Quality upgrading and quality incentives in Uganda's coffee sector

Ameet Morjaria, Lauren Bergquist, Jie Bai

- This project studies how market structure affects incentives for quality upgrading along developing country supply chains via a field experiment in the coffee sector in Uganda.
- Partnering with a leading coffee procurement, processing, and marketing company in Uganda, the research team conducts a randomised control trial (RCT) aimed at generating exogenous variation in quality premiums at different points in the value chain.
- As part of the experiment, Uganda's largest exporter of coffee has offered randomly-selected traders (for example, intermediaries) different prices for high-quality coffee beans and for low-quality coffee beans.
- This generates exogenous variation in quality premiums offered to traders.
- The project examines how much of the quality premiums will get passed through to farmers and how the premiums will affect the traders and farmers' incentives to invest in quality.

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Motivation

Quality upgrading is often seen as key to growth in low- and middle-income countries (LMICs), in part because it enables producers to sell their products to global markets, which typically demand higher quality and offer a higher quality premium in return. However, despite these strong incentives coming from world markets, producers in LMICs often fall short of these quality standards (World Bank, 2020).

What barriers do producers in LMICs face to engage more in quality upgrading? The existing literature on quality upgrading has focused on firm-level barriers that may weaken firms' ability to upgrade. For instance, firms may lack information or know-how to improve their product, credit to invest in quality-enhancing inputs or equipment, or skilled workers to maintain and monitor quality.

There has been less work looking beyond individual firms to focus on the role of supply chains in transmitting quality incentives from the world markets to the producers. In many LMIC contexts, producers do not sell directly to world markets but instead sell through long domestic supply chains. In the context of agricultural exports, farmers sell to local traders, who then sell to exporters, and eventually to global buyers. Products may pass through several intermediaries before reaching world markets. In such settings, it is unclear whether upstream producers face the full world-market quality premium when selling at the farm gate. Do higher prices for higher-quality goods on the world market translate into higher prices for producers? And if not, why not?

Domestic supply chains and quality upgrading

This research project examines how domestic supply chains shape the transmission of quality incentives up the chain, from exporters to the farm gate, and how that affects the incentives to invest in quality along the chain. A key question is whether downstream intermediaries primarily engage in value extraction—by exerting market power and charging large markdowns—or value addition—by contributing to quality upgrading themselves as goods move downstream. This matters both for aggregate outcomes—how much high-quality production ultimately reaches export markets—and for the division of surplus between upstream producers and downstream intermediaries. It also shapes which types of domestic quality-upgrading policies are most likely to be effective.

Methodology

We tackle the research question through a combination of original data collection and a randomised experiment offering quality-specific production contracts to upstream producers and downstream intermediaries to study these issues in the context of Uganda's coffee markets.

In our setting, world markets offer large premiums for Ugandan coffee that is high quality—appropriately dried, defect-free, and clean—relative to low-quality coffee (Morjaria & Sprott, 2018). However, most Ugandan coffee farmers in our sample often do not engage in simple post-harvest upgrading to improve the quality of their coffee: drying the coffee to bring down moisture and sorting the coffee to remove defective beans and foreign matter.

To understand the role that market incentives play in producers' limited quality investment, we begin by mapping the market chains connecting farmers to the export gate. Because domestic agricultural trade is typically informal, with limited administrative data, we know little about chain length and quality premiums along the chain in these contexts. We therefore contribute by collecting original data to map these supply chains, starting with the largest coffee exporter in Uganda at the time, surveying its suppliers, then the suppliers of those suppliers, and so on, until we reach the farmer. We then collect high-frequency transaction-level data by visiting all actors along these chains every two weeks over the course of two harvest seasons to gather information on the date, price, and quantity for all transactions. We also ask agents to retain samples of their three largest sales and purchases during each visit, which we test in a lab we set up in the field to measure the three key physical-quality parameters relevant in this setting: coffee-bean defects, presence of foreign matter, and moisture level of the beans.

Findings

Two stylised facts emerge: (i) first, farmers have limited direct access to export markets, with coffee changing hands on average twice before reaching the export gate; (ii) second, the quality premium—defined as the gap in price for high- vs. low-quality coffee—is dampened as it flows from the export gate to the farm gate, with upstream actors enjoying only about half of the quality premium available downstream.

To understand the efficiency implications of this diminishing quality gradient, we must understand why quality incentives are dampened upstream. To do so, we build a model featuring two competing explanations, both of which can theoretically explain the observed diminishing quality premium, but which have distinct efficiency and distributional implications.

The first explanation is trader value extraction. This is an environment in which intermediaries may have buyer market power, and may have greater market power in the high-quality segment of the market. Downstream intermediaries wishing to engage in trade of high-quality coffee must pay a variety of fixed costs, which may form barriers to entry, such that few traders are able to enter the high-quality segment of the market; consistent with this, we see only 15% of traders engage in high-quality trade. These barriers to entry into the high-quality segment may allow traders who are able to overcome these barriers to exert market power and charge large markdowns. Larger markdowns in the high-quality segment, relative to low, can cut into the quality gradient as it moves upstream, such that it is dampened by the time it reaches the farmer. This mechanism suggests inefficiencies, as farmers face incentives for quality upgrading that are distorted by market power and may, as a result, underinvest in quality upgrading.

However, an alternative explanation for the observed diminishing quality gradient—one unrelated to market inefficiencies—is trader value addition. Traders can also contribute to quality upgrading by engaging in the same post-harvest processing activities available to farmers, including drying and sorting. We term this “productive substitutability,” in which quality upgrading can be done either by upstream actors (farmers) or downstream actors (traders), with these efforts being substitutable in the production function of quality. To the extent that some downstream traders may be more efficient at upgrading than farmers, this will dampen their demand for already upgraded coffee in the upstream market, diminishing the quality premium upstream. Yet unlike a market-power explanation, this will not generate inefficiencies; in fact, it reflects an efficient allocation of upgrading tasks along the supply chain.

We formalise these two key economic mechanisms in a parsimonious model that reflects key features of the supply chain. Farmers do not have direct access to export markets and instead sell through downstream traders, who may enter the high-quality export segment by paying a fixed cost and compete à la Cournot. We allow for heterogeneity in quality-upgrading costs—both across and within layers of the chain—and allow agents, both upstream and downstream, to make endogenous quality investments along the chain given prices and their individual cost draws. The model thus nests the two distinct mechanisms—downstream value extraction through market power and value addition through productive substitutability—that can both contribute to a diminished quality premium upstream, but which have very different implications for efficiency and surplus distribution.

The key to separately quantifying these two explanations and examining the efficiency and distributional consequences is to identify the costs of producing quality at every layer of the supply chain. To do so, we run an experiment to

offer randomised coffee-production contracts to traders and farmers along the chain. The experiment randomises specific details of the contract, specifically the quantity and quality requirements, allowing us to recover the key underlying cost parameters. From there, we recover markdowns and quantify the distortion due to downstream market power. Analysis is ongoing, but preliminary results suggest that both the market and cost structure of domestic supply chains are critical for shaping quality incentives.

Policy takeaways

Once we finalise our structural estimation, we will then run policy counterfactuals, for example, considering the impact of policies that facilitate more downstream entry into the high-quality segment, as well as enabling direct upstream access to world markets (such as through direct exporter-buying programs). Policies that improve access to the world-market quality premium, for both downstream and upstream actors, could yield high returns.