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GETTING PRICES RIGHT: THE IMPACT OF THE MARKET INFORMATION SERVICE IN UGANDA

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19 November 2008

Abstract

The Market Information Service project in Uganda collected data on prices for the main agricultural commodities in major market centres and disseminated the information through local FM radio stations in various districts. Exploiting the variation across space between households with and without access to a radio, we find evidence suggesting that better-informed farmers managed to bargain for higher farm-gate prices on their surplus production. (JEL: O12, D82, D83)

1. Introduction

The importance of information for the effective functioning of markets has been a central concern of economic theory, going back at least to the seminal work of Stigler (1961). However, lack of information, or situations of asymmetric information, is rather the norm in most developing countries. Therefore, it is surprising that there are so few empirical studies based on data from developing countries assessing the effects of improvements in information on market outcomes.¹ Specifically, we know little about what the impact of improving access to market information is on farmers' choice of what to produce, how much to sell, where to sell, and the prices farmers receive for their output.

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1. Notable exceptions are Jensen (2007) and Aker (2008). There is an extensive literature on the effects of increased market information due to information technology diffusion in rich countries, e.g., Baye and Morgan (2001), Baye, Morgan, and Scholten (2004), Brown and Goolsbee (2002) and Ellison and Ellison (2005).

This paper exploits a “natural” experiment—the Market Information Service (MIS) project in Uganda—to assess the impact of asymmetric information about market prices on the price farmers receive for their crops (i.e. farm-gate prices). We focus on maize, which is the most important cereal crop in Uganda. The MIS project collected weekly data on district market prices for different agricultural commodities, and disseminated the information through local FM radio stations in the participating districts. The presumption was that the provision of accurate, timely, and appropriate market information to farmers through radio transmissions would improve their ability to bargain for higher prices with local traders. To identify the effects of market information, we exploit the differences-in-differences between MIS project districts and districts where the project was not implemented, and across households with and without access to a radio. We show that access to market information is associated with higher farm-gate prices, which is consistent with the hypothesis that market information improves farmers’ relative bargaining position vis-à-vis local traders.

To the best of our knowledge, this is the first paper to estimate the impact of asymmetric information between farmers and traders on farm-gate prices in a developing country setting. It relates to a small literature on the effects of increased market information on market outcomes. Jensen (2007) evaluates the effects of the introduction of mobile phones in the fishing industry in Kerala, India. He finds that by improving fishermen’s and traders’ access to market information, the introduction of mobile phones improved arbitrage opportunities and resulted in reduced waste and price dispersion across geographic markets.² In this paper, we focus on the distributional aspects, namely the effects on farm-gate prices of increasing access to market information for farmers in a context that is typical for small-scale farmers in sub-Saharan Africa; i.e. where farmers are engaged in the market through local traders that are relatively well-informed.

General lessons from contract theory show that asymmetric information can have both redistributive and efficiency implications.³ As concerns the former, if the trader has knowledge about the market price and the farmer must sell to the trader or consume her output, the trader has strong incentives to misreport the market price in order to get a more favorable deal. Realizing this, the farmer may agree to give the trader higher rents if the trader reports a high price; i.e., accept a relatively lower farm-gate price, and low rents when the trader reports a low price. As the farmer becomes better informed, the “contract” will require lower incentives and hence the farmer will, on average, get a higher farm-gate price (less rents to the trader). On the issue of efficiency, such a contract would typically involve trading off redistribution with allocative efficiency (see Svensson and

2. Aker (2008) finds similar effects on price dispersions across grain markets when mobile phones were introduced in Niger.

3. See, for example, Mirrlees (1971) and Bolton and Dewatripont (2005).

Yanagizawa 2008). Lack of information about the market price also implies that farmers may choose a sub-optimal composition of goods to produce (and sell); i.e., where relative prices are not equal to the marginal rate of transformation. As shown in Jensen (2007), to the extent that farmers sell directly on the market, asymmetric information can result in large price differences across geographical markets as the possibilities for arbitrage are more limited.

This paper also relates to the ongoing discussion about the role of information and communication technologies (ICTs) for economic development. In particular, it suggests that information dissemination through FM radio may be a powerful tool to increase both efficiency and relative incomes of the poor. Living standards for most of the world's poorest are largely determined by how much they get paid for their agricultural output. Therefore, the functioning of output markets, including marketing and distribution channels, is central for the income of households engaged in agriculture in low-income countries. In most developing countries, however, markets are dispersed and the infrastructure is poor. Small-scale producers typically lack information on market prices, so the potential for inefficiency in the allocation of goods across markets, and the allocation between consumption and trading, is large. Moreover, asymmetric information between sellers (i.e. poor small-scale farmers) and buyers adds important distributional concerns. Improving access to information, for example through the use of FM radio, may help poorly functioning markets work better, improve farmers' bargaining position vis-à-vis wholesalers or middlemen and thereby, in the end, increase the incomes of the poor.

The remainder of this paper proceeds as follows: Section 2 discusses the institutional setup. Section 3 briefly describes the Market Information Service project. Section 4 discusses the data and the empirical strategy. Section 5 examines the effects of market information on farm-gate prices. Section 6 conducts robustness checks and Section 7 concludes.

2. Institutional setup and Ugandan maize markets

Maize is a widely grown and consumed cereal crop in Uganda. It covers about 46% of all cereal-growing land, contributing about 16% of the total cash and food crop contribution to Uganda's GDP. It is estimated that maize provides over 40% of the calories consumed in both rural and urban areas. About 95% of the households engaged in maize production are small-scale farmers, contributing over 75% of the marketable surplus of maize, with land holdings of 0.2-0.5ha. Medium scale commercial farmers with 0.8-2.0ha of land under maize production contribute the remaining 25% (RATES Center 2003).

Small-scale subsistence farmers sell off most of their surplus maize to rural traders immediately after harvest due to limited storage facilities and alternative

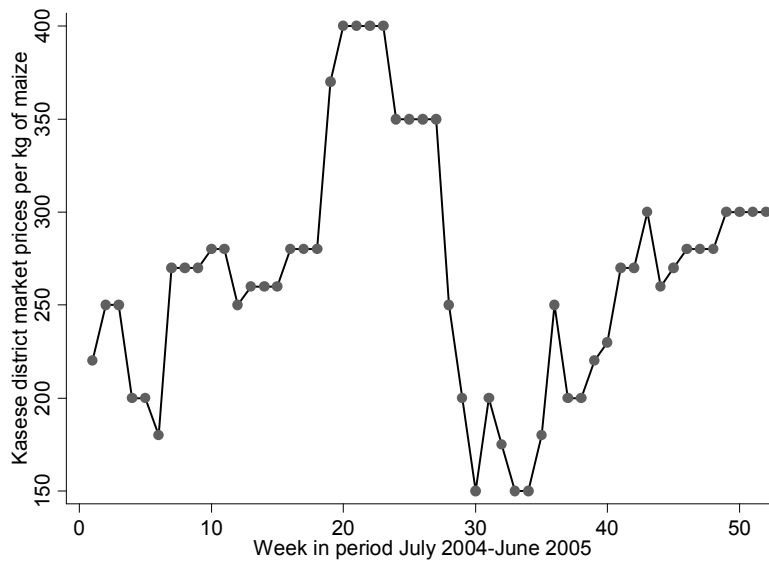


FIGURE 1. Weekly district market prices of maize in Ush in Kasese, July 2004 to June 2005

income generating enterprises. Rural traders, who operate in the villages, constitute over 90% of the total number of maize traders and handle two-thirds of all traded maize. Typically, traders traverse villages on bicycles and pick-ups procuring maize at farm-gate prices on a cash basis. Traders either work independently or as agents of larger urban traders. Since traders travel back-and-forth to the market, while farmers seldom sell their output on the main district markets, sellers generally have less or little information about current prices while buyers are often well-informed, at least about the price in the district market where they are active (RATES Center 2003).

Prices on most cash- and foodcrops vary greatly in district markets in Uganda over time. To illustrate this, Figure 1 depicts the weekly market price for maize in the main market in the district of Kasese (the coefficient of variation over time is 0.24). Given these price variations, it is not surprising that farmers in Uganda view getting market information as one of their highest priorities (Ferris 2004).

Prices also vary greatly across locations. Figure 2 plots the market price of maize at the beginning of December 2004 (the coefficient of variation across district markets is 0.30). The information is drawn from the main markets in the 21 districts where the MIS project was implemented. The variation in prices across districts at a given point in time suggests that to the extent that farmers

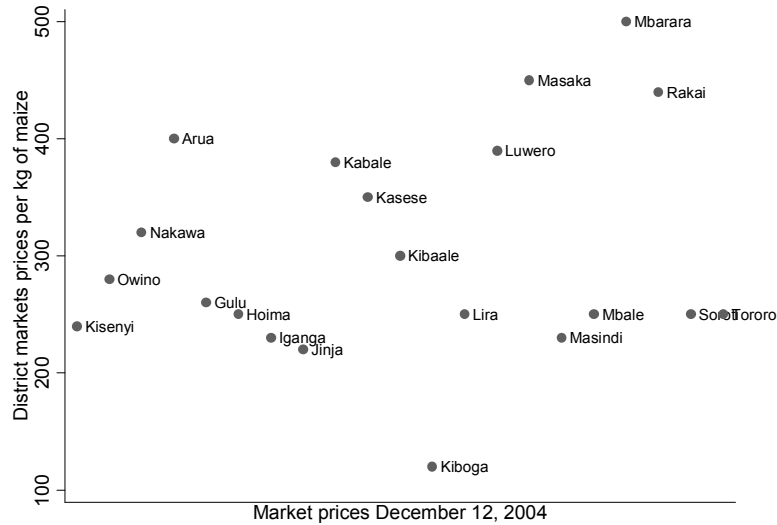


FIGURE 2. District market prices of maize in USH, 12 December 2004

sell their output to traders located in their own district, the market price in that district, rather than the average price in the country, is the key statistic.

3. The Market Information Service

In 2000, the Market Information Service project was initiated by two agricultural research organizations (IITA and ASARECA) in association with the Ministry of Trade, Tourism and Industry in Uganda. The starting point of the project was survey data indicating that most farmers had little idea of the current market prices in the main district market centres, and little knowledge of price movements and market trends. By providing accurate, timely, and appropriate information, the assumption was that small-scale farmers would be able to make better decisions about what to produce and where to sell their output. Timely and accurate information would also improve farmers' bargaining position vis-à-vis local and regional traders.

Starting in April 2000, the Market Information Service project was implemented in 21 districts in Uganda.⁴ The project collected data, on a weekly basis,

4. The total number of districts in 2004 was 56. Not all districts could be included in the MIS project because of budget and administrative reasons. One of the main reasons for participation was USAID presence in the district. USAID—the donor funding the project—wanted to include districts in which

on market prices for 19 different agricultural commodities, including maize, in the main market centre in each MIS district.

The information was processed and disseminated through various radio stations in each MIS district. Each week, a 15-minute radio program was broadcasted and each day, a 2-4 minute news bulletin was broadcasted in altogether eight local languages. The main focus of the radio shows was to provide updates on district market prices. The radio stations used for dissemination were typically popular ones and in 2004 the MIS was estimated to reach seven of Uganda's twenty-four million people each week (Ferris 2004).⁵

4. Data and identification

To assess the effects of improved access to market information on farm-gate prices, we use data from the Uganda National Household Survey 2005 (UNHS 2005). The UNHS 2005 includes a full crop module, enabling us to calculate farm-gate prices for maize. We combine this data with information from the MIS project, so as to identify which households reside in districts where the MIS project assembled and disseminated district market information.

Summary statistics are reported in Table 1. The average farm-gate price per kilogram of maize, over the period July 2004-June 2005, was 188 Uganda Shillings (USh) or approximately US\$ 0.11, while the average district market price in the MIS districts over the same period was USh 291. On average, farmers sell somewhat more than half of what they produce and almost exclusively sell to a local trader.

To identify the effect of the market information service, we exploit two sources of variation. First, we have information on farm-gate prices for households with and without access to a radio. Second, we have household data from MIS districts and districts where MIS did not collect and disseminate market information. While both access to a radio and geographical location may be correlated with other important variables determining farm-gate prices, the key identification assumption made is that the combination of the two is not.

The differences-in-differences specification used is thus

$$p_{ij} = \alpha + \beta_1 \text{radio}_{ij} + \beta_2 \text{radio}_{ij} \times \text{MIS}_j + \beta_3 x_{ij} + \mu_j + \varepsilon_{ij} \quad (1)$$

where p_{ij} is the farm-gate price per kilogram of maize sold by household i in district j , radio_{ij} is a binary variable indicating whether household i in district j

they were operating.

5. The MIS project initially bought air-time from the radio stations for the radio program. Interestingly, because of the popularity of the program among farmers, several commercial radio stations started to transmit the programs without public funds.

has access to a radio, MIS_j is a binary variable indicating whether district j is an MIS district, x_{ij} is a set of household-specific controls, μ_j is a district fixed effect and ε_{ij} is an error term. The coefficient of interest is β_2 , i.e. the differences-in-differences estimate.⁶

5. Effect of market information on farm-gate prices

Table 2 presents some preliminary evidence of the impact of market information on the farm-gate prices of maize. We start by estimating the difference in price between households with and without access to a radio. The coefficient estimate, reported in column (i), is positive and significantly different from zero at the 5% level, providing some, albeit weak, evidence in support of the argument that the provision of market information improves farmers' bargaining position. However, since households with access to a radio may systematically differ (apart from having a radio) from households without access to a radio, and since the Market Information Service did not disseminate information on market prices in roughly two-thirds of the districts included in the sample, the estimate cannot be viewed as the causal effect of better information about market outcomes on farm-gate prices.

In columns (ii) and (iii), we split the sample into a MIS sample (i.e., including all households residing in districts where the MIS project was implemented) and a non-MIS sample. Assuming that the factors that determine radio access are the same in MIS and non-MIS districts relative to the district mean and conditional on observable household characteristics, we can examine the plausibility of market information as the key mechanism for the result reported in column (i) by comparing outcomes across these two samples.⁷

In districts where the market information system was active, column (ii), the difference estimate is positive and precisely estimated. The effect is also economically important. Having access to regular market information, here proxied by having access to a radio, is associated with a 15% higher farm-gate price. In the non-MIS areas, however, the estimated effect is close to zero and insignificant. That is, having access to a radio in districts where market information was not disseminated is not associated with higher farm-gate prices, but having ac-

6. The control variables in x_{ij} are household size, a measure of educational achievement of the household (highest level of education of the head of the household), and a measure of the health status of the household (share of household members that reported suffering from an illness during the 30 days prior to the survey date). All results below are robust to the exclusion of these household controls.

7. The share of households with access to a radio is the same in MIS and non-MIS districts (approximately 60% in 2005). Preliminary evidence also indicates that the change over time in the share of households with access to a radio is the same (Svensson and Yanagizawa 2008).

cess to a radio in districts where the MIS project was operative is associated with significantly higher farm-gate prices.

Estimates based on equation (1) are given in column (iv). The differences-in-differences estimate is positive and significantly different from zero at the 1% level. If our key identification assumption holds, this can be viewed as the causal effect of having information about market outcomes on farm-gate prices. The point estimate is similar to the difference estimate reported in column (ii).

One concern with the results reported in Table 2 is spillovers. If households without access to a radio in MIS districts learnt about market prices from informed households, the difference in outcomes between households with and without access to a radio would be smaller. This would thus work against finding an effect. In column (v) we provide evidence suggesting spillovers to be less of a concern.⁸ Specifically, we restrict the attention to households without access to a radio and compare households in MIS and non-MIS districts. The point estimate is positive (consistent with spillovers being present) but we cannot reject the null hypothesis of no effect.

Another concern is spillovers across districts. Since the radio stations broadcasting market information in MIS districts could be reached by some households residing in neighboring non-MIS districts (and some households in MIS districts could most likely not get the signal), also some non-MIS households received market information. To the extent that these farmers sold their output to traders mainly active in their own district, this information would typically be of less interest, given the large variation in prices across districts at a given point in time, as illustrated in Figure 2. Moreover, even if having access to information about the market price in district x would help the farmer predict the market price in his/her district y , this effect would work against finding an effect of the market information system. In that respect, the point estimate in column (iv) could be viewed as providing the lower bound on the effect. If farmers in neighboring non-MIS districts sold their output to traders mainly active in MIS districts, we would also underestimate the effect of the market information system on farm-gate prices.

6. Robustness

While both access to a radio and geographical location may be correlated with other determinants of farm-gate prices, the key identification assumption we make is that the combination of the two is not. We conduct two robustness checks in order to assess this assumption. If MIS districts were chosen such that the project reached households with a radio that had particularly high crop incomes (and thus

8. This is consistent with the results on learning about technology adoption in agriculture reported in Duflo, Kremer, and Robinson (2006).

higher incomes), then differences-in-differences estimates would be biased upwards. We use consumption expenditures data from the 1999 Ugandan National Household Survey, i.e. shortly before the MIS project was implemented, to test for these selection problems. First, in Table 3 columns (i)-(ii), we test whether average incomes in MIS districts are different from average incomes in non-MIS districts in 1999. We find no significant difference. Second, if the identification assumption is correct, the differences-in-differences estimate should be zero in the absence of the Market Information Service. Therefore, we estimate equation 1, with the monthly consumption expenditure in USD per household member equivalent in 1999 as the dependent variable, in columns (iii)-(iv). The point estimate on the interaction term is small, and in fact even negative, and we cannot reject the null hypothesis that the differences-in-differences estimate is zero. That is, while radio owners have higher (farm) income, the difference in (farm) income between households with and without access to a radio is not systematically different in MIS districts, as compared to non-MIS districts, prior to the initiation of the project.

7. Concluding remarks

The issue of information is central to economic theory. However, lack of information or situations of asymmetric information is more the norm in many developing countries. In this paper, we have exploited a natural experiment in Uganda—“the Market Information Service Project”—to assess the effects of improved access to market information. We found that access to market information resulted in higher farm-gate prices, a result consistent with the hypothesis that market information improves farmers’ relative bargaining position vis-à-vis local traders. The result is also consistent with qualitative evidence based on interviews with farmers in MIS districts.⁹

Asymmetric information may not only affect redistribution between traders and farmers but also production decisions. How to boost agricultural production in developing countries has been an ongoing policy and research question. The question is of particular importance for countries in sub-Saharan Africa, where the growth in agricultural yield has been stagnant.

The important policy and research question that remains to be understood is therefore to what extent dissemination of market information can improve efficiency and production decisions. In future research we plan to expand the analysis to assess such aspects (Svensson and Yanagizawa 2008).

9. Farmers claim that access to market information increased their ability to bargain for better prices and that as a result farm-gate prices have increased by between 5–15 % (Ferris et. al. 2006; Ferris 2004).

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TABLE 1. Summary statistics

	Mean	Median	St. dev.	Obs
Farm gate price (per kg) of maize	187.8	183.3	80.1	2761
Market price (per kg) of maize	291.0	280.0	67.1	1092
Sell to traders	0.78	1	0.42	2761
Radio	0.61	1	0.46	2761

Notes: "Farm gate price" is the reported value of maize sold in Ugandan shillings divided by kilograms sold for the sample period July 2004-June 2005. "Sell to trader" is a dummy variable indicating whether the maize was sold to a local private trader. "Radio" is a dummy variable indicating whether the household owns a radio (Source: Uganda Bureau of Statistics National Household Survey 2004/05). "Market price" is the weekly maize grain price in each MIS district over the same sample period (Source: Foodnet Market Information Service).

TABLE 2. Effects of market information on price farmers' receive

Specification	(i)	(ii)	(iii)	(iv)	(v)
Dep. Variable	Farm gate price per kilogram of maize				
Sample	All	MIS	No-MIS	All	No radio
Radio	12.6 ^{***} (4.00)	28.6 ^{***} (5.35)	1.12 (4.11)	2.86 (3.52)	
Radio×MIS				23.3 ^{***} (7.23)	
MIS					5.91 (12.9)
Constant	172.8 ^{***} (5.48)	189.4 ^{***} (8.85)	160.3 ^{***} (6.92)	172.5 ^{***} (5.93)	177.8 ^{***} (13.2)
District fixed effects	Yes	Yes	Yes	Yes	No
Household controls	Yes	Yes	Yes	Yes	Yes
Districts	53	17	36	53	53
Observations	2739	1164	1575	2739	810

Notes: Robust standard errors, columns (ii)-(iii), clustered by district in parenthesis, columns (i), (iv), (v). ***significant at 1%; **significant at 5%; *significant at 10%.

The household controls include household size, a measure of educational achievement of the household (highest level of education of the head of the household), and a measure of health status of the household (share of household members that reported suffering from an illness during the 30 days prior to the survey date).

TABLE 3. Robustness tests: Income pre-market information system

Specification	(i)	(ii)	(iii)	(iv)
Dep. Variable	Average Consumption expenditures	Average Consumption expenditures (log)	Consumption expenditures	Consumption expenditures (log)
Radio			23.9 ^{***} (4.62)	0.54 ^{***} (.08)
Radio×MIS			-1.69 (5.71)	-0.08 (.10)
MIS	1.52 (5.30)	0.05 (.11)	-0.69 (3.10)	0.03 (.10)
Constant	40.5 ^{***} (3.81)	3.39 ^{***} (.08)	30.1 ^{***} (2.48)	3.15 ^{***} (.08)
Districts	41	41	41	41
Observations	41	41	10695	10695

Notes: Robust standard errors, columns (i)-(ii), clustered by district, columns (iii)-(iv), in parenthesis. ***significant at 1%; **significant at 5%; *significant at 10%.

Dependent variable is monthly consumption expenditure in USD per household member equivalent in 1999, averaged by district in columns (i)-(ii) (Source: 1999/2000 Uganda National Household Survey).