (33)	7.2 (32)	1.0 (1)
Stockout caused an operational disruption (%)	74.4 (39)	73.7 (38)	100.0 (1)
Made an emergency sugar purchase (%)	100.0 (43)	100.0 (42)	100.0 (1)
Emergency-price premium (%)	89.0 (38)	91.1 (37)	10.0 (1)
Lost customers or orders (%)	100.0 (37)	100.0 (37)	–

Notes: Stockout incidence indicates whether a firm reported experiencing at least one sugar stockout during the survey reference period. Means are reported for the number of stockouts, days of affected activity, and emergency-price premium, while binary indicators are reported as percentages. Numbers in parentheses are the variable-specific numbers of valid observations. Questions concerning operational disruption, emergency purchasing, price premiums, and customer losses were administered to relevant routed subsamples; their percentages should therefore not be interpreted as applying to all surveyed firms. "Larger F2F firms" refers to the six purposively selected larger firms interviewed face-to-face. Differences across firm groups are descriptive.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

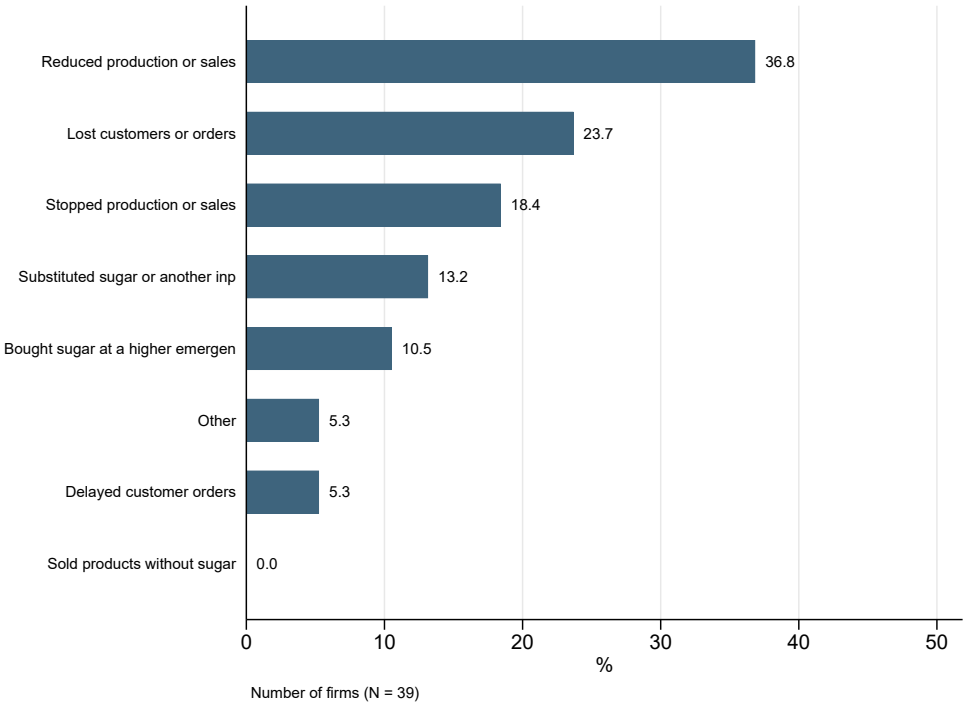
Specific consequences of stockouts. Figure 9 provides a more detailed description of how stockouts affected the 39 firms with valid information on operational consequences. The most frequently reported response was a reduction in production or sales, mentioned by 36.8% of affected firms. A further 23.7% reported losing customers or orders, while 18.4% temporarily stopped production or sales.

Approximately 13.2% substituted another type of sugar or another input, while 10.5% purchased sugar at a higher emergency price. Delayed customer orders and other consequences were each reported by 5.3% of firms. None of the firms in this subsample reported continuing to sell products without sugar.

The predominance of reduced activity, customer losses, and temporary stoppages shows that stockouts affected more than firms' purchasing arrangements. They also reduced firms' capacity to produce, sell, and meet customer demand. For firms operating with limited inventories or relying on frequent sugar purchases, even a temporary interruption in supply may translate quickly into lower revenue and weaker customer relationships.

Substitution was possible for only a minority of firms. This is consistent with the earlier finding that many productive-input users considered sugar a primary input without an easy substitute. Where substitution is technically possible, it may still involve changes in product quality, production methods, recipes, or customer acceptance. Consequently, substitution cannot necessarily eliminate the economic costs of a stockout.

Figure 9: Operational consequences of sugar stockouts



Notes: The figure is restricted to 39 firms with valid information on the operational consequences of a sugar stockout. Bars report the percentage of firms selecting each consequence. Respondents could report more than one consequence; consequently, percentages do not sum to 100%. The denominator differs from the total number of firms reporting any stockout because the figure uses the valid routed subsample for this set of follow-up questions.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Customer losses and broader business effects. The table indicates that all 37 firms with valid responses to the relevant customer-loss question reported losing customers or orders. This result differs from the 23.7% shown in Figure 9, most likely because the table and figure are based on different survey variables or routed subsamples. The two percentages should therefore not be treated as directly comparable without verifying the questionnaire routing and variable definitions.

The results show that sugar stockouts affected a minority of the full sample but imposed

substantial costs on the firms experiencing them. Stockouts often disrupted normal activity for several days and were associated with reduced production or sales, customer losses, temporary closures, substitution, and emergency purchasing. The high reported emergency-price premium further suggests that firms may face a difficult choice between interrupting their activity and purchasing sugar at substantially higher cost.

These findings underline the importance of evaluating the sugar market not only through average prices but also through supply reliability. A supplier offering a relatively low regular price may still impose significant indirect costs if deliveries are uncertain or stocks are frequently unavailable. Measures that improve inventory availability, delivery reliability, and firms' access to alternative suppliers may therefore generate benefits through both lower disruption risk and reduced dependence on costly emergency purchases.

3.7 Supply Reliability and Contract Preferences

Reliable access to sugar is valuable because firms may incur substantial costs when deliveries are delayed, stocks are unavailable, or emergency purchases become necessary. A supplier offering a slightly lower regular price may not represent the least costly option if unreliable delivery leads to production interruptions, lost sales, or customer losses. Firms may therefore be willing to pay more for greater certainty or to enter contractual arrangements that reduce uncertainty about prices, delivery, and payment conditions. This subsection examines firms' willingness to pay for reliable supply and the contractual terms they value most.

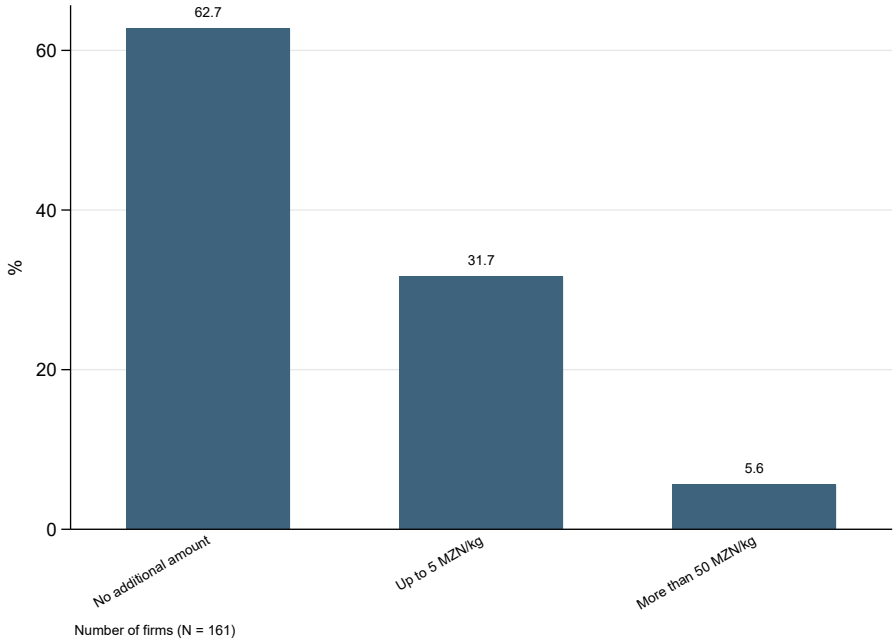
Willingness to pay for reliable supply. Figure 10 reports the additional amount firms would be willing to pay per kilogram for guaranteed and reliable sugar supply. Among the 161 firms with valid responses, 62.7% indicated that they would not pay any additional amount. A further 31.7% were willing to pay up to 5 MZN per kilogram, while 5.6% reported a willingness to pay more than 50 MZN per kilogram.

The results indicate that most firms place value on reliable supply but remain highly price-sensitive. The fact that almost one-third of respondents were willing to pay a positive but relatively limited premium suggests that reliability has a measurable commercial value, although most firms would only accept a modest increase in the purchase price. This is consistent with the predominance of small retailers and other businesses that may operate with narrow margins and limited working capital.

The large interval between the first positive category and the highest category should be interpreted carefully. The figure reports ordered response categories rather than exact continuous amounts. It therefore does not imply that every firm in the final category would pay exactly the same premium, nor should the categories be converted automatically into a single average willingness-to-pay amount.

The 5.6% of firms willing to pay more than 50 MZN/kg represent a small but potentially important group. These firms may face especially high costs from stockouts or may attach substantial value to uninterrupted production and sales. However, the category may also contain unusually large responses and should be examined further before being used to estimate the monetary value of reliability.

Figure 10: Willingness to pay for reliable sugar supply



Notes: The figure reports the percentage distribution of firms across ordered categories of the additional amount they would be willing to pay per kilogram for guaranteed and reliable sugar supply. The sample contains 161 firms with valid substantive responses. The categories represent intervals and should not be interpreted as exact continuous willingness-to-pay amounts.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Preferred contractual conditions. Figure 11 shows the contractual condition firms considered most important in a sugar-supply agreement. A fixed price during the contract was the most frequently selected condition, identified by 41.8% of the 158 firms with valid responses. Guaranteed delivery was the second most important condition, selected by

28.5%, while 15.2% prioritized better credit conditions.

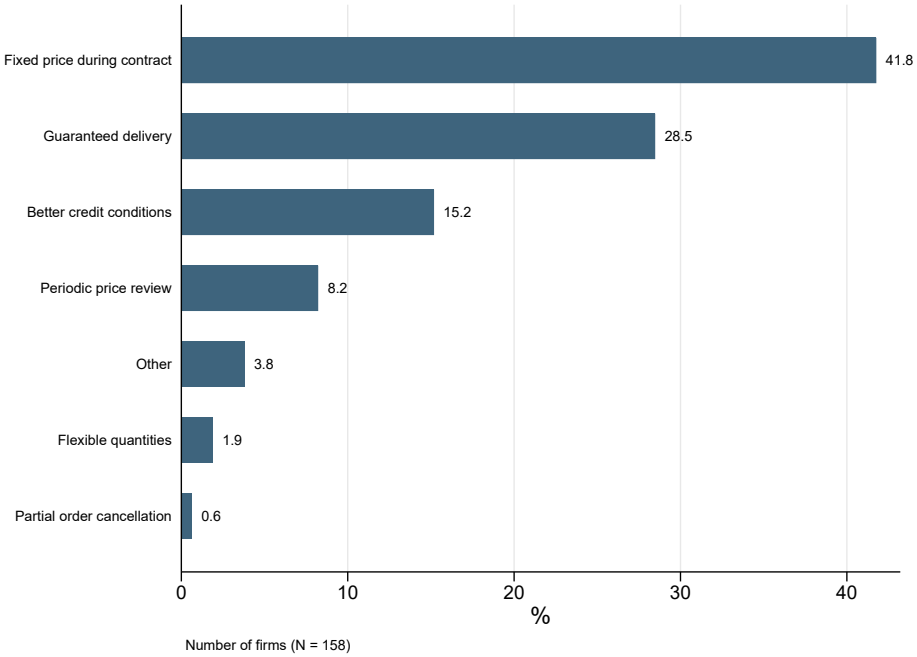
A further 8.2% preferred periodic price review, while 3.8% selected another contractual condition. Flexible quantities were considered most important by 1.9%, and only 0.6% prioritized the possibility of partially cancelling an order.

The strong preference for fixed prices indicates that firms place considerable value on protection against price uncertainty. A fixed-price contract allows firms to plan purchasing expenditure, manage cash flow, and set their own selling prices with greater confidence. This may be particularly important for firms that cannot adjust final-product prices immediately or that face strong competition in downstream markets.

Guaranteed delivery was also highly valued, reflecting the operational costs of stockouts documented in the previous subsection. For firms that depend on sugar as a principal input or sales product, delivery reliability may protect against reduced production, lost customers, emergency purchases, and temporary suspension of activity.

The importance attached to better credit conditions further suggests that liquidity constraints shape firms' purchasing decisions. Because most firms reported paying at the time of purchase, deferred payment or supplier credit could reduce the amount of working capital required to maintain stocks. Contract design may therefore influence not only supply reliability but also firms' ability to finance regular purchases.

Figure 11: Preferred conditions in a sugar-supply contract



Notes: The figure reports the contractual condition identified by each firm as the most important in a sugar-supply agreement. Categories are mutually exclusive and percentages are calculated over 158 firms with valid responses. Because respondents selected only one principal condition, percentages sum to 100%.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

The results indicate that firms value both price certainty and supply reliability, but their willingness to pay for these benefits is limited. Most firms were unwilling to pay an additional amount for guaranteed supply, while those expressing a positive willingness to pay generally preferred a relatively small premium. At the same time, fixed prices and guaranteed delivery were the two most frequently selected contractual conditions.

This combination suggests that firms would prefer reliability to be achieved through predictable contractual arrangements rather than through substantially higher spot-market prices. Contracts that combine clear pricing, guaranteed delivery, and improved payment conditions may therefore be more attractive than arrangements offering reliability only in exchange for a large price premium.

The results also show that contract design should account for the needs of relatively small firms. Long or inflexible contracts may be difficult for businesses with uncertain demand, limited storage capacity, or restricted working capital. A practical contractual framework may therefore need to balance price stability and delivery guarantees with manageable

purchase quantities, transparent review mechanisms, and payment terms appropriate to the financial capacity of smaller firms.

3.8 Responses to Sugar-Price Increases

The ability of firms to respond to an increase in the price of sugar depends on their market position, production technology, profit margins, access to alternative suppliers, and ability to adjust the prices or characteristics of the products they sell. Firms may pass the higher cost on to customers, reduce the quantity or quality of their products, change suppliers, reduce activity, or temporarily absorb the increase. These adjustment mechanisms determine how changes in sugar prices are transmitted to final-product prices, production, sales, and consumers. This subsection examines firms' principal responses to higher sugar prices, the speed of final-product price adjustment, and the extent to which firms can reduce or substitute sugar use.

Principal responses to higher sugar prices. Figure 12 shows that increasing the final-product price was by far the most common expected response to an increase in the price of sugar. Approximately 81.0% of the 221 firms with valid responses indicated that they would raise the price charged to customers. This result suggests that a substantial share of sugar-price increases may eventually be transmitted downstream rather than being fully absorbed by firms.

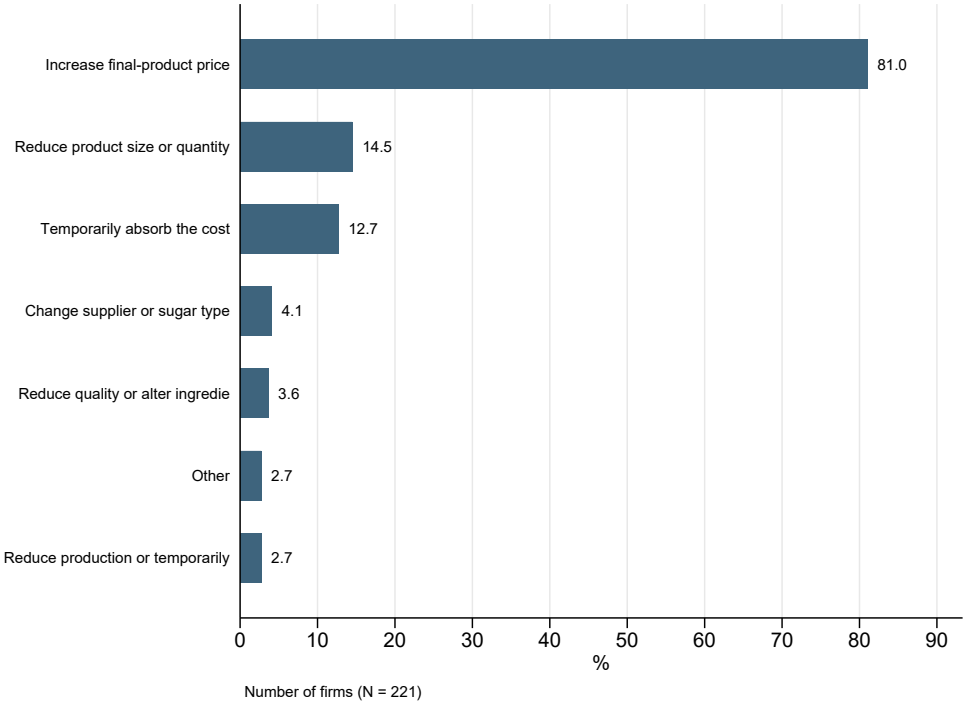
The second most frequently reported response was reducing product size or quantity, selected by 14.5% of firms. This form of adjustment allows a firm to maintain the nominal selling price while reducing the amount of product received by the customer. It therefore represents an indirect form of price adjustment that may not be immediately visible in conventional price data.

A further 12.7% of firms indicated that they would temporarily absorb the higher cost. Such absorption may protect customer relationships or delay a price increase, but it reduces the firm's profit margin and may not be sustainable when the increase is large or persistent. Only 4.1% would change supplier or sugar type, 3.6% would reduce quality or alter ingredients, and 2.7% would reduce production or temporarily close. Another 2.7% selected another response.

The limited use of supplier switching is notable given the earlier evidence that many firms reported knowing alternative suppliers. This suggests that changing supplier may not be

an immediate or practical response to a sugar-price increase. Alternative suppliers may face similar wholesale prices, may not have sufficient stocks, or may offer less favourable delivery and payment conditions.

Figure 12: Firm responses to an increase in the price of sugar



Notes: The figure reports the percentage of firms selecting each potential response to an increase in the price of sugar. The analytical sample contains 221 firms with valid responses. Respondents could select more than one response; consequently, percentages do not sum to 100%.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Speed of final-product price adjustment. Figure 13 shows that firms generally expected to adjust their own prices relatively quickly after an increase in the price of sugar. Approximately 66.1% of firms reported that they would change final-product prices in less than one week, while a further 19.5% would do so within one to four weeks. Taken together, 85.6% of firms expected to adjust prices within one month.

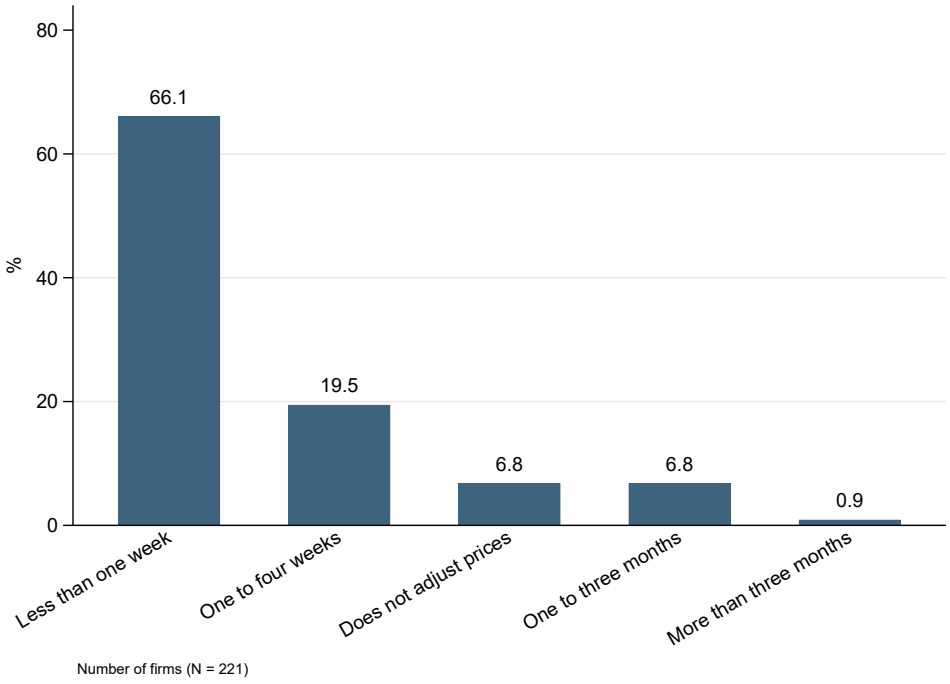
Only 6.8% expected the adjustment to take between one and three months, and 0.9% reported a delay of more than three months. Another 6.8% stated that they would not adjust prices. The predominance of short adjustment periods indicates that increases in sugar costs may be transmitted to final-product prices rapidly.

The speed of adjustment is consistent with the high proportion of firms indicating that

they would increase selling prices. It also suggests that temporarily absorbing the cost is generally a short-run response rather than a permanent strategy. Firms with limited margins or working capital may be unable to maintain unchanged prices for long when their input costs rise.

Nevertheless, adjusting prices within one week does not imply that firms pass through the entire sugar-price increase. Some may combine a partial price increase with smaller product sizes, lower margins, changes in ingredients, or reduced production. The timing results therefore describe how quickly firms respond, but not the exact size of the resulting price adjustment.

Figure 13: Time required to adjust final-product prices



Notes: The figure reports the percentage distribution of firms according to the time they expected to require to adjust final-product prices after an increase in the price of sugar. Categories are mutually exclusive and percentages are calculated over 221 firms with valid responses.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Capacity to reduce or substitute sugar use. Table 8, Panel A, reports firms' capacity to adjust quantities, inputs, prices, and business activity. All 105 firms with valid responses to the relevant question indicated that reducing sugar use was commercially or technically viable. This result applies to the routed subsample answering the question and should not be interpreted as establishing that all firms in the full sample can reduce sugar use without

significant costs.

Similarly, all 21 firms with valid responses reported that a technically viable substitute existed. The small denominator indicates that this finding relates to a restricted group of firms for which substitution was considered relevant. A technically possible substitute may also differ from sugar in cost, product quality, taste, consumer acceptance, or ease of use. Technical feasibility should therefore not be interpreted as costless substitution.

All 50 firms in the corresponding routed subsample reported having changed final-product prices, while all 30 firms answering the activity-reduction question reported reducing production or sales. Among the 19 firms reporting the duration of reduced activity, the average reduction lasted 17.4 days. These outcomes indicate that adjustment may involve substantial changes in both prices and the scale of business operations.

Panel B examines firms' expected quantitative response to a hypothetical 50% increase in the price of sugar. Approximately 44.8% stated that they would reduce sugar use by more than 25%, while 28.6% would reduce use by up to 10%. By contrast, 13.0% would not reduce sugar use, and 13.5% did not know how they would respond.

These responses indicate considerable heterogeneity in firms' capacity to adjust. Some firms expect a large contraction in sugar use, while others report little or no ability to reduce consumption. The latter group may include firms for which sugar is indispensable to the principal product or activity. The results also show that technical viability alone does not determine adjustment: the magnitude of the response will depend on demand, production requirements, product standards, and the availability and cost of substitutes.

Reported changes in final-product prices. Panel C reports distributional statistics for the magnitude of observed final-product price changes. The median reported increase was 5%, the 25th percentile was also 5%, and the 75th percentile was 10%. These statistics suggest that the typical reported adjustment was relatively moderate.

However, the reported mean of 1,595.2% and maximum of 68,000% are not economically credible as percentage changes without additional verification. They indicate that one or more observations may have been recorded in a different unit, entered as a monetary amount rather than a percentage, or otherwise miscoded. The mean should therefore not be interpreted substantively in its current form.

Table 8: Capacity to absorb or adapt to higher sugar prices

Panel A. Adjustment capacity and observed responses

	Full sample	Other firms	Larger F2F firms
Reducing sugar use is commercially or technically viable (%)	100.0 (105)	100.0 (101)	100.0 (4)
Technically viable substitute exists (%)	100.0 (21)	100.0 (21)	–
Changed final-product prices (%)	100.0 (50)	100.0 (50)	–
Reduced production or sales activity (%)	100.0 (30)	100.0 (30)	–
Number of days activity was reduced	17.4 (19)	17.4 (19)	–

Panel B. Expected response to a 50 percent sugar-price increase

Category	Full sample	Other firms	Larger F2F firms
Would not reduce sugar use	13.0	12.4	33.3
Would reduce sugar use by up to 10%	28.6	29.0	16.7
Would reduce sugar use by more than 25%	44.8	44.6	50.0
Does not know	13.5	14.0	0.0
N	192	186	6

Panel C. Distribution of reported final-product price changes

Variable	Statistic	Full sample	Other firms	Larger F2F firms
Change in final-product prices (%)	Mean	1595.2	1595.2	.
	Median	5.0	5.0	.
	P25	5.0	5.0	.
	P75	10.0	10.0	.
	Minimum	2.0	2.0	.
	Maximum	68000.0	68000.0	.
	N	43	43	0

Notes: Panel A reports means for continuous outcomes and percentages for binary indicators. Numbers in parentheses are the variable-specific numbers of valid observations. Questions were administered to relevant routed subsamples; percentages should therefore not be interpreted as applying to the full sample. Panel B reports column percentages across mutually exclusive responses to a hypothetical 50% sugar-price increase. Panel C reports the mean, median, interquartile range, minimum, maximum, and number of valid observations for reported final-product price changes. The exceptionally large mean and maximum in Panel C indicate unresolved extreme values or possible unit inconsistencies. These statistics should be treated as provisional until the underlying observations are verified. Comparisons involving the larger face-to-face firms are descriptive.

Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

The results indicate that firms would respond to higher sugar prices primarily by increasing final-product prices, and that most expect to do so within one month. Smaller product sizes and temporary cost absorption provide secondary adjustment mechanisms, while changes in suppliers, ingredients, quality, or production are less common.

At the same time, the expected response to a 50% price increase shows that some firms would substantially reduce sugar use. This suggests that sufficiently large price increases may affect not only consumer prices but also firms' demand for sugar, production levels, and product characteristics.

The findings therefore point to relatively rapid cost pass-through combined with heterogeneous real adjustments. Firms with greater pricing power may pass the increase on to customers, while firms facing stronger competition or technical constraints may reduce quantities, margins, or activity. The final effect of a sugar-price increase will consequently depend on both the speed of price adjustment and firms' capacity to reorganize production or sales.

3.9 Market Access, Transport, and External Shocks

Physical access to suppliers is an important component of the effective cost of purchasing sugar. Firms located far from their principal purchase points may face higher transport expenditure, longer restocking times, and greater exposure to road disruptions, floods, fuel-price increases, and other shocks. These constraints may affect not only the price paid for sugar but also firms' ability to maintain inventories and respond quickly when their usual supplier is unavailable. This subsection examines travel time to principal purchase locations, perceived changes in access conditions, the incidence and severity of transport shocks, and the resulting increases in transport costs.

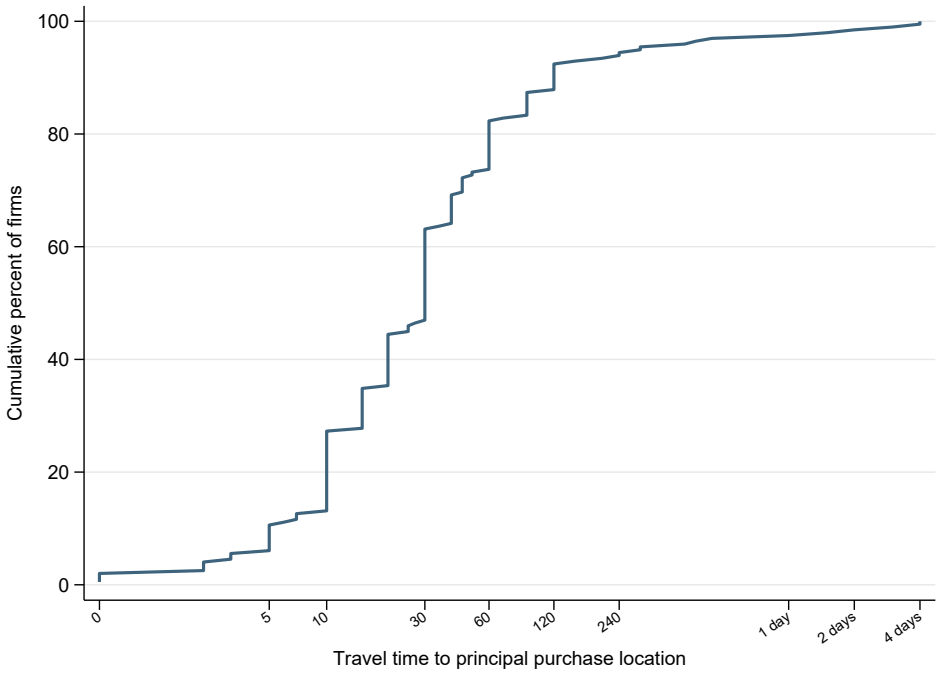
Travel time to the principal purchase location. Table 9, Panel A, shows that the average reported travel time to the principal sugar-purchase location was 159.1 minutes among 198 firms with valid information. The corresponding average was 163.0 minutes among the other surveyed firms, compared with 34.5 minutes among the six larger firms interviewed face-to-face. The difference suggests that the larger firms may purchase from more accessible or better-connected locations, although the comparison is descriptive and based on only six larger firms.

The mean of 159.1 minutes should not be interpreted as the travel time faced by a typical

firm. Figure 14 shows a strongly uneven distribution, with a substantial concentration of firms reporting relatively short journeys and a smaller number reporting travel times extending to one or more days. These very long journeys increase the average considerably. The cumulative distribution rises most sharply between approximately 20 minutes and two hours, but a long upper tail remains beyond this range.

This pattern indicates substantial heterogeneity in firms' physical access to sugar suppliers. Some firms operate close to established commercial centres, while others must travel for several hours or longer to restock. Firms in the latter group are likely to face higher direct transport costs, greater time losses, and more difficulty responding rapidly to stockouts or changes in supplier availability.

Figure 14: Travel time to the principal sugar-purchase location



Notes: The figure presents the cumulative distribution of reported travel time to firms' principal sugar-purchase locations. The vertical axis shows the cumulative percentage of firms whose reported travel time is less than or equal to each value on the horizontal axis. The sample contains firms with valid travel-time responses. The horizontal scale includes minutes and longer intervals extending to several days.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Perceived changes in access conditions. Panel B reports firms' assessments of whether obtaining sugar on favourable commercial terms had become easier or more difficult. Half of the 212 firms with valid responses stated that access had become easier, while a further

15.6% considered it much easier. Taken together, 65.6% therefore reported an improvement in access conditions.

Approximately 18.4% perceived no clear change, describing access as neither easier nor more difficult. By contrast, 12.7% considered access more difficult and 3.3% considered it much more difficult. Thus, although most firms reported improvement, approximately one in six experienced worsening access conditions.

The distribution differs somewhat among the six larger face-to-face firms. Only 33.4% reported easier or much easier access, while 50.0% reported no clear change and 16.7% considered access more difficult. Given the very small number of larger firms, these percentages should be treated as descriptive rather than as evidence of a systematic difference by firm size.

The majority reporting improved access may reflect greater supplier availability, stronger commercial networks, or changes in distribution arrangements. However, the minority reporting increased difficulty remains economically important because these firms may face geographic isolation, limited supplier choice, higher transport costs, or deteriorating road conditions.

Incidence and severity of transport and access shocks. Panel A indicates that 79 firms answered the routed question on whether they had experienced a transport or access shock, and all reported that such a shock had occurred. Similarly, all 70 firms in the relevant district-shock subsample reported exposure to a district-level shock. These values should not be interpreted as showing that every surveyed firm experienced these shocks. Rather, they reflect the conditional subsamples to which the follow-up questions were administered.

Panel C shows that the severity of transport and access shocks varied considerably. Among the 79 firms with valid severity responses, 40.5% classified the shock as severe, 24.1% as moderate, and 35.4% as mild. Thus, almost two-thirds of affected firms described the shock as moderate or severe.

Among the other surveyed firms, 41.6% reported severe shocks, while the two larger face-to-face firms with valid responses classified their shocks as either mild or moderate. Once again, the latter comparison is based on too few observations to support a broader conclusion.

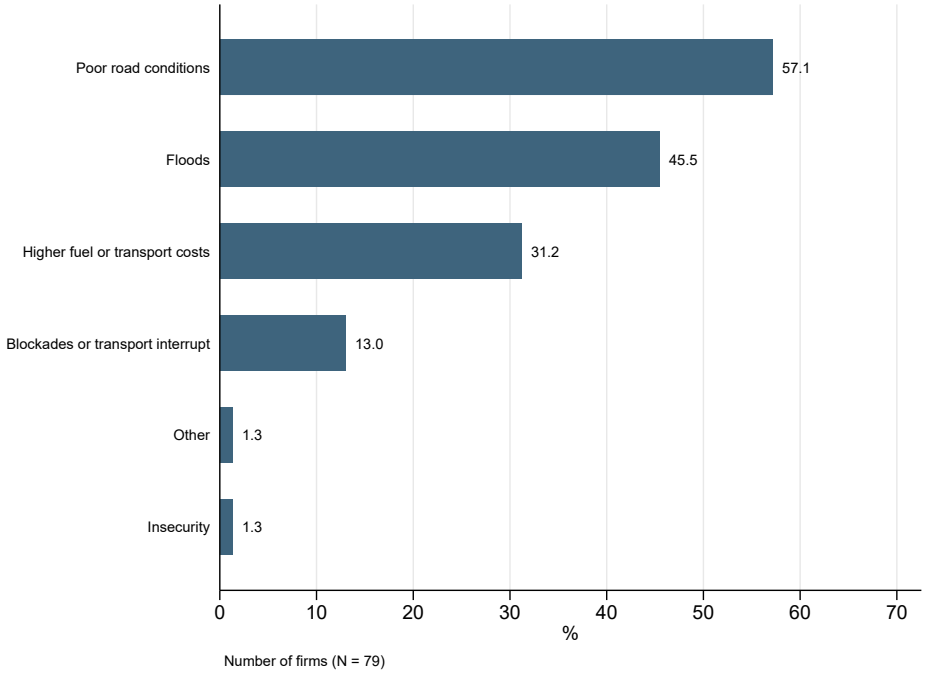
Types of transport and access shocks. Figure 15 shows that poor road conditions were the most frequently reported transport constraint, affecting 57.1% of the 79 firms in the

relevant subsample. Floods were reported by 45.5%, while 31.2% identified higher fuel or transport costs. Blockades or transport interruptions were reported by 13.0%, and insecurity and other shocks were each mentioned by 1.3%.

The prominence of poor roads and floods indicates that physical infrastructure and weather conditions are major determinants of access to sugar. These shocks may lengthen travel times, interrupt deliveries, increase vehicle operating costs, and prevent firms from reaching their normal suppliers. Their effects may be especially severe for firms operating in areas where only one practical route or transport service is available.

Higher fuel and transport costs were also reported by almost one-third of affected firms. Unlike floods or blockades, cost increases may not completely prevent a purchase, but they raise the effective price of sugar and may reduce the quantities firms can afford to transport. Transport shocks can therefore affect firms through both availability and cost channels.

Figure 15: Transport and access shocks affecting sugar purchases



Notes: The figure is restricted to 79 firms reporting a transport or access shock and providing valid information on its type. Bars show the percentage of firms selecting each category. Respondents could report more than one shock; consequently, percentages do not sum to 100%.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

Transport-cost increases following shocks. Panel D reports the distribution of percentage increases in transport costs following a shock. Among the 36 firms with valid information,

the median reported increase was 47.5%. The 25th percentile was 10.0%, while the 75th percentile was 250.0%. These statistics indicate that transport shocks produced substantial cost increases for many affected firms, although the magnitude varied widely.

The reported mean was 4,227.6%, and the maximum reached 125,000%. These values are driven by extreme observations and should not be interpreted as representative of the typical firm. They may reflect genuine cases in which the initial transport cost was extremely low, but they may also result from respondents entering absolute monetary amounts instead of percentage changes, differences in the unit reported, or data-entry errors.

Before publication, the original observations used to construct `transport_cost_incr_v` should therefore be reviewed. Until these extreme values are verified, the median and interquartile range provide a more reliable description of the central distribution than the mean.

The single larger face-to-face firm with valid information reported a 20.0% transport-cost increase. Because this subgroup contains only one observation, it should not be compared directly with the other firms.

Table 9: Market access and transport constraints, by firm group

Panel A. Travel time and exposure to transport or district shocks

	Full sample	Other firms	Larger F2F firms
Travel time to principal purchase location (minutes)	159.1 (198)	163.0 (192)	34.5 (6)
Experienced a transport or access shock (%)	100.0 (79)	100.0 (77)	100.0 (2)
Experienced a district-level shock (%)	100.0 (70)	100.0 (66)	100.0 (4)

Panel B. Difficulty obtaining sugar on favourable terms

Category	Full sample	Other firms	Larger F2F firms
Much easier	15.6	15.5	16.7
Easier	50.0	51.0	16.7
Neither easier nor more difficult	18.4	17.5	50.0
More difficult	12.7	12.6	16.7
Much more difficult	3.3	3.4	0.0
N	212	206	6

Panel C. Severity of transport and access shocks

Category	Full sample	Other firms	Larger F2F firms
Mild	35.4	35.1	50.0
Moderate	24.1	23.4	50.0
Severe	40.5	41.6	0.0
N	79	77	2

Panel D. Distribution of transport-cost increases following shocks

Variable	Statistic	Full sample	Other firms	Larger F2F firms
Increase in transport costs following shock (%)	Mean	4227.6	4347.8	20.0
	Median	47.5	50.0	20.0
	P25	10.0	10.0	20.0
	P75	250.0	300.0	20.0
	Minimum	0.0	0.0	20.0
	Maximum	125000.0	125000.0	20.0
	N	36	35	1

Notes: Panel A reports mean travel time and shock incidence; numbers in parentheses are variable-specific valid observations. Panels B and C report column percentages across mutually exclusive response categories. Panel D reports distributional statistics for transport-cost increases following shocks. Its mean and maximum are strongly affected by extreme observations and should be interpreted cautiously. Routed subsamples and comparisons involving the six larger face-to-face firms are descriptive.

Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

The results show that physical access to sugar suppliers varies substantially across firms. While many businesses reach their principal purchase location within a relatively short period, others face journeys lasting several hours or even days. These longer travel times increase the costs of restocking and reduce firms' ability to respond quickly to supply interruptions.

Transport and access shocks are also economically important. Poor roads, floods, and higher transport costs were the most common problems, and a large share of affected firms classified the shocks as severe. The median increase in transport costs following a shock was substantial, even though extreme observations make the mean unreliable.

Taken together, these findings indicate that market access depends not only on the number of suppliers formally available but also on firms' ability to reach them under reliable and affordable transport conditions. Improvements in road infrastructure, resilience to floods, transport services, and the geographic distribution of supply points may therefore reduce both direct purchasing costs and firms' vulnerability to stockouts.

3.10 Larger Face-to-Face Firms and Other Surveyed Firms

The six larger firms interviewed face-to-face differ substantially from the remaining surveyed firms in scale, purchasing requirements, and organizational structure. Comparing these groups is useful because market reforms, supplier disruptions, and sugar-price changes may affect larger firms differently from smaller retailers and productive users. Larger firms may purchase greater quantities, rely on more formal supply arrangements, and possess stronger bargaining capacity, but they may also be more exposed to interruptions because of the scale of their operations. This subsection provides a descriptive comparison of the two groups across firm size, sugar quantities, supplier relationships, prices, stockouts, and adjustment behaviour.

Table 10 confirms that the larger face-to-face firms represent a distinct segment of the sample. They employed an average of 100.5 full-time workers, compared with only 4.0 workers among the other surveyed firms. The full-sample average of 6.5 workers is therefore strongly influenced by the six larger businesses.

Differences in sugar use are also substantial. Among productive-input users with valid responses, the larger firms used an average of 28,185 kilograms of sugar per month, compared with 319.6 kilograms among the other firms. This difference reflects the much greater production scale of the larger businesses. However, the estimate for the larger group

is based on only five valid observations and should therefore be interpreted cautiously.

For sugar purchased for resale, the single larger firm with valid information reported monthly sales of 12,000 kilograms, compared with an average of 1,665 kilograms among 111 other firms. Since the larger-firm estimate is based on one observation, it should not be treated as representative of all six larger firms.

Supplier use appears more similar across groups. The larger firms used an average of 2.4 suppliers during the previous 12 months, compared with 2.9 among other surveyed firms. Nevertheless, their purchases were more concentrated in the principal supplier. On average, the principal supplier accounted for 78.0% of purchases among the five larger firms with valid responses, compared with 62.2% among the other firms.

This pattern suggests that larger firms did not necessarily diversify their purchases more widely despite operating at a greater scale. Their higher concentration may reflect the need for suppliers capable of delivering larger quantities, meeting specific quality requirements, or maintaining regular delivery schedules. The number of suppliers alone therefore does not fully capture effective supplier dependence.

Reported purchase prices were moderately higher among the larger firms. The average was 91.8 MZN/kg among five larger firms, compared with 85.5 MZN/kg among 176 other firms. This difference could reflect variation in sugar type, quality, delivery arrangements, location, purchase timing, or contractual conditions. Because the larger firms were purposively selected and the subgroup is small, the difference should not be interpreted as evidence that larger firms systematically pay higher prices.

Stockout incidence was similar across groups. Approximately 16.7% of the six larger firms reported experiencing a sugar stockout, compared with 17.4% of the other surveyed firms. This suggests that supply interruptions were not limited to small businesses. However, the operational consequences of a stockout may differ substantially by firm size, since a disruption affecting a larger productive user may involve much greater quantities, employment, and output.

All firms in the relevant routed subsamples reported changing their principal supplier during the previous 12 months. This includes 48 other firms and one larger face-to-face firm. These percentages should not be interpreted as showing that every firm in either group changed supplier, because the question was answered only by the applicable routed subsample.

Differences are more visible in willingness to pay for reliable supply. Among the five larger firms with valid responses, none reported a positive willingness to pay an additional amount

for guaranteed supply, compared with 38.5% among the other surveyed firms. This result may indicate that larger firms expect reliability to be provided through existing commercial arrangements rather than through a higher per-kilogram price. It may also reflect differences in bargaining power, procurement practices, or the limited size of the subgroup.

By contrast, all firms in the relevant contract-preference subsamples reported willingness to sign a sugar-supply contract. The result applies to 157 other firms and four larger firms. This widespread willingness is consistent with the value firms place on fixed prices, guaranteed delivery, and improved credit conditions.

Finally, all 50 firms with valid responses reported having changed final-product prices, but none of the larger firms provided valid information for this variable. It is therefore not possible to compare price-adjustment behaviour across the two groups using this outcome.

Table 10: Larger face-to-face firms and other surveyed firms

	Full sample	Other firms	Larger F2F firms
Full-time workers	6.5 (225)	4.0 (219)	100.5 (6)
Monthly sugar used as input (kg)	6124.9 (24)	319.6 (19)	28185.0 (5)
Monthly sugar sales (kg)	1757.2 (112)	1665.0 (111)	12000.0 (1)
Suppliers used in previous 12 months	2.9 (180)	2.9 (175)	2.4 (5)
Purchases from principal supplier (%)	62.8 (124)	62.2 (119)	78.0 (5)
Purchase price (MZN/kg)	85.7 (181)	85.5 (176)	91.8 (5)
Experienced a sugar stockout (%)	17.3 (225)	17.4 (219)	16.7 (6)
Changed principal supplier in previous 12 months (%)	100.0 (49)	100.0 (48)	100.0 (1)
Positive willingness to pay for reliable supply (%)	37.3 (161)	38.5 (156)	0.0 (5)
Willing to sign a supply contract (%)	100.0 (161)	100.0 (157)	100.0 (4)
Changed final-product prices (%)	100.0 (50)	100.0 (50)	–

Notes: The larger face-to-face group comprises six purposively selected firms whose survey identifiers begin with "P". Means are reported for continuous variables and percentages for binary indicators; numbers in parentheses are variable-specific valid observations. Several outcomes are based on routed subsamples, and some larger-firm estimates rely on only one to five responses. All comparisons are descriptive and should not be interpreted as causal effects of firm size or interview mode.
Source: Authors' calculations based on the Survey of Sugar-Consuming and Sugar-Reselling Firms (2026).

The comparison shows that the six larger face-to-face firms differ most clearly from the

remaining sample in employment and the quantities of sugar used. Their operations are substantially larger, but they do not appear to use more suppliers and may rely more heavily on their principal supplier.

At the same time, the small number of larger firms and the limited valid-response counts for several outcomes prevent strong conclusions. The comparison is most useful for showing that aggregate sample averages combine businesses operating at very different scales. Subsequent findings should therefore be interpreted primarily as describing the broader sample of smaller firms, while the larger businesses provide complementary descriptive evidence about a distinct market segment.

4 Conclusion

This report examined the structure and functioning of the sugar market from the perspective of firms that use sugar as a productive input or purchase it for resale. Based on a survey of 225 firms, the analysis considered the economic importance of sugar, supplier relationships, purchasing conditions, stockouts, transport constraints, expectations regarding the ARC decision, preferences for reliable supply, and firms' responses to higher sugar prices. Six purposively selected larger firms were also interviewed face-to-face and described separately from the predominantly smaller businesses in the remainder of the sample.

The findings confirm that sugar is economically important to both productive users and resellers. Approximately four-fifths of firms in each group described sugar as either indispensable or important to their principal activity. Changes in its price, availability, or delivery conditions may therefore affect production, sales, inventories, cash flow, customer relationships, and final-product prices.

The survey also reveals meaningful supplier dependence. Firms used an average of 2.9 suppliers during the previous 12 months, but the principal supplier accounted for 62.8% of purchases on average. More than one-third of firms used only one supplier, while 44.4% obtained at least three-quarters of their purchases from their principal supplier. Although most firms reported knowing at least one realistic alternative, some indicated that replacing the current supplier would require more than 30 days or would not be possible. Effective supplier choice therefore depends not only on the number of suppliers formally available, but also on whether firms can access them quickly and under acceptable commercial conditions.

Most surveyed firms purchase through wholesalers, retailers, and other downstream intermediaries rather than directly from producers, refineries, or importers. These intermediaries

may offer proximity, smaller quantities, and lower direct transport requirements, but reliance on similar channels may limit bargaining power and the independence of available alternatives. Greater competition should therefore be assessed through firms' practical ability to compare and change suppliers rather than through supplier counts alone.

The central purchase-price distribution was relatively concentrated, with a median of 85 MZN/kg, but firms reported meaningful differences across suppliers. Transport costs were considerably more dispersed, while payment at the time of purchase was the dominant arrangement. These findings indicate that the effective cost of sugar extends beyond the quoted price and includes transport, liquidity requirements, delivery conditions, and the time needed to establish a replacement supply relationship.

Supply reliability is also an important dimension of market performance. Stockouts were reported by 17.3% of firms and, among affected businesses, frequently disrupted normal activity, reduced production or sales, caused temporary stoppages, and led to emergency purchases or customer losses. The results therefore show that average prices alone provide an incomplete measure of market conditions. A relatively low regular price may offer limited benefit when supply is uncertain and interruptions impose substantial indirect costs.

Firms' preferences reflect this concern with reliability. Most were unwilling to pay a large premium for guaranteed supply, although more than one-third expressed a positive willingness to pay. Fixed prices and guaranteed delivery were the most frequently preferred contractual conditions, followed by improved credit terms. Firms therefore appear to favour predictable commercial arrangements rather than reliability obtained through substantially higher spot-market prices.

Sugar-price increases are also likely to be transmitted rapidly downstream. Approximately 81.0% of firms reported that they would raise final-product prices, and 85.6% expected to adjust within one month. Other responses included reducing product size, temporarily absorbing the increase, changing suppliers, modifying ingredients, or reducing activity. A sufficiently large price increase may therefore affect consumers through both higher prices and changes in product quantity, composition, and availability.

Transport and market access remain important constraints. Some firms reported improved access to sugar, but others faced long journeys, poor roads, floods, and higher fuel or transport costs. These conditions increase restocking costs and reduce firms' ability to respond when their regular supplier is unavailable. Supplier entry will consequently generate limited benefits where physical access remains costly or unreliable.

The results also identify a substantial information gap regarding the ARC decision. Only

8.9% of firms had heard about it, even though 62.5% expected the sugar-distribution system to change significantly by 2027. Firms strongly supported greater price transparency and the entry of additional suppliers, but many were concerned that market changes could increase instability. Implementation should therefore be accompanied by clear communication on the content, timing, and practical implications of the reform.

Monitoring should extend beyond average prices to include supplier entry, concentration of purchases, payment conditions, delivery reliability, stockouts, transport costs, and firms' ability to change suppliers. Transparent supply agreements specifying prices, delivery commitments, payment conditions, and procedures for non-delivery may also reduce uncertainty. Such arrangements should remain accessible to small firms and avoid requirements that effectively exclude them.

The six larger face-to-face firms operated at a substantially greater scale, but did not appear to use more suppliers and were more concentrated in their principal supplier. These comparisons are informative but should be interpreted cautiously because the firms were purposively selected and several outcomes are based on very small valid-response counts.

Several limitations remain. The analysis is descriptive and does not identify causal effects. Many variables are observed only for routed subsamples, the sample is dominated by downstream retailers, and some reported percentage changes contain unresolved extreme values or possible unit inconsistencies. The survey should therefore be understood as a baseline description rather than a complete evaluation of the reform.

In sum, improving the functioning of the sugar market requires more than increasing the formal number of suppliers. Firms benefit when alternatives are operationally accessible, prices and commercial conditions are transparent, deliveries are reliable, payment requirements are manageable, and transport networks permit affordable and timely restocking. The benefits of the ARC decision will consequently depend on effective implementation, communication, and monitoring of both competition and supply reliability.

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A Multivariate Analysis

The descriptive analysis reveals several relationships that warrant further examination. Firms with fewer suppliers appear more exposed to stockouts, firms experiencing supply disruptions report a greater willingness to pay for reliable supply, and dependence on the principal supplier may be associated with differences in prices, access to alternatives, and operational vulnerability. Since these patterns may also reflect differences in firm size, economic activity, location, transport conditions, and business model, a parsimonious multivariate analysis can be used to assess whether they remain after conditioning on observable firm characteristics.

Supplier dependence, prices, stockout exposure, and purchasing arrangements are jointly determined and may respond to unobserved factors such as managerial capacity, supplier quality, bargaining power, local infrastructure, and demand conditions. Estimated coefficients should therefore be interpreted as conditional associations rather than as the effects of exogenous changes in supplier structure or market conditions.

Empirical framework. For firm i, the baseline specification is:

$$\begin{aligned} Y_i = \alpha + \beta_1 \text{Dependence}_i + \beta_2 \text{Suppliers}_i + \beta_3 \text{TransportShock}_i \\ + \beta_4 \ln(\text{FirmSize}_i + 1) + \beta_5 \text{F2FLarge}_i + \boldsymbol{\delta}' \mathbf{X}_i + \mu_p + \varepsilon_i. \end{aligned} \tag{4}$$

The dependent variable Y_i varies across specifications and may represent stockout incidence, purchase price per kilogram, positive willingness to pay for reliable supply, availability of a realistic alternative supplier, or operational disruption. The variable Dependence_i indicates that at least 75% of purchases are obtained from the principal supplier, while Suppliers_i measures the number of suppliers used during the previous 12 months. The term TransportShock_i captures exposure to a transport or access shock, and firm size is measured by the logarithm of the number of full-time workers plus one. The vector $\mathbf{X}_i$ contains a limited set of additional controls, and μ_p denotes province fixed effects.

The coefficient on F2FLarge_i should not be interpreted as a pure interview-mode effect. The indicator also identifies six purposively selected larger firms that differ from the remaining sample in scale and organizational structure. Its inclusion is intended to prevent these observations from mechanically driving the main coefficients.

Binary outcomes may be estimated using a linear probability model with heteroskedasticity-robust standard errors:

$$\Pr(Y_i = 1 \mid \mathbf{Z}_i) = \alpha + \mathbf{Z}_i' \boldsymbol{\theta} + \mu_p + \varepsilon_i, \tag{5}$$

where $\mathbf{Z}_i$ contains the explanatory variables in equation (4). Logit models may be estimated as a robustness exercise. For purchase prices, the preferred specification uses the natural logarithm of the valid price per kilogram:

$$\ln(P_i) = \alpha + \mathbf{Z}_i'\boldsymbol{\theta} + \mu_p + \varepsilon_i. \tag{6}$$

The logarithmic transformation limits the influence of extreme observations and permits an approximate percentage interpretation of coefficients. Results should also be estimated in levels to assess whether conclusions depend on the functional form.

Supplier concentration should be represented by alternative measures in separate specifications rather than entered simultaneously. These measures include the high-dependence indicator, the continuous share of purchases obtained from the principal supplier, the number of suppliers used, and the number of realistic alternatives. Estimating them separately reduces multicollinearity and clarifies interpretation.

The baseline control set should remain limited because several outcomes have fewer than 225 valid observations. Appropriate controls include firm size, business-use type, years associated with the firm, travel time to the principal purchase location, exposure to transport shocks, principal economic activity, and province fixed effects. Variables that substantially reduce the analytical sample should be introduced only in extended specifications.

Two complementary analyses are particularly relevant. First, stockout incidence can be related to supplier diversification and the availability of realistic alternatives. Second, positive willingness to pay for reliable supply can be related to previous stockout exposure, operational disruption, and emergency purchasing:

$$\begin{aligned}\text{PositiveWTP}_i = \alpha &+ \beta_1 \text{Stockout}_i + \beta_2 \text{OperationalDisruption}_i \\ &+ \beta_3 \text{EmergencyPurchase}_i + \boldsymbol{\delta}'\mathbf{X}_i + \mu_p + \varepsilon_i.\end{aligned} \tag{7}$$

A further specification may examine whether purchase prices vary systematically with supplier type, transport inclusion, payment conditions, and quantities purchased:

$$\begin{aligned}\ln(P_i) = \alpha &+ \beta_1 \text{SupplierType}_i + \beta_2 \text{TransportIncluded}_i + \beta_3 \text{PaymentTerms}_i \\ &+ \beta_4 \ln(\text{Quantity}_i + 1) + \boldsymbol{\delta}'\mathbf{X}_i + \mu_p + \varepsilon_i.\end{aligned} \tag{8}$$

This specification should be estimated only after confirming that prices, quantities, and transport variables are expressed in consistent units.

The preferred empirical sequence is to begin with a bivariate specification, then add firm characteristics, supplier and transport controls, and finally province fixed effects. Robustness checks should compare the full sample with a sample excluding the six larger face-to-face firms, replace the high-dependence indicator with alternative concentration measures, and compare linear probability estimates with logit marginal effects.

Each regression should report the analytical sample size, the mean of the dependent variable, the included control set, and whether province fixed effects are used. Non-substantive codes such as -98 and -99 must be converted to missing values before estimation. Variables with unresolved unit inconsistencies or implausible extreme values should not be used as

dependent variables until their construction is verified.

The results should be interpreted in terms of conditional associations. Supplier diversification may reduce stockout risk, but stockouts may also encourage firms to seek additional suppliers. Likewise, firms may pay higher prices because of limited bargaining power or because they deliberately purchase more reliable supply. Terms implying causality should therefore be avoided unless a credible source of exogenous variation becomes available.



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