Selling at the Farm-Gate or Travelling to Market*

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Abstract

Using detailed survey data from Uganda, this paper examines whether coffee producers sell to itinerant traders or directly to markets, where they can get a higher price but must incur a transport cost. We find that selling to the market is more likely when the quantity sold is large and the market close by. Wealthy farmers are less likely to sell to the market, possibly because the shadow value of their time is higher. But if they have a large quantity of coffee for sale, they are more likely to sell it to the market. They are also more likely to travel to a distant market. These findings are consistent with their better ability to pay for public transportation. We find no evidence that the decision to sell at the farm-gate is driven by a self-control motive.

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1 Introduction

This paper examines one critical dimension of producer prices that has seldom been studied in poor countries, namely the decision to sell at the farm-gate. Farmers' decision whether to sell at the farm-gate or to transport their produce to the market has received little attention in the literature. This is surprising from a policy perspective because the livelihood of many poor farmers the world over depends on the sale of agricultural commodities for export. The price growers receive for these commodities has major implications regarding poverty alleviation. Farmers typically have the choice between selling their output at the farm gate or transporting their output to the nearest market. Selling at the farm gate often is less remunerative but it may be the only alternative open to farmers who cannot afford carrying their crop to the market, usually located many miles away. If poor farmers receive a lower price because they sell at the farm-gate, their welfare could be raised by offering institutional alternatives to farm-gate sales, such as producer cooperatives.

The lack of interest in farm-gate sales is also surprising given the existence of a long-standing literature in transactions costs and how they affect farmers' crop choices (e.g. Bardhan 1989, de Janvry, Fafchamps and Sadoulet 1991, Goetz 1992, Key, Sadoulet and de Janvry 2000). Most empirical work on farming households – especially those in poor countries – typically assumes that some market is missing or constrained.[1] Doing so is usually justified by the idea that farmers face transactions costs when they sell or purchase goods. Sometimes transactions costs are so high that the market can be said to be missing; other times, the market is used by some farmers while others choose to remain self-sufficient to economize on transactions costs (Key et al. 2000).

[1] For instance, by using household size or wealth as regressor or instrument in a production function, output supply or input demand function. Assuming a missing market is often necessary to identify instruments.

To date, the literature has typically assumed that transactions costs are exogenously determined and has focused on the various ways that self-sufficiency affects behavior, especially with respect to production, insurance and credit (e.g. Sandmo 1971, Besley 1988, de Janvry et al. 1991, Finkelshtain and Chalfant 1991). Paradoxically, little research has been devoted to the study of transactions costs themselves.

This paper represents one step in that direction as it seeks to understand how farmers choose between trader pickup and market delivery when selling their output. By examining how small coffee farmers sell their output, we hope to throw some light on the nature of transactions costs affecting farmers in poor countries. In contrast with farmers in developed countries who often have large farms and enjoy good institutions and infrastructure, most farmers in developing countries are very small, geographically isolated, and outside the reach of formal market institutions. For them, interacting with the market is fraught with difficulty and danger, so much so that many opt for self-subsistence altogether (e.g. Key et al. 2000, Fafchamps 1992).

Efforts to liberalize agricultural markets in recent years have often resulted in atomized markets with poorly protected property rights – what Fafchamps and Minten (2001) have dubbed 'flea markets'. The marketing of Robusta coffee in Uganda is a perfect example of this state of affairs. Market liberalization has spurred entry in the coffee export business. But it has also led to a collapse in the number of producer cooperatives, to a disorganized agricultural input distribution for coffee growers, and, not surprisingly to stagnant exports (Fafchamps, Hill, Kaudha and Nsibirwa 2003). Over the same period, Vietnamese Robusta exports went from nothing to five times the level of Ugandan exports.

The question we ask here is: Why do 15% of Ugandan growers carry their coffee to the nearest market town – where it fetches a higher price – when the others simply wait for an itinerant trader to show up at their doorstep? We begin by constructing a simple model of

the decision to sell at the farm gate or travel to the market. The focus of the model is on the relationship between wealth and farm-gate sales. If we assume away public transportation, the model predicts that because poor farmers have a lower opportunity cost of time, they prefer to walk to the market in order to fetch a higher price for their crop. We then allow for public transportation and assume that the rich can better afford to pay for public transportation. In this case, the relationship between wealth and the decision to sell at the farm-gate is reversed, as wealthier farmers can better afford to pay for public transportation.

Model predictions are tested using original survey data collected by the authors in four regions of Uganda. We find the likelihood of selling to the market increases with the quantity sold and the proximity to the market. The relationship between wealth and market sales is found to be non-linear: poorer and wealthier farmers are more likely to sell to the market while farmers of intermediate wealth sell at the farm-gate. This non-linearity goes away once we include an interaction term between wealth and quantity sold: wealthy farmers are less likely to sell to the market, possibly because the shadow value of their time is higher. But if they have a large quantity of coffee for sale, they are more likely to sell it to the market. They are also more likely to travel to a distant market. We also consider other possible motives for farm-gate sales, such as liquidity constraints and self-control issues.

Taken together, our results provide some evidence that differences in behavior can be explained by convenience – i.e. the opportunity cost of travelling to the market to sell coffee. They also provide some support to the idea that credit or liquidity constraints play a role, namely wealthy farmers' better ability to pay for public transportation. Little or no evidence is found in favor of the self-control motive. In line with Fafchamps, Gabre-Madhin and Minten (2004), we find no evidence that there are returns to transaction size for traders. Indeed, if this were the case, farmers selling large quantities would more easily find a pickup buyer. The empirical

analysis to the contrary indicates that farmers selling large quantities are more likely to travel to the market, suggesting that it is farmers who benefit from increasing returns in their own transport. Taken together, the evidence presented here demonstrates that transactions costs should not be construed as constant across farmers. This raises new challenges for modelers and empirical researchers interested in understanding how farmers in developing countries interact with the market.

Research in the US (e.g. Fu, Epperson, Terza and Fletcher 1988, Fletcher and Terza 1986, Edelman, Schmiesing and Olsen 1990) and Australia (McLeay and Zwart 1998) has shown that farmer characteristics influence the farmer's choice of sale mechanism. But little if anything has been written on the choice of sale mechanism by farmers in poor countries. More has been written on similar choices made by consumers, i.e., whether to buy from a nearby convenience or micro-retail outlet or to travel to a larger store. Research has shown that poor consumers are more likely to use convenience stores and to buy from micro-retail outlets. As a result, they typically pay more for consumption goods. This propensity to purchase from convenience stores for the sake of proximity is further reflected in the prevalence of convenience stores relative to supermarkets in low-income areas. For the US, evidence can for instance be found in the works of Goodman (1968), Alcaly and Klevorick (1971), and Bureau of Labor Statistics (1966). More recent but similar evidence for the UK is reported by Caraher, Dixon, Lang and Carr-Hill (1998), Wrigley, Warm, Margetts and Whelan (2002), and Whelan, Wrigley, Warm and Cannings (2002). Even at low income, an increase in wealth raises the premium consumers are willing to pay for convenience, with poor but slightly better off consumers preferring to use convenience stores (Whelan et al. 2002). Rao (2000) provides similar evidence for India. The findings presented here are similar in many respects, except that they apply to selling instead of buying.

This paper is also related to the literature on agricultural marketing in spatial mode – particularly the work of Furlong and Slotsve (1983) on pick-up and delivery and that of Sexton (1990) and Sexton and Sexton (1987) on cooperatives. The main difference is that market institutions and infrastructure are much less developed in Uganda – and the rest of sub-Saharan Africa – than they are in, say, the US (Fafchamps 2004).[2] Consequently, certain contractual solutions to transactions costs problem are not necessarily feasible or sustainable. We note, for instance, that producer cooperatives for the marketing of coffee have existed in Uganda in the past but they have gradually disappeared following market liberalization (Fafchamps et al. 2003). Here we focus here on sales to private traders.

The paper is organized as follows. Section 2 presents the conceptual framework underlying our testing strategy. Section 3 describes the survey on which the paper is based and introduces the data. Econometric analysis is presented in Section 4.

2 Conceptual framework

When deciding whether to sell at the farm-gate or to travel to the nearest agricultural market, a farmer must choose between receiving a lower price up front, or receiving a higher price but incurring a transaction cost. Formally, let the farm-gate and market prices be written p^f and p^m respectively. We assume that $p^f \leq p^m$, so that it is potentially interesting for traders to pick coffee up at the farm-gate.[3] The cost incurred by the farmer to transport his coffee to the

[2] To compensate for information processing and monitoring costs in large organizations and complex contracts, many institutional solutions require the existence of increasing returns in storage, transport, or intermediation. In their study of agricultural traders in Africa, Fafchamps et al. (2004) find no evidence of increasing returns to any of these marketing functions.

[3] Given that coffee is not locally consumed, we can ignore the situation in which farmers wish to consume more coffee and $p^f > p^m$.

market is denoted c. The farmer chooses to transport coffee to the market if:

$$p^f < p^m - c \tag{1}$$

Let the difference between the two be written $D \equiv p^m - c - p^f$. Forces that raise D make it more likely the farmer will transport his coffee to the market.

Itinerant traders who buy from the farm-gate also have to incur transport and search costs m. With free entry in itinerant trading, competition ensures that:

$$p^f = p^m - m \tag{2}$$

We therefore have $D = m - c$, with sale at the farm gate if $m < c$ or $D < 0$ and sale to the market if $D \geq 0$.[4]

To empirically test the model, let M denote the decision on how to sell, with $M = 1$ if the farmer sells directly to the market, and $M = 0$ if the farmer sells at the farm-gate. This decision depends on the latent variable $D^* = D + u$ where u is an error term. We have $M = 1$ if $D^* \geq 0$ and $M = 0$ otherwise. Factors that raise D thus make farmers more likely to sell to the market.

We now examine the effect of distance from the market d on m and c. We assume that m increases with distance: $m(d)$ with $m' > 0$. The transaction cost c incurred by the farmer also increases with distance. For farmers walking small quantities of coffee to the market, the cost is basically the shadow cost of their time w. Because walking travel time is more or less

[4]By assuming free entry and constant unit costs for traders, the behavior of traders need not be formalized further. The model could be generalized to allow trader costs to decrease with quantity purchased (e.g., because the trader economizes on search costs). If this were the case, traders would offer higher prices for larger quantities. This in turn would induce farmers selling large quantities to sell at the farm-gate. Since we find the opposite in the data, we do not pursue this modeling extension.

proportional to distance d, the unit transport cost to the farmer can be approximated as:

$$c = \frac{\alpha d w}{q^{\sigma}} \tag{3}$$

where α is the time required to travel one unit of distance. Parameter σ allows for the possibility that the unit transport cost varies with the quantity transported. As long as the quantity is small enough that only one trip is required, the walking cost does not depend on the quantity transported. In this case, the unit shadow cost is inversely proportional to the quantity sold q and $\sigma = 1$. More generally, transport cost may increase with quantity. If transport time increases more than proportionally with quantity, the farmer's *unit* transport cost increases with quantity and $\sigma < 0$. In the remainder of this section, we assume that $\sigma \leq 1$.

It follows immediately from the above that:

$$\frac{\partial D}{\partial q} = \sigma \frac{\alpha d w}{q^{\sigma+1}} \gtrless 0 \text{ if } \sigma \gtrless 0 \tag{4}$$

hence:

Proposition 1 *Farmers are more likely to travel to market if the quantity sold is large provided that the farmer's unit transport cost does not increase with quantity, i.e., that* $\sigma > 0$.

In our study area, traders travel by motorbike while many farmers walk or cycle. It is therefore reasonable to assume that traders' transport cost increase less rapidly with distance than that of farmers, i.e., that $m'(d) < \alpha w / q^{\sigma}$ beyond a minimum distance d_m. We thus have:

$$\frac{\partial D}{\partial d} = m' - \frac{\alpha w}{q^{\sigma}} < 0 \text{ for } d > d_m \tag{5}$$

Proposition 2 *Farmers located near the market walk their crop to the market while farmers*

located further away sell at the farm-gate to itinerant buyers.

We also see that:

$$\frac{\partial D}{\partial \alpha} = -\frac{dw}{q^{\sigma}} < 0 \tag{6}$$

Proposition 3 *To the extent that owning a bicycle reduces α, by increasing the speed at which a farmer can travel, it also increases D and thus the likelihood of travelling to the market.*

So far we have assumed that w is constant across farmers. This assumption is reasonable if markets are perfect. With imperfect markets, however, the shadow cost of labor varies across farmers. In this case, we expect that, other things being constant, wealthier farmers to have a higher shadow cost of leisure – in part because they have more productive capital and in part because their income is higher and leisure is a normal good.[5] Consequently, we have $w = w(y)$ with $w' > 0$ where y denotes wealth. It immediately follows that:

$$\frac{\partial D}{\partial y} = -\frac{\alpha dw'}{q^{\sigma}} < 0 \tag{7}$$

Proposition 4 *Wealthier farmers are less likely to sell to the market and more likely to indulge in the convenience of farm-gate sale.*

Wealth also affects the slope of the effect that d and q have on D:

$$\frac{\partial^2 D}{\partial d \partial y} = -\frac{\alpha w'}{q^{\sigma}} < 0 \tag{8}$$

$$\frac{\partial^2 D}{\partial q \partial y} = \sigma \frac{\alpha dw'}{q^{\sigma+1}} \gtrless 0 \text{ if } \sigma \gtrless 0 \tag{9}$$

[5] In practice, the shadow cost of leisure also depends on other characteristics of the household, most notably its size and composition. As illustrated by Barrett and Clay (2003), if wealthier households are also much larger, their shadow cost of leisure may be lower than in poor households. For this reason, we control for household size and composition in the empirical analysis.

Proposition 5 *Equation (8) implies that, as distance increases, wealthy farmers are less likely to sell to the market than poor farmers.*

Proposition 6 *Equation (9) means that, provided that $\sigma > 0$, wealthy farmers are more likely to sell to the market as quantity sold increases.*

Public transportation can be added to the model as follows. Suppose that the farmer can hire private transport for a lumpsum price td/q^{γ} which depends on distance and quantity transported.[6] Parameter t measures by how much unit cost of public transportation increases with distance d while parameter γ represents how it varies with quantity. The farmer hires private transport if

$$\frac{\alpha w(y) d}{q^{\sigma}} > \frac{td}{q^{\gamma}} \tag{10}$$

Given that public transport is motorized while farmers are not, it is reasonable to assume that the unit cost of motorized transport falls with quantity – i.e., $\gamma > 0$ – and that it falls faster with quantity than that of transport by the farmer – i.e., $\gamma \geq \sigma$. With this amendment, the farmer sells at the farm gate if:

$$D = m(d) - \frac{d}{q} \min\left(\alpha w(y) q^{1-\sigma}, t q^{1-\gamma}\right) > 0 \tag{11}$$

Proposition 1 ($\frac{\partial D}{\partial q} \gtreqless 0$ if $\sigma \gtreqless 0$) is changed in an important way by the presence of public transport. Let $\widehat{q}$ be the quantity at which the farmer is indifferent between public transport and own transport, i.e., at which $\alpha w(y) \widehat{q}^{\gamma-\sigma} = t$. Then for all $q > \widehat{q}$, the farmer chooses public transport. In this case, for all for $q > \widehat{q}$ we have $\frac{\partial D}{\partial q} > 0$ even if $\sigma < 0$ (Proposition 1'). With public transport available, all farmers are more likely to hire public transportation to carry a large enough quantity of coffee to the market.

[6] In practice, farmers hitch a ride on a mini-bus or pick-up truck with a bag of coffee.

Other propositions are basically unchanged. We still have proposition 2 as before, i.e., $\frac{\partial D}{\partial d} < 0$. But propositions 3 ($\frac{\partial D}{\partial \alpha} < 0$) and 4 ($\frac{\partial D}{\partial y} < 0$) hold only up to the point at which $\alpha w(y)\widehat{q}^{1-\sigma} = t$. Letting $\widehat{y}$ be defined as the level of income at which $\alpha w(\widehat{y})q^{\gamma-\sigma} = t$, we see that farmers with $y > \widehat{y}$ use public transportation and for them $\frac{\partial D}{\partial y} = \frac{\partial D}{\partial \alpha} = 0$. Call these results Propositions 3' and 4'.

In the presence of cash constraints, poor farmers may not be able to afford public transportation. If this is the case, Proposition 1 remains applicable to them over the entire range of quantity. This raises one interesting possibility regarding the joint effect of q and y on D whenever $\sigma < 0$. In this case, we have a negative relationship between q and D for poor farmers – i.e., poor farmers are less likely to sell to market if the quantity is large because they cannot afford to take the coffee to market by public transport and it is to costly for them to carry the coffee on their own. In contrast, we have a positive relationship between q and D for unconstrained (i.e., wealthy) farmers for all quantities $q > \widehat{q}$. This is because wealthy farmers are much more likely to use public transportation which, given our assumptions, is always cheaper than relying on itinerant traders if the quantity sold is large enough.

Before taking the model to the data, it is important to recognize that other factors may affect the relationship between wealth and D. We briefly consider three of them here: other trips to the market; intrahousehold issues; and self-control problems. Until now we have assumed that the farmer visits the market exclusively to sell coffee. This need not be the case: other trips to the market could be motivated by consumption purchases or the need to visit the local clinic or school, which are often located in rural market towns. In this case the marginal cost of selling coffee to the market is zero (because the farmer can take the coffee along when travelling to the market town). The immediately corollary is that farmers who visit the market town more frequently for various purposes are also more likely to sell their coffee there. Let $N = 1$ denote

a trip to the market. We now have:

$$\Pr(M=1) = \Pr(N=1|y) + \Pr(N=0|y)\Pr(mq > d\min\left(\alpha w(y)q^{1-\sigma}, tq^{1-\gamma}\right)|y) \tag{12}$$

If the number of these trips increases with income, the first term $\Pr(N=1|y)$ increases with income – and hence $\Pr(N=0|y)$ decreases with income. We know that $\Pr(mq > d\min\left(\alpha w(y)q^{1-\sigma}, tq^{1-\gamma}\right)$ falls with income – up to the point where $y = \widehat{y}$. This means therefore that, as income increases, the first term in equation (12) increases while the second falls before tapering off. A strong enough first terms therefore eventually dominates for large enough wealth. This generates a U-shaped relationship between sale to market and wealth: initially negative but eventually positive when the first term dominates.

Following Anderson and Baland (2002) and Dercon and Krishnan (2000), it is now recognized that conflicts of interest between spouses may drive them to undertake actions that are not in the common interest of the household. Applying these ideas to coffee sales, we may fear that one spouse would sell the coffee on the sly in order to indulge himself or herself. What is unclear, however, is whether this would encourage or discourage farm-gate sales. On the one hand, itinerant coffee buyers may provide an opportunity to obtain immediate cash behind a spouse's back. On the other hand, by selling at the market, a spouse could spend part of the money by misreporting how much was received for the coffee. To the extent that such conflicts are more or less prevalent in wealthy households, they may affect the relationship between wealth and D.

One last factor worth discussing is the possibility that poor farmers fear impulse purchases. Behavioral issues are becoming more prominent in economics (e.g. Akerlof 2002, Kahneman 2003, Mullainathan and Thaler 2000). Psychological research has shown that human beings often succumb to sudden desires that they often regret later on – e.g., the temptation to drink, to spend money, to assault someone (e.g. O'Donoghue and Rabin 1999, Thaler and Benartzi

2004, Loewenstein, Read and Baumeister 2003, Della Vigna and Malmendier 2004). When poor farmers walk to the market to sell their coffee, they may find themselves tempted to spend the cash they just received. In particular, they may not trust themselves *not* to spend the money on frivolous expenditures – especially alcohol consumption. It is reasonable to expect poor farmers to worry more about impulse purchases than rich farmers because, for them, the marginal utility cost of foregone money is larger. For this reason, they may prefer to sell their coffee at the farm-gate where opportunities for spending money are more limited and family needs less easy to forget.[7] This effect operates in a direction opposite to the opportunity cost of time argument that underlies Proposition 4. If strong enough, the self-control motive would generate a positive relationship between wealth and sale to market. To identify this effect, we need to control for quantity sold. Indeed, temptation in all likelihood increases with the amount of money involved. Consequently a concern for self-control generates a negative relationship between quantity sold and sale to market. Since quantity sold is correlated with wealth, quantity needs to be controlled for to identify the wealth effect.

The purpose of the rest of this paper is to test all the above model predictions.

3 The data

We now proceed to test this model with data on 300 Ugandan growers of Robusta coffee. Ugandan coffee producers are typically smallholders. The average size of a smallholding is about 0.19 hectares (APSEC 1999). Although the bimodal pattern of rainfall Uganda receives allows for coffee harvesting throughout the year, there are two main harvest seasons: October to March, concentrated in the months of November to January; and May to August, concentrated in the

[7] Many forms of saving by the poor, such as Roscas and susu collectors (Aryeetey and Steel 1994), can be understood as self-disciplining devices. The obligation to set aside a given amount each day or week shelters savings from temptation.

months of June and July. The West of the country experiences its main harvest between May and August, with a smaller harvest from October to March, whilst the central and Eastern regions experience their main harvest from October to March, with a fly crop earlier in the year. Farmers harvest coffee cherries and dry them.

The majority of Ugandan producers sell their coffee in the form of dry cherries locally known as *kiboko*. Prior to market liberalization some ten years ago, producer cooperatives played an important role in the marketing of kiboko. Today coffee cooperatives have basically all disappeared.[8] Kiboko cherries are milled by middlemen who buy the coffee either directly from farmers or from itinerant traders who tour villages on a bicycle or motorbike. Milling involves separating the cherry from its husk, a process that yields what is called Fair Average Quality coffee cherries, known as FAQ coffee. This coffee is then sorted and exported to be roasted in the coffee houses in Europe and elsewhere.

The data were collected by a team from the Uganda Bureau of Statistics (UBOS) in collaboration with the Centre for the Study of African Economies at Oxford University. The survey built on a national household survey conducted in 1999/2000, from which a random sample of coffee producing households was drawn. Data were collected in four districts producing most of Robusta coffee in Uganda: Mukono, Luwero and Masaka in the central region, and Bushenyi in the western region. These four districts combined account for about 50 percent of all Robusta coffee produced in the country. The Uganda Bureau of Statistics (UBOS), the data collection body responsible for the 1999/2000 survey, also conducted the 2003 survey through face-to-face interviews.[9] As the period between the baseline and the follow up survey was relatively short,

[8] In the early nineties co-operatives were responsible for 90% of the primary processing of coffee, whilst in the survey only one out of 490 recorded sales was made to a co-operative.

[9] UBOS conveyed upon the survey a sense of legitimacy which allowed the enumerators to receive cooperation from the respondents in nearly all cases. Introduction letters stating the purpose of data to be collected were given to the district administrative officers concerned and the data collection team worked entirely with the local council leaders in those selected villages within sub-counties and towns. These both reduced the problem of non-cooperation and suspicion among the respondents. In only one instance did the respondent refuse to

there was little attrition resulting from death and migration.

Detailed data on coffee sales were collected by asking the farmer to describe his latest coffee sale transaction: where the coffee was sold, who to, how much was sold, at what price and other aspects of the transaction. Once details on the last coffee transaction were complete, the farmer was asked to recall the transaction made before that and if possible the one before that, collecting what could be remembered. In some cases the farmer only made one transaction in the year, or could only recall the details of the latest transaction. In this case only one transaction was recorded for that farmer. More than half of the surveyed farmers were able to give information on their two or three most recent transactions.[10]

Table 1 describes the kind of information on coffee transactions collected in the survey. Reported values are based on 490 observations. We find that 15% of sales transactions take place at the market; other sales take place at the farm-gate. The average transaction size is 128 Kg. This average hides a lot of variation, however: the median transaction size is a much lower 43 Kg per transaction, a quantity that can be carried by hand or bicycle. The median distance to the nearest market is 6.25 miles.[11] We see that, among farmers selling at the market, the distance travelled is short and a little less than half of them use public transportation.

The Table also reports values for various household characteristics such as the wealth and age of the farmer and the number of trees harvested. Wealth is measured as the value of all non-land wealth of the household (including the value of buildings). Robusta coffee growers tend to be older farmers, reflecting a waning interest in coffee among younger farmers. As alluded to in the conceptual section, we need to control for household size and composition in

cooperate.

[10] To control for the likely correlation of errors within the same household, robust standard errors allowing for household clustering are used throughout the econometric analysis.

[11] This refers to road distance, not distance as the crow flies. Because individual transport takes place by foot or bicycle, whether roads are paved or not does not matter too much (most surveyed farmers live nearby unpaved rural feeder roads). Given that Robusta production occurs in a relatively flat part of the country, measuring distance in road miles is an adequate proxy for farmers' transport time and effort.

case they are correlated with wealth. In the survey area, the median household size is relatively small – 6 individuals – reflecting the atomistic nature of hoe agriculture in humid sub-Saharan Africa.[12] Dependents (young children and elderly people) represent a little over half of the average household.

The number of trees harvested may appear high to the uninformed reader, but farmers count as trees all off-shoots from their original planted tree. Off-shoots typically form clumps of 5 to 15 'trees' bunched up together. Coffee is generally interspersed with food crops.

We also report a number of household characteristics used as additional controls in an attempt to disentangle wealth effects from other factors discussed at the end of the conceptual section. Households may have various reasons to travel to the nearest town, for instance to take a small child to the clinic or to visit an older child attending secondary school. Having a small child or a child in secondary school would therefore raise the probability of visiting the market town, hence making coffee sale to the market more likely. Some 21% of surveyed coffee growers have a small child and 25% have at least one child attending secondary school.

We argued that conflict of interest between spouses may affect their decision to sell to itinerant traders, although the direction of the bias is unclear. Because such conflicts would not arise when the household head is unmarried, the inclusion of a dummy for an unmarried household head should capture the effect of conflicts of interest. Some 30% of surveyed households are headed by an unmarried person, male or female.[13]

It is more difficult – though not impossible – to come up with household characteristics that capture household-specific self-control factors. Let us assume that this fear is about handling money: Ugandan farmers do not trust themselves when they have money in their pocket. This

[12] Unlike plow-based agriculture that requires coordination to allocate animal power to each field, traditional hoe cultivation generates few if any returns to scale. Consequently, hoe cultivation areas are often characterized by small farming households and by substantial decentralization of field management authority within the household (Binswanger and McIntire 1987).

[13] In the survey area, living together as a couple is equivalent to being married.

fear of cash gets focused on the sale of coffee if it is the only source of cash for the household. But if the household has other sources of cash income – e.g., wage work – coffee sales no longer focalize the household's fear of impulse spending. Following this reasoning to its logical conclusion, we expect more monetized households to be more willing to sell coffee to the market.

Based on survey information, we have at our disposal several variables measuring various aspects of a household's degree of monetization: whether household members work for a wage, whether a large share of their non-coffee income takes the form of cash, and whether they consume a lot of self-produced agricultural products. As shown in Table 1, one fourth of non-coffee income in the survey area takes the form of cash, making it plausible that handling cash from coffee sale is problematic for many farmers. Households also consume a lot of self-produced agricultural produce.[14]

Monetization variables may also capture liquidity constraints. As we have argued in Section 2, households are predicted to sell to itinerant traders if they cannot finance transport to the market. Variables that capture the household's access to liquidity may thus proxy for its ability to finance transport. Because fear of impulse spending and liquidity constraint operate in the same direction – i.e., making market sale more likely for more monetized households – it is difficult to disentangle them. There is, however, one dimension in which the two effects operate differently. If a member of the household has a wage job, this should release the household's liquidity constraint. But it may not reduce the fear of impulse spending if the wage earner – the person who receives the cash – is not the household head. Consequently, distinguishing between households in which the head is the wage earner and households in which it is somebody else may enable us to separate the liquidity constraint motive from the fear of impulse motive. Unfortunately, as shown in Table 1, the proportion of households with wage earners is small –

[14] The high weight of self-consumed produce is partly due to the fact that maize, which is the main grain crop, was weighted on the cob.

17% – and in 12% of the households the head is the wage earner. It is therefore unlikely that we will be able to separate the two effects with the data at hand.

4 Empirical results

We now test the various model predictions presented in Section 2. We begin regressing non-parametrically the decision M to sell to the market on wealth. The reason is that we suspect this relationship to be non-linear and we need to know what shape this non-linearity takes in the data. Results are presented in Figure 1. We observe a positive relationship between wealth and selling to market, which a priori contradicts to proposition 4 but is a prima facie consistent with the other factors discussed at the end of Section 2 – namely, credit constraints for public transportation, consumption visits, and fear of impulse purchases by the poor.

Survey respondents also reported, for each coffee sale, the distance between the farm and the actual point of sale. Thus, for instance, if a farm-gate sale in practice took place half a kilometer from the farm, the distance was recorded as half a kilometer. Because distance is a continuous variable, this measure is potentially more informative. A non-parametric regression of this variable on wealth is shown in Figure 2. Here we observe a U-shaped relationship between wealth and distance travelled: it is the poorest and wealthiest farmers who travel the furthest to sell their coffee. This finding is consistent with $\sigma < 0$ but credit constraints in accessing public transportation (or consumption visits and fear of impulse purchases).

The univariate results presented in Figures 1 and 2 may be misleading because they do not control for quantity and distance. We therefore turn to multivariate analysis. Probit results are presented in Table 2 by increasing order of complexity. In all cases, robust standard errors are reported that allow for household-level clustering.[15] In the first model, we include only two

[15] In case of multiple observations per household. Unfortunately, households do not change their transaction

regressors – distance between the farm and the nearest coffee market, and a dummy which takes value one if the household owns a bicycle. Both distance and bicycle ownership are shown to have the sign predicted by the model.

We then introduce the quantity sold. It is potentially endogenous to the transaction choice, for instance if itinerant traders cannot buy more than they can carry on their motorbike. It is also conceivable that itinerant traders incite farmers to sell small quantities before they have finished harvesting. Farmers indeed harvest their trees sequentially and dry their coffee as it is harvested. For these reasons, we need to instrument quantity sold. We do so using as instrument the number of coffee trees harvested by the farmer over the entire year. There is no reason to suspect the number of trees harvested to affect the form of sale except through their effect on quantity sold. The instrumenting regression for quantity sold is presented in the first column of Table 4. The instrument is strongly significant with a F-statistic of 160.66. The R^2 of the instrumenting regression is 0.33, suggesting that it is unlikely to suffer from overfitting.

Results with instrumented quantity are presented in the second column of Table 2. Standard errors are corrected to account for the presence of a predicted regressor. Because the dependent variable is dichotomous, we use the Smith and Blundell (1986) approach to instrumentation and include the predicted residuals from the instrumenting regressions in the regression. This generates a test of endogeneity as a by-product, which suggests that endogeneity is not a problem. Results show that, as predicted by the model when $\sigma > 0$, quantity sold raises the likelihood of direct sale to the market. Once we control for quantity, distance and the bicycle dummy keep the same sign but are not longer significant.

We then introduce wealth as additional regressor.[16] The corresponding instrumenting re-

mode sufficiently often to enable us to use fixed effects.

[16] Very similar results are obtained if we use income as regressor instead and instrument income with wealth. Those results are omitted here to save space.

gression is again shown in Table 4. To control for possible household size effects, we include the household size and share of dependents as additional regressors in Table 2. They are never significant. Because both the model and the non-parametric analysis makes us suspect the presence of a U-shaped relationship between wealth and sale to the market, we include a square term as well. Both terms are significant.[17] Plotting the combined effect of wealth confirms the presence of a U-shaped relationship. The same U-shaped relationship obtains if we use income as regressor instead of wealth, and if we instrument income using wealth. These results are not shown here to save space.

Next we introduce an interaction term between quantity and wealth. When we do so, the square wealth term becomes non-significant, indicating that non-linearity in wealth is due to the omission of the interaction term. Whenever we include the quantity-wealth interaction term, we therefore drop the square wealth term from the regression. Wealth alone now has an unambiguously negative effect, a result that is in accordance with Proposition 4. This result also contradicts the self-control motive as discussed at the end of in Section 2.

Because quantity sold is potentially endogenous, we need to instrument the cross-term. We do so using the interaction between wealth and number of trees harvested as instrument. The instrumenting regression results are presented in Table 5 at the end of the paper. Probit results are presented in the fourth column. We find that once we include the cross-term, quantity itself becomes strongly negative while the interaction term is strongly positive. We visualize the combined effect in Figure 3. We see that poor farmers become *less* likely to sell to the market when the quantity sold increases while rich farmers become *more* likely to sell to the market when quantity rises. This finding is consistent with the version of our model where $\sigma < 0$ (unit cost of own transport rises with quantity), public transportation is available, and because of

[17] We also experimented with partial non-parametric regression. Results are very similar to those reported in table 2 and are omitted here for the sake of space.

cash constraints the poor cannot finance transport.

The fifth column introduces another interaction term between wealth and distance. Proposition 5 says that, in the absence of public transportation, this interaction term should have a negative sign. When public transportation is available and the poor cannot afford it, however, the proposition is reversed: as distance increases it becomes more attractive to transport to the market using public transportation. To the extent that only the wealthy can afford to do so, we expect a positive sign on the interaction term. This is indeed the result we obtain.

Finally, we add a number of control variables that seek to capture intrahousehold conflicts (single head of household dummy), other trips to the market (young child dummy and child in secondary school dummy) and fear of impulse spending (household wage earner dummy, share of income received in cash, the log of consumption from own produce, and head wage earner dummy). As noted earlier, of the last four variables the first three may also capture liquidity constraints; the household wage earner dummy should only be significant if the fear of impulse spending is present. As should be clear to the reader, these regressors are not very precise measures of the forces they seek to capture, so we should not expect very strong results. But they are the best we can do given the data.

Results presented in the sixth column of Table 2 show that none of the additional controls is significant.[18] Moreover, the inclusion of these controls hardly affects the magnitude and significance of the other regressors. These results suggest that none of the additional regressors can account for the observed relationship between wealth, distance, and sale to market.

To check the robustness of our results, we redo the analysis using instead actual distance travelled as dependent variable. Because distance travelled is censored at 0, we estimate the model using tobit. Results are presented in Table 3. The combined effect of wealth and quantity

[18] In case the reader wonders whether this is due to multicollinearity, we also estimated the model with each control included one at a time: they are never significant.

sold on distance travelled is visualized in Figure 4. All our earlier findings are confirmed.

Results are by and large consistent with model predictions. The version of the model that best fits the data is one in which unit costs on own travel increase with quantity ($\sigma < 0$), hence explaining why poor farmers switch to farm-gate sales as they sell more coffee. The simplest version of the model predicts that wealthy households are more likely to sell at the farm gate because they value the convenience itinerant traders offer. We find some evidence of this at low wealth levels. But for wealthier households, the relationship between wealth and sale to the market is positive. This finding can be accounted for by the combination of availability of public transportation and the presence of cash constraints explaining why poor households do not resort to public transportation.

The main difference between Tables 2 and 3 is in the sixth column where two of the additional controls are now significant. Households with a child in secondary school are more likely to sell at the market, possibly because the school is located close to a coffee market. In contrast, households with a higher share of cash income are found less likely to sell to the market, a result that contradicts both the liquidity constraint and fear of impulse spending hypotheses. The coefficients of wealth, distance and quantity are unaffected by the inclusion of additional controls, however, suggesting that whatever effect these variables are controlling for, it has little to do with the relationship between wealth, distance, quantity and sale to the market.[19]

To investigate issues further, we examine whether wealthier farmers are indeed more likely to use public transportation to sell their coffee. Results are omitted here to save space. The dependent variable is a dummy variable that equals one if the farmer reported spending money for transport. Given that only 33 farmers reported transport expenditures, results should be

[19] Recall bias may affect answers about ancient coffee transactions more than recent ones. To investigate whether our results are affected by recall bias, we reestimate Table 3 using only information about the last reported coffee sale. Results (not reported here to save space) are unchanged in terms of sign and significance of the coefficients.

taken with a grain of salt as it is possible that some farmers used public transportation but failed to recall how much they spent on transport. In spite of this shortcoming, we find that the likelihood of reported use of public transport increases with quantity sold and with wealth.[20] Results regarding interaction terms are unchanged as well. We take this as evidence that our earlier interpretation is consistent with the data.

5 Conclusion

Using household data from Uganda, we have examined farmers' choice to sell at the farm-gate. We first constructed a simple model of farmers' choice of form of sale. We showed that, when farmers must walk coffee to the market, wealthier farmers are predicted to resort to farm-gate sales, especially if the distance is far or the quantity sold is large. When we introduce cash constraints and public transportation as an additional option, predictions get reversed in the sense that wealthy farmers are more likely to sell to the market.

We then tested these predictions using original survey data collected by the authors in four regions of Uganda. We find that the likelihood of selling to the market increases with the quantity sold and the proximity to the market, as predicted by the simple model. The relationship between wealth and market sales is found to be non-linear: poorer and wealthier farmers are more likely to sell to the market while farmers of intermediate wealth sell at the farm-gate. This non-linearity goes away once we include an interaction term between wealth and quantity sold: wealthy farmers are less likely to sell to the market, possibly because the shadow value of their time is higher. This result can be taken as weak evidence against the self-control motive. Results also show that if wealthy farmers have a large quantity of coffee for sale, they are more likely to sell it to the market. They are also more likely to travel to a distant market.

[20] In this case the wealth squared term is not significant.

We take these findings as consistent with our more general model in which wealthy farmers are better able to pay for public transportation.

This paper leaves some important research and policy questions unanswered. It is surprising, for instance, that individual farmers do not bunch up their sales to reduce transport costs and reap a higher price. Perhaps they have urgent cash needs and cannot afford to wait. Alternatively, it is possible that they already bunch up sales but quantities remain too small to justify travelling to the market. To increase quantities, farmers could sell jointly, with one farmer travelling to the market carrying the quantities sold by several neighbors. It is possible that farmers do not trust each other enough to do this (Fafchamps 2004): with coffee prices changing all the time, it would only be too easy for the travelling farmer to defraud his neighbors. The benefit from pooling sales may thus be outweighed by the cost of peer monitoring. An alternative would be for a rich farmer to purchase coffee from his neighbors and sell it to the nearest market. This does not appear to be taking place in our study area. It is unclear why. Yet another alternative is for farmers to form producer cooperatives to market their coffee (Sexton 1986). Such cooperatives did exist in the past but following market liberalization they have gradually disappeared (Fafchamps et al. 2003). More research is needed to address these issues.

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Table 1: Descriptive Statistics on Characteristics of Coffee Sales and Coffee Farmers

Variable	Unit	Median	Mean
Characteristics of coffee sale:			
Quantity sold	kilo of FAQ equivalent	43.20	127.66
Price at which sale made	US$ / kilo of FAQ equivalent	0.292	0.281
Distance from coffee market	miles	6.25	11.697
Sale at market	1 = sale at market		15%
If sale made at market:			
Distance travelled	miles	1.250	2.578
Public transport used	1 = public transport used		46%
Public transport spending	US$	1.316	1.543
Characteristics of farmer:			
Wealth	US$	580.39	2012.6
Owns a bicycle	1 = household owns a bike		51%
Owns a bicyle and other transport	1 = owns bike and other transport		11%
Age of farmer	years	50	51.36
No. of trees harvested	number	80	305.15
Household size	number	6	6.066
Share of dependents in household	share	0.519	0.507
Young child in household	1 = child under 2 years		21%
Child attending secondary school	1 = child attending secondary school		25%
One household member is wage earner	1 = household member earns wage		17%
Household head is wage earner	1 = head earns wage		12%
Household head is single	1 = household head is single		30%
Share of income received in cash	share	0.259	0.316
Consumption of own produce	kilos per capita	289	422.4
Location and season dummies:			
Masaka	1 = Masaka		24%
Mukono /Kayunga	1 = Mukono / Kayunga		21%
Bushenyi	1 = Bushenyi		26%
Luwero	1 = Luwero		29%
Season	1 = high season		51%

Table 2: Probit Results for Decision to Sell at the Market (* denotes significant at 0.01, ** significant at 0.05, and *significant at 0.1. District and season controls are included but not shown)**

	First	Second	Third	Fourth	Fifth	Sixth
log(distance to market)	-0.128	-0.093	-0.105	-0.077	-1.850	-1.909
	(0.085)	(0.091)	(0.093)	(0.092)	(0.429***)	(0.424***)
bike dummy	0.561	0.245	0.317	0.316	0.306	0.356
	(0.206***)	(0.244)	(0.268)	(0.273)	(0.267)	(0.266)
log(quantity sold)		0.432	0.420	-1.312	-1.446	-1.606
		(0.175**)	(0.200**)	(0.578**)	(0.567**)	(0.597***)
residual for quantity sold		-0.257	-0.263	1.652	1.462	1.284
		(0.189)	(0.230)	(0.632***)	(0.639**)	(0.665*)
log(wealth)			-0.195	-1.158	-1.723	-1.812
			(0.414)	(0.460**)	(0.538***)	(0.540***)
square of log(wealth)			0.013			
			(0.032)			
log(quantity)*log(wealth)				0.281	0.280	0.302
				(0.091***)	(0.090***)	(0.092***)
residual for quantity*wealth				-0.258	-0.247	-0.273
				(0.088***)	(0.098**)	(0.097***)
log(distance)*log(wealth)					0.266	0.277
					(0.067***)	(0.066***)
log (household size)			-0.131	-0.004	-0.023	-0.102
			(0.214)	(0.240)	(0.234)	(0.278)
share of dependents			-0.235	-0.046	-0.146	-0.183
			(0.438)	(0.458)	(0.439)	(0.472)
wage earner dummy						-0.153
						(0.466)
head is wage earner dummy						-0.016
						(0.528)
young child dummy						0.148
						(0.260)
secondary school dummy						-0.019
						(0.290)
share of income in cash						-0.338
						(0.500)
single hh. head dummy						-0.063
						(0.268)
log (cons. of own produce)						-0.100
						(0.082)
constant	-1.210	-2.571	-1.391	5.010	9.004	10.315
	(0.232***)	(0.732***)	(1.670)	(2.425**)	(2.638***)	(3.097***)
Number of observations	490	490	490	490	490	490
Wald χ^2	10.97***	31.45***	32.77***	40.48***	56.38***	66.54***
Pseudo r-squared	0.0507	0.1315	0.1410	0.1717	0.1923	0.2066

Table 3: Tobit Results for Distance Travelled to Sell Coffee (* denotes significant at 0.01, ** significant at 0.05, and *significant at 0.1. District and season controls are included but not shown)**

	First	Second	Third	Fourth	Fifth	Sixth
log(distance to market)	-0.341	-0.117	-0.262	-0.179	-2.257	-2.364
	(0.161**)	(0.160)	(0.160)	(0.166)	(0.862***)	(0.873***)
bike dummy	1.462	0.354	0.864	0.743	0.709	0.7813
	(0.398***)	(0.432)	(0.432**)	(0.436*)	(0.437)	(0.451*)
log(quantity sold)		1.433	1.721	-1.702	-1.857	-1.882
		(0.310***)	(0.407***)	(1.021*)	(1.053*)	(1.101*)
residual for quantity sold		-0.755	-1.016	2.135	2.340	2.227
		(0.343**)	(0.423**)	(1.150*)	(1.204*)	(1.234*)
log(wealth)			-1.808	-2.942	-3.699	-3.754
			(0.610***)	(0.751***)	(0.988***)	(1.000***)
square of log(wealth)			0.099			
			(0.048**)			
log(quantity)*log(wealth)				0.536	0.569	0.579
				(0.155***)	(0.164***)	(0.169***)
residual for quantity*wealth				-0.478	-0.519	-0.511
				(0.168***)	(0.181***)	(0.183***)
log(distance)*log(wealth)					0.319	0.346
					(0.131**)	(0.134***)
log (household size)			-0.086	0.145	0.128	-0.094
			(0.387)	(0.397)	(0.396)	(0.449)
share of dependents			-1.447	-0.958	-1.196	-0.795
			(0.809*)	(0.844)	(0.832)	(0.885)
wage earner dummy						-1.109
						(1.149)
head is wage earner dummy						1.323
						(1.269)
young child dummy						-0.011
						(0.488)
secondary school dummy						0.848
						(0.473*)
share of income in cash						-1.086
						(0.812)
single hh. head dummy						0.360
						(0.493)
log (cons. of own produce)						-0.233
						(0.160)
constant	-4.934	-9.907	-2.540	7.851	12.921	14.343
	(0.711***)	(1.332***)	(2.361)	(4.224*)	(5.732**)	(5.894**)
σ	3.224	2.979	2.888	2.850	2.851	2.819
	(0.225)	(0.206)	(0.200)	(0.197)	(0.197)	(0.195)
Number of observations	489	489	489	489	489	489
LR χ^2	58.97***	98.01***	120.29***	121.55***	121.59***	130.28***
Pseudo r-squared	0.0529	0.0879	0.1079	0.109	0.1091	0.1169

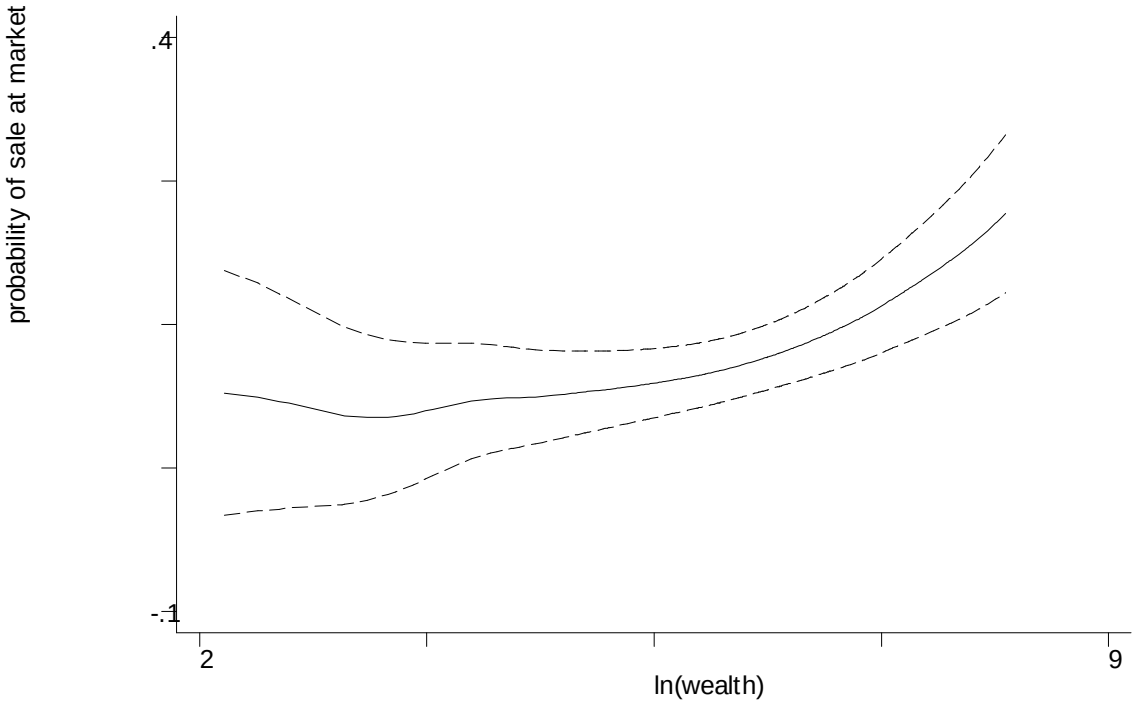

Figure 1: Non-parametric Estimation of Effect of Wealth on the Probability of Sale at Market (kernel regression with 95% confidence intervals).

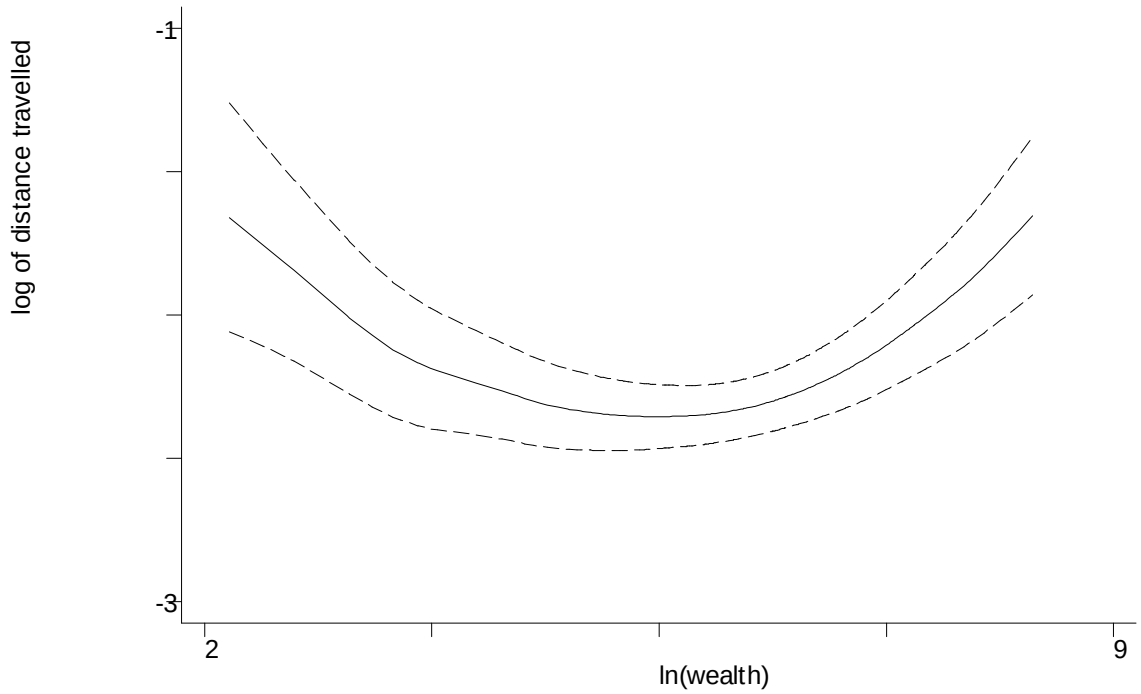

Figure 2: Non-parametric Estimation of Effect of Wealth on the Distance Travelled to make the Sale (kernel regression with 95% confidence intervals).

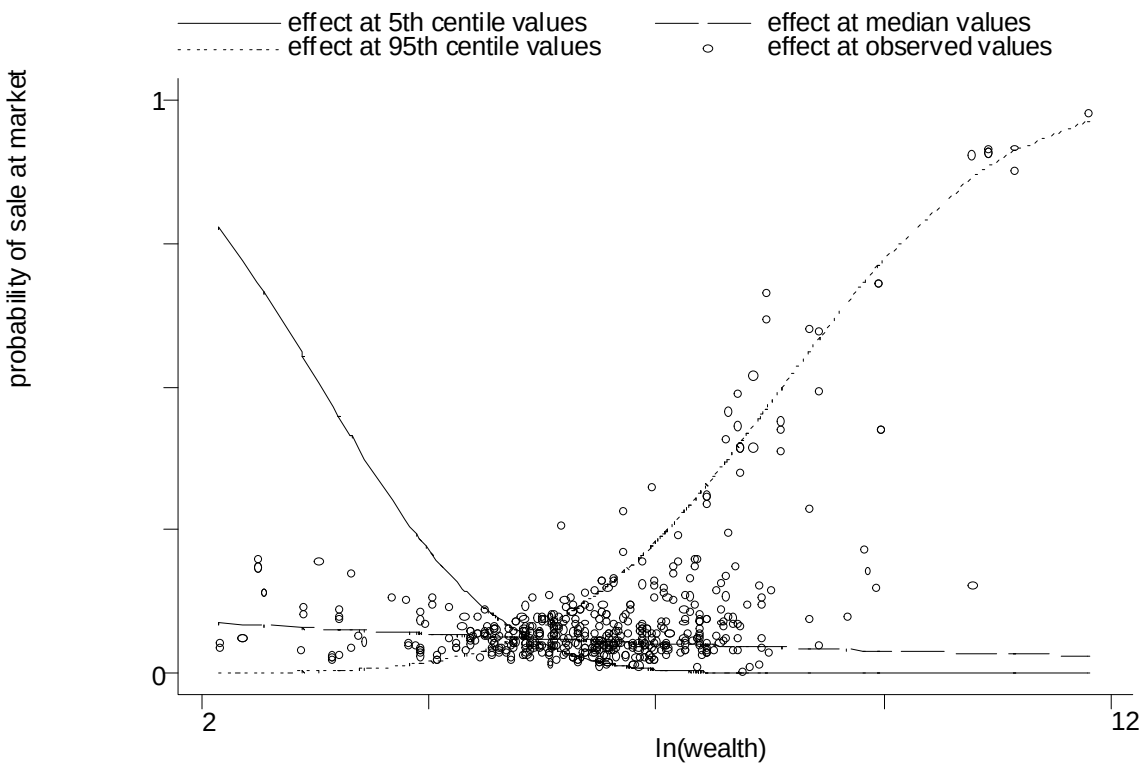

Figure 3: **Effect of Wealth on Probability of Sale at Market for Values of Quantity at the 5th, 50th and 95th Percentile and for Observed Values of Quantity as Noted**

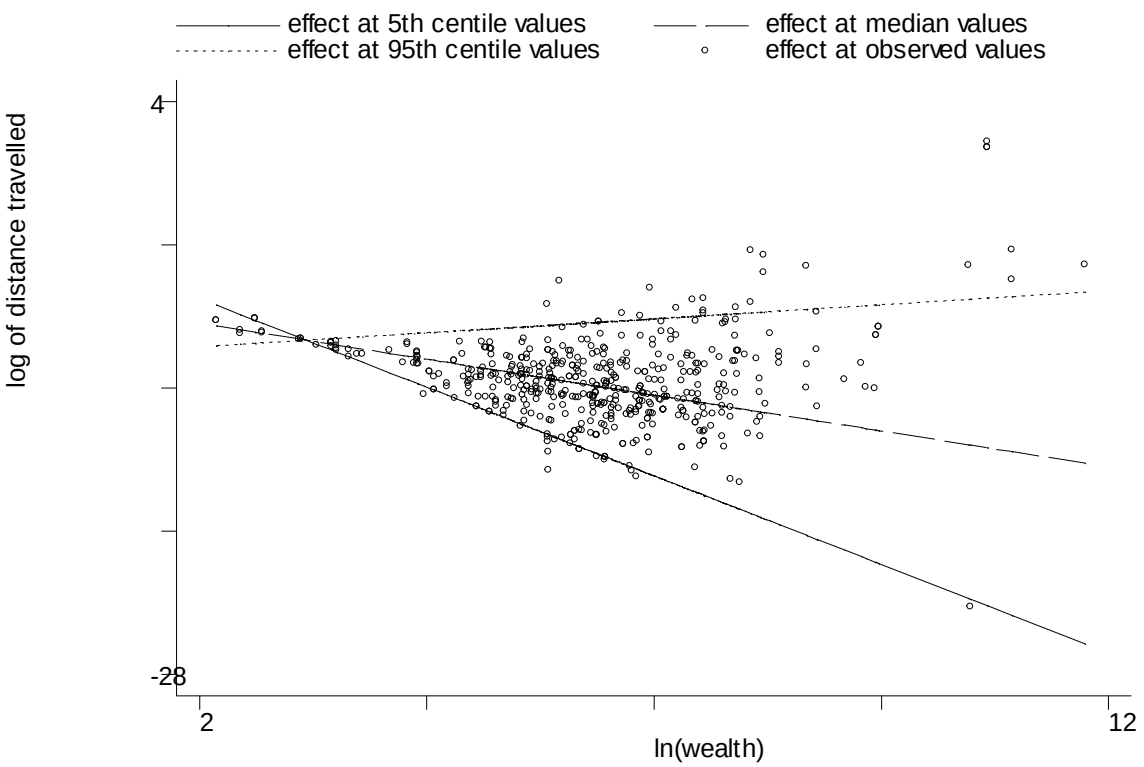

Figure 4: Effect of Wealth on Distance Travelled to Sell Coffee for Values of Quantity at the 5th, 50th and 95th Percentile and for Observed Values of Quantity as Noted

Table 4: Instrumenting Regression Results for log of Quantity Sold (*** denotes significant at 0.01, ** significant at 0.05, and *significant at 0.1.)

Dependent variable: log(quantity)	Second	Third	Fourth	Fifth	Sixth
log(distance to market)	-0.160	-0.076	-0.071	0.498	0.509
	(0.043***)	(0.044*)	(0.044*)	(0.168***)	(0.110***)
Bicycle dummy	0.301	0.102	0.075	0.082	0.059
	(0.100***)	(0.105)	(0.106)	(0.104)	(0.108)
log(wealth)		-0.264	0.392	0.578	0.555
		(0.172)	(0.118***)	(0.128***)	(0.130***)
square of log(wealth)		0.037			
		(0.013***)			
log(distance)*log(wealth)				-0.087	-0.090
				(0.023***)	(0.025***)
log(household size)		0.151	0.128	0.134	0.050
		(0.094)	(0.095)	(0.094)	(0.108)
share of dependents		0.038	-0.065	0.008	0.037
		(0.202)	(0.202)	(0.201)	(0.216)
wage dummy					0.091
					(0.256)
farmer wage dummy					-0.268
					(0.286)
young child dummy					0.168
					(0.119)
secondary school student dummy					0.073
					(0.119)
share of income received in cash					0.168
					(0.195)
single household head dummy					-0.157
					(0.116)
log (consumption of own produce)					0.008
					(0.040)
Masaka	0.091	0.191	0.272	0.245	0.254
	(0.131)	(0.130)	(0.132**)	(0.131*)	-0.136
Mukono / Kayunga	-0.065	-0.049	-0.013	0.011	0.010
	(0.135)	(0.131)	(0.133)	(0.131)	(0.134)
Bushenyi	0.666	0.590	0.578	0.558	0.545
	(0.128***)	(0.123***)	(0.128***)	(0.128***)	(0.137***)
Season dummy	0.194	0.236	0.221	0.248	0.251
	(0.104*)	(0.101**)	(0.101**)	(0.100**)	(0.101**)
log(number of trees)	0.445	0.361	0.611	0.663	0.5602
	(0.035***)	(0.036***)	(0.144***)	(0.143***)	(0.146***)
log(number of trees)*log(wealth)			-0.035	-0.039	-0.037
			(0.021*)	(0.021*)	(0.021*)
constant	1.727	1.875	-0.744	-2.058	-1.793
	(0.223***)	(0.603***)	(0.775)	(0.851**)	(0.899**)
Number of observations	489	489	489	489	489
R-squared	0.3259	0.3762	0.3694	0.3843	0.382
F-test on significance of instruments	160.66***	99.82***	56.47***	56.44***	50.54***

Table 5: Instrumenting Regression Results for log of Quantity Sold Interacted with Wealth. (*** denotes significant at 0.01, ** significant at 0.05, and *significant at 0.1.)

Dependent variable: log(quantity)*log(wealth)	Fourth	Fifth	Sixth
log(distance to market)	-0.735	6.164	6.175
	(0.311**)	(1.158***)	(1.173***)
bicycle dummy	0.565	0.662	0.453
	(0.745)	(0.718)	(0.745)
log(wealth)	4.211	6.447	6.294
	(0.832***)	(0.881***)	(0.893***)
log(distance)*log(wealth)		-1.044	-1.060
		(0.171***)	(0.173***)
log(household size)	0.543	0.609	0.073
	(0.669)	(0.645)	(0.745)
share of dependents	-1.170	-0.297	-0.130
	(1.428)	(1.384)	(1.481)
wage dummy			0.847
			(1.763)
farmer wage dummy			-1.923
			(1.965)
young child dummy			1.147
			(0.815)
secondary school student dummy			0.305
			(0.817)
share of income received in cash			1.648
			(1.341)
single household head dummy			-1.263
			(0.797)
log (consumption of own produce)			-0.011
			(0.276)
Masaka	1.962	1.636	1.782
	(0.933**)	(0.900*)	(0.938*)
Mukono / Kayunga	-0.306	-0.023	-0.011
	(0.936)	(0.903)	(0.923)
Bushenyi	3.732	3.491	3.483
	(0.906***)	(0.874***)	(0.942***)
Season dummy	1.033	1.354	1.4376
	(0.714)	(0.690**)	(0.691**)
log(number of trees)	0.526	0.785	0.629
	(1.018)	(0.982)	(1.002)
log(number of trees)*log(wealth)	0.288	0.239	0.253
	(0.148**)	(0.143*)	(0.146*)
constant	-13.37	-28.98	-26.96
	(5.47**)	(5.86***)	(6.18***)
Number of observations	489	489	489
R-squared	0.6769	0.6998	0.7114
F(2, 469) test on significance of instruments	48.58***	48.78***	45475***