Understanding fresh produce supply chain dynamics and price wedges

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- Sale of fresh produce from auction to retail involves margins retained by intermediary agents, potentially increasing the price paid by the final consumer.
- Evidence from previous research suggests that farmers receive only 57% of the auction price.
- Focusing on the sale of three staple vegetables – potatoes, onions, and tomatoes – at the Badami Bagh market in Pakistan, this study tracks price wedges from wholesale auctions to retail and consumer prices.
- Findings indicate a substantial wedge between the farmgate and final consumer prices, which can be explained by margins retained by wholesalers, bulk-breakers, and retailers.
- Reducing the storage and transportation costs of middlemen could potentially lead to lower final consumer prices.

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Introduction

In an earlier work, we examined the potato supply chain in Punjab, Pakistan, from the farmgate to the wholesale market in order to determine the impact of exogenous demand shocks such as COVID-19 on the price shares received by farmers and middlemen. Results suggested that middlemen (commission agents who were responsible for the wholesale of farmers' produce in the market) retained 53% of the auction price, a proportion that increased to 65% due to pandemic-induced demand shocks. This study expands on the previous research and broadens its scope by closely documenting the supply chains from the wholesale market to the final consumer of three staple vegetables – onions, potatoes, and tomatoes. Our study is based on observational data from transactions conducted between middlemen and retailers at the Badami Bagh market, which is a major hub for fresh produce-related transactions receiving produce supply from all over the country. The three vegetables that we focus on are an important part of the daily staple diets of many Pakistani households.

The fresh produce supply chain usually starts with the farmer procuring agriculture inputs, planting, and selling the harvest to a commission agent who keeps a share of the sale price. The commission agent – locally referred to as an *aarti* – is a wholesale auctioneer registered with local market authorities. They auction off the fresh produce in lots sorted by quality to the highest bidder. The highest bidder is another middleman, known locally as a *pharia*, who sorts the produce they have purchased into different categories or grades based on visible characteristics such as size, colour, extent of rot, etc. The *pharia* acts as the bulk breaker, selling the produce to retailers. Retailers – big supermarkets, shop owners, and small street vendors – sell the produce to the final consumer. Each intermediary in this supply chain retains a portion of the final price to cover their costs and profits.

In order to fully map the supply chain from the auction to the retailer, we trace each product in our sample from the auction yard, to the *pharia,* to the retailer, and finally to the consumer. Table 1 describes the transaction-level data used in our analysis. For each transaction, we calculate the price margins retained by each entity for each vegetable under consideration to determine the impact on consumer surplus. For each intermediary agent, margins are calculated as the percentage charged above the purchase price paid by the agent to the preceding intermediary.

TABLE 1 – Data sources used in the analysis

Data source	Explanation
Auction data survey	Recorded 751 auctions for potatoes, onions, and tomatoes between 30 May 2022 and 8 March 2023 from Badami Bagh Mandi, Lahore.
Pharia data survey	Recorded 1,965 transactions between *pharias* and retailers for potatoes, onions, and tomatoes between May 2022 and 8 March 2023 from Badami Bagh Mandi, Lahore.
Retailer interview calls	Traced consumer prices of 487 *pharia*-retailer transactions between 31 October 2022 and 8 March 2023. Of these, 130 were further reconfirmed via mystery shopping and the remaining ones were reconfirmed through interview calls.

Findings

The study primarily combines three main data sources (auction data, *pharia* data, and retailer data) in order to determine the price margins retained by each entity in the supply chain. On average, for onions, the *pharias* retain a margin of 18.6% on top of the auction prices received by the *aarti*, while retailers keep a margin of 14.9% on average over what they pay the *pharia*. For potatoes, the retail margin is high – at almost 40% as opposed to a 15% margin for the *pharias*. Conversely, for tomatoes, we can see that *pharias* are responsible for keeping a significant margin of 49.5% versus a 30% retailer margin.

Empirical results from transaction-level data also highlight other correlates that influence the margins for *pharias* and retailers, respectively. The price of produce is dependent on crop quality, which consequently influences *pharia* and retailer margins. For medium or low-quality produce, *pharia* margins tend to decrease considerably since low-quality produce will have to be sold at relatively lower prices to retailers. For medium-quality produce, the retailer margin is higher, which could be attributed to consumer willingness to pay a premium for quality.

Overall, we find that controlling for quality, the total margin charged from auction to consumer price for all three products is non-trivial at 31%, 53%, and 83% for onions, potatoes, and tomatoes, respectively. Product wastage, transport, and other costs likely lead to variations in margins across different products.

Policy recommendations

- Results indicate that intermediaries at the wholesale markets (*pharias*) charge a significant margin on top of the wholesale prices, some of which is passed along to the consumer in the form of higher prices. The margins are product-specific, potentially due to product type and differing storage, wastage, and transport costs incurred by the intermediaries.
- These findings imply that, in addition to the price control efforts by policymakers at the consumer end, improving infrastructure at wholesale markets could also potentially reduce the margins charged by intermediaries, leading to lower consumer prices.
- At the retailer end, initiatives to reduce transport and wastage costs can similarly lead to cost savings, trickling down to lower prices for consumers.
- Future research can test whether interventions that improve the functionalities of wholesale markets, including proper storage facilities to reduce wastage and initiatives to reduce the per kg costs incurred by retailers, can help stabilise consumer prices.