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Olipa Zulu-Mbata[a], Thomas S. Jayne[b], Johann F. Kirsten[a]

[a]Department of Agricultural Economics, Extension and Rural Development, University of Pretoria, South Africa.

[b]Department of Agricultural, Food and Resource Economics, Justin S. Morrill Hall of Agriculture, 446 West Circle Drive, East Lansing, MI 48824, United States

ABSTRACT

Marketing margin analysis has usually been used to examine the behaviour and competitiveness of markets and the share of a retail commodity price accruing to farmers. Most studies examining marketing margins have typically considered margins to vary either spatially or temporally; with little attempt to understand how or why marketing margins may vary across households holding both space and time constant, even though inter-household variability has been observed in most rural maize marketing areas. This article determines the relative importance of spatial, temporal, and household-specific factors in the maize prices received by farmers in Zambia and in the associated farm-to-retail marketing margin under the assembly trader channel. We find that spatial factors account for the largest source of explained variation (72%) in the maize marketing margin and farm-gate prices obtained by farmers followed by temporal factors (16.7%). Household-specific factors account for the smallest source of explained variation (11.3%) in marketing margins, with marital status, kinship ties to the chief or village elders, and access to price information being the most important. Wide inter-household variation in farm-gate prices within the same locality and month suggest the importance of unobserved household-specific factors. These results hence indicate that the prices that maize farmers in Zambia obtain are not fully exogenous to farmers as often assumed. Programs that generate and improve farmers' access to timely market information can raise prices that farmers obtain, while improved road infrastructure in areas where marketing margins are high could significantly improve farm-gate prices.

Keywords: Marketing Margin, Maize, Traders, Zambia

1. Introduction

Most studies of rural grain markets in Africa typically regard farmers as price takers, suggesting that both farm-gate prices and farm-to-retail marketing margins are exogenous to the farmer. Farm-gate prices are perceived to reflect market conditions in the particular village and time of sale, while farm-to-retail marketing margins are the difference between this exogenous farm-gate price and the retail price in the nearest market centre (Wohlgenant, 2001). The margin itself can of course vary across space and time according to traders' transport and storage costs and the degree of non-competitive behaviour in these markets, but these are still exogenous to the farmer. We find that this characterization of marketing margins and farm-gate prices is inconsistent with anecdotal evidence in survey data suggesting the existence of wide variability in farm-gate prices among farmers in the same villages and time of sale. We therefore posit that household-specific factors (e.g. those correlated with negotiation ability or an understanding of how markets operate) may be important in explaining variations in prices received by farmers and hence the farm/retail price spreads commonly analysed in agricultural economics.

While many staple food marketing studies have been carried out in Africa (e.g. Vigne and Darroch, 2010; Dessalegn et al, 1998; Truab and Jayne, 2008), few studies have examined how or why marketing margins of staple grains may vary across farm households. Most have confined their focus to simply measuring the margin between the various stages in the maize value chain (e.g., Kirimi et al 2011; Sitko and Jayne, 2014) or examining the factors influencing marketing margins over time (e.g. Traub and Jayne, 2008). Most studies analysing marketing margins use market-level price data, enabling the measurement of factors associated with spatial and temporal variation in these margins, but not among transactions carried out at a particular time and location. Consequently, relatively little attention has been devoted to understanding how or why marketing margins may vary across households, holding both space and time constant, even though inter-household variability has been observed in many household-level analyses of rural market behaviour (Sitko and Jayne, 2014; Yamano and Arai, 2010; Jayne et al, 2010). Understanding the reasons why marketing margins may vary across households in the same locality and time frame may allow analysts to identify policy and programmatic options for raising the prices that smallholder farmers receive for their surplus production. Different sources of variation in marketing margins would call for different policy actions to improve market access and efficiency for farmers. A review of literature shows that no study to our knowledge has tried to decompose the marketing margin into temporal, spatial and household-specific factors.

Therefore, this study identifies the extent to which marketing margins and farm-gate prices received by smallholder farmers in Zambia are indeed exogenous. We examine three specific issues: 1) the difference between the retail price and the farm-gate price offered to small-scale farmers in their villages, and decomposes this farm-to-retail marketing margin into spatial, temporal, and household-specific factors; 2) underlying sources of variation in the size of the

household-specific marketing margins and the degree to which each factor affects the size of the marketing margin; and 3) the implications of these findings for policy actions to promote farmers' incomes from participation in maize markets. The remainder of this article, looks at prior studies that have been done on marketing margins, provides a description of the data sources and research methods used in our study, presents the main findings of the analysis, and concludes with a summary of main findings and possible government actions to raise smallholders' incomes from surplus grain production.

2. A Review of Prior Marketing Margin Studies

Food marketing margin analysis has been of interest to researchers and policy makers for a long time. Marketing margins provide an indication of market structure, performance and efficiency (Myers, et al., 2010). For commodities that do not undergo processing until after the consumer purchases it, the farm-retail margin indicates whether producers are getting an increasing or declining share over time of the total retail price of the commodity. Wider margins mean that farmers obtain a smaller share of the retail price. Margins are influenced by a number of factors, primarily shifts in retail demand, farm supply, the costs of transformation across time, space and form (e.g., transport and storage costs, processing costs in many cases, transaction costs associated with exchange, the quality of products and risk associated with the transactions) and potentially non-competitive behaviour in the markets (Wohlgenant, 2001).

A number of empirical studies have analysed marketing margins (retail-price spreads) in developing countries based on the types of variables mentioned above (Wohlgenant and Mullen, 1987). Other studies have examined the role of policies and potential non-competitive behaviour in determining the size of the margin. Studies by Traub and Jayne, (2008) and Vigne and Darroch (2010) have used marketing margin analysis to determine the size of the maize meal margins in South Africa, finding that the maize meal margins had been rising along the years.

The degree of risk through prices or yield uncertainty has also been shown to affect the marketing margin (Brorsen, 1985). The marketing margin is also affected by temporal and spatial factors (Carambas, 2005; Wohlgenant, 2001). Minten and Kyle, (1999) in their study in the former Zaire, examined how the producer-wholesale price margin of various foods was affected by distance and road quality. This study found that distance and bad roads increased the size of the marketing margins. They also found substantial regional price variation and relative price variations. This price variation and variation in margins across regions and villages has also been observed in other areas. Apart from regional and seasonal variations in prices, inter-household variations have also been found in the maize margins in Malawi, Kenya and Zambia (Sitko and Jayne, 2014; Yamano and Arai, 2010; Jayne et al., 2010). This then raises an interesting question of whether marketing margins are affected by household or individual factors. Some recent studies have looked at characteristics of the market participants and how

these factors might affect the size of the marketing margin; these factors include age, level of education, marital status, gender and the family size (Yamano and Arai, 2010).

Other studies have looked at the differences in the marketing margins across different marketing channels. They have found that marketing margins tend to vary across different market channels. Therefore, the type of channel the farmer chooses to utilize affects the size of the marketing margin and in fact, the price the farmer obtains for their produce (Sitko and Jayne, 2014)

From our review of the literature, we conclude that most marketing margin studies of food commodities have mainly focused on spatial and temporal factors. This stems from the notion that market participants are price takers, hence their characteristics should have little to do with price determination and indeed margin size. However, variations in the size of the marketing margins have been observed at the household level, holding time and space constant, thus an enquiry of this variation may produce useful insights. Few studies have examined whether household-specific factors affect the size of the farm-gate price and marketing margin, and none have tried to decompose the size of marketing margins into spatial, temporal vs. household-level components. It is from this gap in the literature that this study is motivated to examine the magnitude of inter-household variability in marketing margins versus spatial and temporal differences.

3. Data and Methods

The study used nationally-representative cross-sectional household data collected in the 2012 Rural Agricultural Livelihoods Survey (RALS12) by Zambia's Central Statistical office (CSO) and the Indaba Agricultural Policy Research Institute (IAPRI). The data covers a 12 month period, from May 2011 to April 2012. For the purpose of this article, only households that sold their maize to assembly traders were considered. Assembly traders constituted the second main transaction channel apart from FRA, chosen by smallholder maize sellers in this year (17.2% of total maize transactions). The sample was also restricted to areas where maize trade flowed from the farm to the retail centre (surplus areas). This restriction is important as marketing margin analysis should be based on observations where the flow of grain is from the farm to the retail and hence where the retail prices are higher than the farm-gate price. We excluded observations in rural areas where maize purchases exceeded sales (imply reverse trade flows into those rural areas), as including them would downwardly bias the measurement of the marketing margin. Marketing margin analysis is valid if it only includes observations where the flow of grain is from the farm to the retail centre (lower price to higher price). This exclusion brought our sample size to 579 households. Farm-gate prices reported by maize selling households in a particular month was matched to monthly retail price data at the nearest district town (collected by the Central Statistics Office) in the same period to construct monthly farm-to-retail marketing margins.

3.1 Empirical Model Specification

The dependent variable in this analysis is the farm-to-retail marketing margin for maize grain. The marketing margin (MM) was calculated as the difference between the farm-gate price received by the farmer (FP) and the price in the retail market at the nearest district town (RP) for the particular month t by household i and transaction j:

$$MM_{ijt} = RP_{ijt} - FP_{ijt} \qquad (1)$$

A variation of Marketing Cost Model was used and derived from

$$RP_{ijt} = Xtij\alpha + vt \qquad (2)$$
$$FP_{ijt} = Xtij\infty + v't \qquad (3)$$
$$RP_{ijt} - FP_{ijt} = Xtij(\alpha - \infty) + et \qquad (4)$$

where $\beta = \alpha - \infty$ and $et = vt - v't$, therefore;

$$MM_{ijt} = X_{tij}\beta + \varepsilon_{jt} \qquad (5)$$

where the dependent variable is the marketing margin (MM_{tij}), X_{tij} is a set of independent variables that were hypothesized to influence the size of the marketing margin and ε_t is the error term. The model was estimated using Ordinary Least Squares (OLS) regression. The independent variables used in the analysis are shown in Table 1.

Table 1. Independent variables used

Variables
Spatial Variables
District Dummies
Temporal Variables
Month Dummies
Household Variables
Age Of Household Head In Years
Sex of the household head (1= Male, 2= Female)
Household heads education
Primary Education (1= attended, 0= otherwise)
Secondary Education (1= attended, 0=otherwise)
Tertiary Education (1=attended, 0=otherwise)
Marital status of household head
Never Married (1= Yes, 0=No)
Divorced (1= Yes, 0=No)
Widowed (1= Yes, 0=No)
Separated (1= Yes, 0=No)
Number Of Household Members
Farm size of household (Hectares)
Productive Assets of the household (ZWK)
Household head Kinship Ties Dummy, 1=Yes 0=No
Number Of Traders Entering A Village
Distance To Nearest Boma (Km)
Distance To Nearest Road (Km)
Transport Cost Of Transporting A Kg Of Grain To District Sale point
Access to Price Information (1=Yes, 0=No)

4. Bivariate relationships

Table 2 shows the descriptive results. The mean marketing margins for the farmers that used the assembly trader channel was found to be ZMK[1]195.703 (USD0.04) per kg of maize sold, which entails that in general farmers obtained a lower price at the farm-gate than if they would have sold at the same period at the nearest district retail market in the same month. However, selling at the retail market would have necessitated farmers to organize transport from the farm-gate to the retail market, which may or may not have involved greater costs that the marketing margin.

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[1] The marketing margin and the farm-gate and retail prices are reported in the old Zambian kwacha (ZMK) before the currency was rebased by 1000 in January 2013 to the new Zambia Kwacha (ZMW)

We note that roughly 10% of the farmers had negative marketing margins; these farmers managed to obtain a higher price at the farm-gate compared to the price they would have obtained had they sold at the retail market during that month. The mean farm-gate price was found to be ZMK 822.74 (USD 0.16) per kg of maize sold and the mean retail price was ZMK 1018.44 (USD 0.20) per kg of maize sold. The farm-gate price as a percentage of the retail price was found to be 80.78%. More than 80% of the farmers had access to price information. This shows that price information is readily available to farmers, even in remote areas.

The distance and time travelled to the nearest retail centre give an indication of the ease of accessing markets. The mean distance to the nearest retail district town (Boma)[2] was found to be about 46 kilometres and the average distance from the villages to the nearest tarred road was 26 kilometres. Even with these distances, it was found that most of the farmers did not travel long distances to sell their produce. About 75% of the farmers sold their maize produce at the farm gate. For those that did travel to sell to assembly traders, their average distance was 4.5km per maize sale transaction thus the farmers in this case might not have problems with regard to market access as is normally believed to be the case with rural smallholder farmers in Africa. These findings are similar to those found by Chamberlin and Jayne (2013), who found that the distance travelled from the farm to the point of sale, was zero for over 70% of a nationwide sample of Kenyan farmers selling maize to private traders. Hence, it can be noted that traders offer a much-needed service by obviating the need to organize transport services that the farmers would otherwise need to pay for themselves if they have to travel to the nearest retail town to sale their maize. Thus, for 75% of the farmers in this nationally-representative sample of Zambian farmers the transport costs are borne directly by the trader, which the trader recovers by offering a lower price to farmers than at the district town. About 25% of the farmers incurred some transport costs themselves. We can therefore hypothesize that the greater the distance that farmers travel on their own to sell their maize, the higher the farm-gate price should be and the lower the marketing margin should be. The average transport cost for the farmers that transported the maize grain for sale was found to be ZMK863.35 per 50kg bag of maize grain.

We found that the average number of traders that entered the different villages to purchase maize grain directly from the farmers was seven. This indicates a reasonable level of competitiveness in the village grain market. The findings are also in line with those by Chapoto and Jayne, (2011) and Sitko and Jayne, (2014), who found that the mean number of traders in each village during the marketing season was 9 and 10 respectively.

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[2] BOMA, or British Overseas Management Area was a term coined during the colonial period for the district town capital but it continues to be used in Zambia today.

Table 2: Descriptive Statistics

Variable Name	Description of Variable	Mean	Distribution of Variables				
			p10	p25	p50	p75	p90
Dependent variables	*Dependent variables*						
Market Margin	Market Margin (Zambian kwacha, ZMK)**	195.703	-102.30	39.22	181.45	360.09	480.82
Farm-gate Price	Farm-gate Price (ZMK)	822.735	545.455	626.087	800.00	995.025	1111.111
Explanatory variables	*Explanatory variables*						
Age	Age of Household head (years)	44.833	28	34	41	55	65
Sex	Sex of household head (=1 if male, 2 female)	1.187	-	-	-	-	-
Education level of household head	Education level of household head						
dedulev1	Primary Education Dummy(attended=1, 0 otherwise)	0.549	-	-	-	-	-
dedulev2	Secondary Education Dummy(attended=1,0 otherwise	0.273	-	-	-	-	-
dedulev3	Tertiary Education Dummy(attended=1, 0 otherwise)	0.050	-	-	-	-	-
dedulev4	No Education Dummy	0.128	-	-	-	-	-
Household size	Number of household members	5.907	3	4	6	8	9
Dkinties	Household Kinship ties dummy,1=yes 0=no	0.484	-	-	-	-	-
Farm size	Farm size (Ha)	4.042	1	1.715	2.835	5.188	8.91
Prodasst	All household Assets (million ZMK)	24.9	0.5	1.02	2.92	10.4	27.8
Traders	Number of Traders Entering a Village	6.877	0	2	5	9	15
Distance boma	Distance to nearest Boma (Km)	46.019	10	20	35	62	98
Distance road	Distance to nearest tarred road (Km)	26.602	1	5	20	40	65
Transport cost	Cost of transporting a kg of maize to sale point (ZMK)	17.611	0	0	0	0	86.96
Price information	Access to price information-agric commodity(1=yes)	1.128	-	-	-	-	-
Month	Month of Maize Sale	7.699	-	-	-	-	-
Retail Price	Retail Price Per Kg (ZMK)	1018.438	717.647	941.1765	1038.647	1176.471	1176.471

Source: Authors computations from RALS 2012 ** 1 USD = 6240 ZMK in 2012.

We also examine how farm-gate prices and marketing margins vary according to farmers' socio-demographic characteristics. Table 3 shows that male farmers obtain a higher farm-gate price than female farmers, but they also tend to incur higher marketing margins than female farmers. The higher farm-gate price conforms to most studies, as males are believed to be better negotiators and tend to have more price information than females. Farmers who were less than 30 years obtained higher farm-gate prices followed by those farmers that were between the ages of 50-70 years. The farmers above 70 years fetched the lowest farm-gate price. We will examine in the next section whether these bivariate relationships hold after controlling for other observed factors.

Table 3: Maize Farm-Gate Price and Marketing Margin by Sex, Age and Education Level.

Variable	Observations	Farm-Gate Price (ZMK)	Farm-gate price minus median farm-gate price at ward level	Marketing Margin (ZMK)
Gender				
Male	471	823.03	4.95	196.80
		(224.05)	(147.87)	(244.97)
Female	108	821.43	-0.14	190.93
		(190.22)	(160.48)	(217.68)
Age in years				
18-30	107	847.60	5.38	157.74
		(226.69)	(157.33)	(242.46)
30-50	286	828.16	2.87	196.56
		(213.31)	(144.88)	(240.90)
50-70	154	817.09	10.79	220.43
		(216.41)	(158.30)	(233.30)
>70	32	718.33	-23.14	195.99
		(216.65)	(134.79)	(249.67)
Education Level				
Primary	318	801.25	5.02	204.96
		(227.51)	(161.89)	(247.66)
Secondary	158	855.88	3.82	168.07
		(216.65)	(133.66)	(237.34)
Tertiary	29	878.96	37.07	228.53
		(182.42)	(93.35)	(247.15)
No Education	74	822.25	-12.96	202.06
		(179.16)	(149.16)	(206.07)

Source: Authors computations from RALS 2012, (Numbers in parentheses are standard errors)

The level of education of the farmer is expected to affect the size of the farm-gate price and the marketing margin in that, the more educated the farmer is, the more likely they are to make informed decisions and obtain better farm-gate prices. This was shown to be the case, as the farmers with tertiary education obtained higher farm-gate prices (ZMK878.96) than the farmers with lower levels of education. The farmers with no formal education on the other hand fetched a lower farm-gate price than the prevailing median farm-gate price at ward level.

4.1 Spatial and Temporal Price Variation

Prices that farmers receive at the farm-gate, as well as the retail price, normally vary from one region to another according to supply and demand conditions as well as transport costs to major demand centres. Minten and Kyle (1999) for example, states that "the presence or absence of road infrastructure is perceived to be one of the main determinants of spatial price variation observed in African grain markets". After decomposing the data into temporal and spatial aspects, Table 4 shows how the marketing margins vary by province, with Southern Province having the lowest marketing margin (ZMK66.02). Farmers in this province obtained a farm-gate price that is closer to the retail price in the nearest town/retail centre. Eastern province on the other hand had the highest margin (ZMK268.95). These differences in marketing margins per province indicate the spatial price differences that are observed due to differences in marketing access conditions as well as other factors, such as price information that farmer's in the different provinces have access to and the road conditions.

Table 4: Maize Marketing Margin by Province and District

Province	Observations	Marketing Margin (ZMK)
Central	109	189.29
Copperbelt	47	192.89
Eastern	165	268.95
Luapula	34	264.97
Lusaka	19	225.32
Muchinga	13	151.77
Northern	74	208.82
North Western	48	73.64
Southern	63	66.02
Western	7	118.07

Source: Authors computations from RALS 2012

Apart from spatial price variation, prices tend to also vary over time. Food grains and other types of food products are likely to exhibit seasonal price variations, due to variations in food availability and supply. In Zambia, the maize marketing season starts a month or so after the harvest in May/June, reaches a peak in the June/August period, and tapers off noticeably in the

February/April period just before the next harvest. During the main maize marketing season of June/August, large quantities of maize grain are offloaded onto the market and a decline in retail prices is observed (Table 5 below). Retail prices are lowest in the months of June and July, with June having the largest quantity of maize sold in the season.

Table 5: Monthly Maize Prices, Quantity Sold and Marketing Margin

Month[3]	Observations	Mean Number of Sales Transactions per Household	Farm-gate Price (ZMK)	Retail Price (ZMK)	Quantity Sold for all transactions (Kg)	Marketing Margin (ZMK)
2011						
May	19	1.16	696.93	1052.10	549.76	355.18
June	66	1.18	709.99	908.56	1671.68	198.58
July	93	1.24	772.86	929.46	995.36	156.59
August	174	1.34	837.68	1004.45	1329.05	166.77
September	61	1.46	869.56	992.93	749.11	123.37
October	69	1.42	868.70	1119.81	901.32	251.10
November	30	1.93	845.21	1164.22	522.18	319.01
December	24	1.58	908.43	1091.91	522.94	183.49
2012						
January	24	1.71	930.52	1185.46	734.13	254.94
February	15	2.40	868.34	1100.00	889.33	231.66
March	3	2.67	811.59	1176.47	345.00	364.88
April	1	2.00	695.65	1058.82	287.50	363.17

Source: Authors computations from RALS 2012

The marketing margin also varies from month to month, with September having the lowest marketing margin and March and April having the highest marketing margins.

4.2 Inter-Household Price Variation

Price variations are evident in terms of spatial and temporal variations. Theses price variations are expected as geographical differences bring about differences in market infrastructure and facilities, such as access to roads, which in turn affect the cost of transportation and thus affecting the prices differently depending on the area. Seasonal differences affect the grain availability and in turn affect the price. However, even within the same time period and in the

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[3] The data was collected from May 2011 to April 2012, therefore the months in this table are reported in this order

same areas, maize farm-gate prices have been seen to vary among households (see Sitko and Jayne, 2014:64). Figure 1 below examines the inter-household price variation in the same district and the same months, where the farm-gate price is plotted alongside the retail price for Petauke district. The results show that within the same district and the same month farmers fetch varying prices, with some farmers being able to obtain prices above the retail price while others receive very low prices, even less than 50% of the retail price.
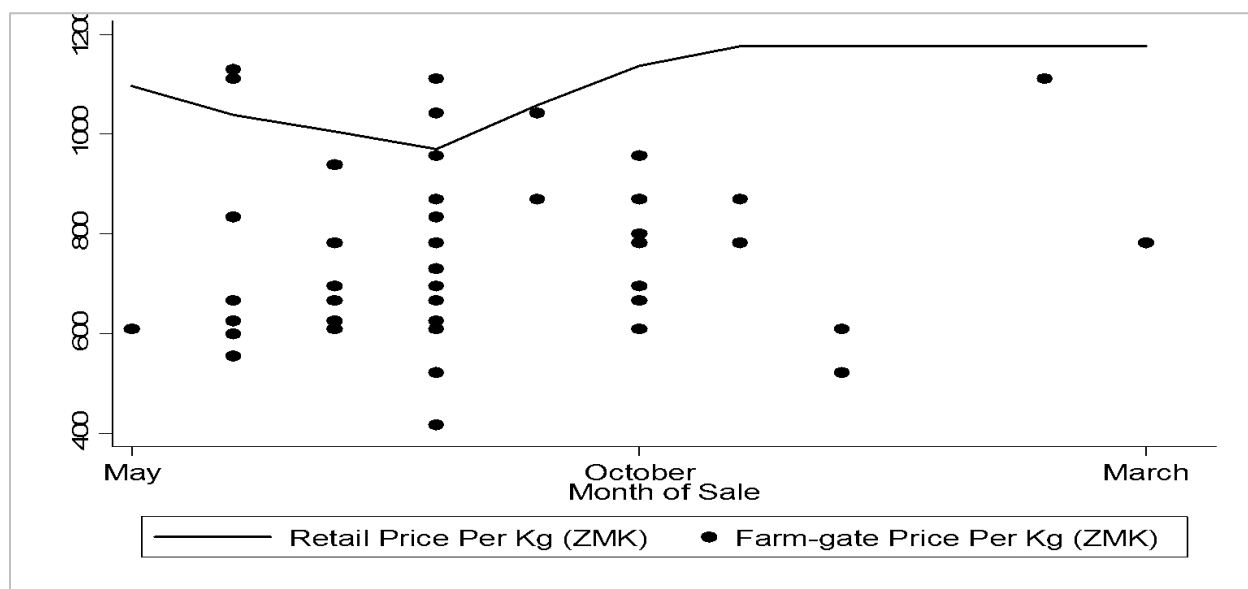

Figure 1: Farm-Gate Price Relative to Retail Maize Prices in Petauke District

Source: Authors computations from RALS 2012

Figure 1 shows a very wide range in farm-gate prices obtained among households in the same district in the same months. For instance in the month of August, the price range between the lowest farm-gate price and highest farm-gate price obtained was as large as ZMK693 per kg of maize grain. Some of this variation may be explained by differences in transport costs to the district town center or to the main road to Lusaka and/or other demand centers, yet the very large inter-household variation in prices raises *prima facie* questions as to why farmers in the same area would obtain such widely varying prices. Other districts in the other provinces also show a consistently similar pattern. A closer examination of this price variation, holding distance to the retail centre within the same district constant at 30km (Figure 2 below), still showed variations in the prices obtained by farmers in Petauke District. Some farmers were able to fetch prices above the retail price while others fetched prices below the retail price.

The significant inter-household variation in prices holding time and space constant suggests that other factors apart from the spatial and temporal factors might have an influence on the farm-gate price obtained by farmers and indeed the size of the marketing margin in Zambia. Household-specific factors e.g. access to price information, the farmer's market knowledge,

negotiating skills, age, gender or relationships with the assembly traders; might have an influence on the price a farmer obtains. Therefore, an examination of the contribution of the spatial, temporal and household specific factors to the size of the farm-gate price and the marketing margins is carried out in the next section.
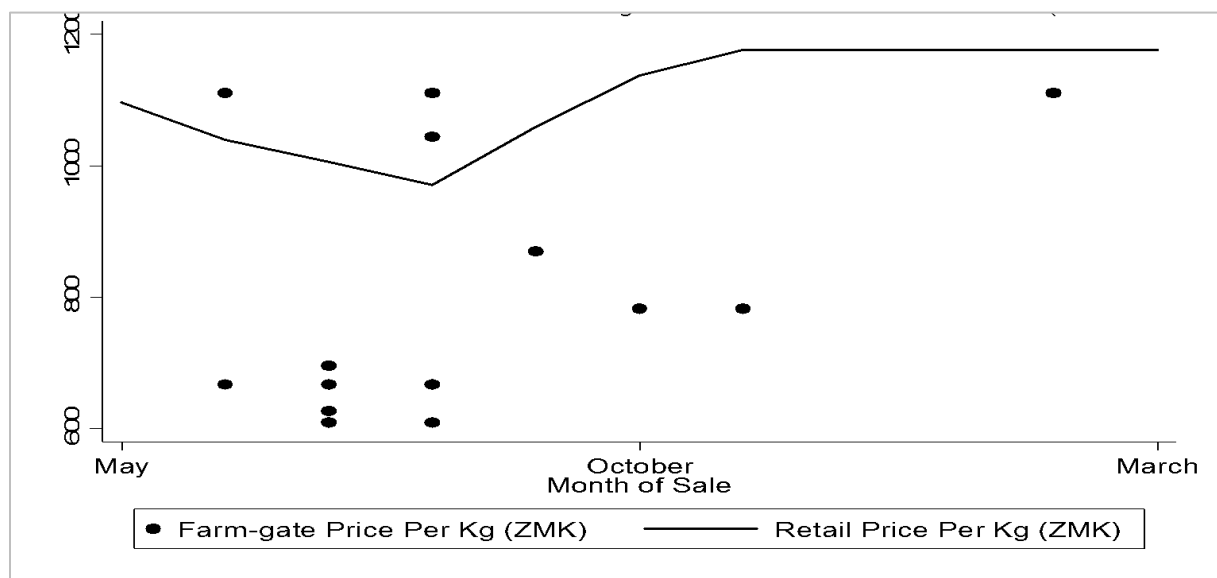

Figure 2: Farm-Gate Price Relative to Retail Maize Prices in Villages with Distance of 30km to Retail Centre in Petauke District
Source: Authors computations from RALS 2012

5.   Factors Affecting the Household-Specific Marketing Margins and the Farm-gate Price

Three models were estimated to establish how much variation in marketing margins is due to spatial, temporal and household specific factors. The dependent variable in all three models is the marketing margin. The first model contains only spatial factors on the right-hand side, which are the district dummies. The second model contains both spatial and temporal factors (monthly dummies), and the third model includes the spatial factors, temporal factors and the household specific factors. The results of all three regressions are presented in Table 6. From the results, it can be seen that spatial factors account for the largest variation in marketing margins given by an adjusted R-squared of 21.1%. Adding the temporal factors increases the adjusted R-squared by 4.9 percentage points and including the household specific factors increases the adjusted R-squared by 3.3 percentage points to 29.3%. Therefore, of the explained variation in marketing margins 72% is due to spatial factors, 16.7% is from temporal factors and household-specific factors account for 11.3% of the variation. But the majority of the variation in maize marketing margins, 70.7%, are unexplained by our model.

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These results show that apart from the usual expected spatial and temporal factors, marketing margins are also affected by household-specific factors, even though the contribution of the observed household factors presented are relatively small compared to the other factors. The household specific factors that were found to be statistically significant in affecting the size of the marketing margin are marital status, kinship ties, cost of transporting grain and access to price information.

Table 6: Maize Marketing Margin Regression Results

Variables	Regression 1	Regression 2	Regression 3
Age Of Household Head In Years			-0.174
			(0.781)
Sex (1= Male, 2= Female)			-21.06
			(44.52)
Primary Education (1= attended, 0= otherwise)			-15.35
			(33.15)
Secondary Education (1= attended, 0=otherwise)			-34.64
			(36.98)
Tertiary Education (1=attended, 0=otherwise)			-0.653
			(74.43)
Never Married (1= Yes, 0=No)			-262.8**
			(109.5)
Divorced (1= Yes, 0=No)			-78.05
			(64.91)
Widowed (1= Yes, 0=No)			-30.56
			(50.31)
Separated (1= Yes, 0=No)			-9.907
			(73.99)
Number Of Household Members			-1.296
			(4.549)
Farm size			0.349
			(3.509)
Productive Assets (ZWK)			4.19e-07
			(3.10e-07)
Kinship Ties Dummy, 1=Yes 0=No			88.26***
			(27.36)
Number Of Traders Entering A Village			0.252
			(1.875)
Distance To Nearest Boma (Km)			-0.0158
			(0.585)

Distance To Nearest Road (Km)			-0.561
			(0.674)
Transport Cost Of Transporting A Kg Of Grain To District Sale point			-0.578*
			(0.323)
Price Information (1=Yes, 0=No)			-74.76**
			(35.51)
District dummies included	Yes	Yes	Yes
Month dummies included		Yes	Yes
Constant	279.4***	385.6***	509.5***
	(55.16)	(98.49)	(116.6)
Mean Marketing Margin	195.703	195.703	195.703
Observations	579	579	579
R-squared	0.275	0.334	0.386
Adj.R-squared	0.211	0.260	0.293

Note: Robust standard errors in parentheses   *** $p<0.01$, ** $p<0.05$, * $p<0.1$

The results indicate that households that are headed by single farmers obtained a lower marketing margin by ZMK262.8 than households headed by married farmers. The results also show that households with kinship ties, that is ties to either the chief or village elders have a margin that is higher by ZMK88.26 than those without kinship ties, holding other things constant. It has always been believed that households with kinship ties obtain higher farm-gate price and in turn lower marketing margins, however these results show the opposite. Thus, is the notion of kinship ties being positively related to price a myth and not a fact? Household's access to price information also affects the size of the marketing margin. The results show that households with access to price information obtain a lower marketing margin by ZMK74.76 *ceteris paribus. A priori*, it had been hypothesized that access to price information equips one with the information and thus are able to negotiate a better price and choose a buyer or seller that offers a better price, therefore obtaining a higher farm-gate price and reducing the market margin.

A similar analysis was carried out with the dependent variable being the farm-gate price to shed more light on how much variation in farm-gate prices are due to spatial, temporal and household specific factors, with the same independent variables. The results of all three regressions are presented in Table 7, show that spatial factors account for the largest variation of 18.8% as reported by the adjusted R-squared. Adding the temporal factors increases the adjusted R-squared by 3 percentage points. Addition of the household specific factors increases the adjusted R-squared by 3.2 percentage points. As was the case with marketing margin, spatial factors contribute the most to size of farm-gate price (75.2%), temporal factors and the household specific factors have very minimal contribution to the farm gate price obtained by farmers with 12% and 12.8% respectively. The household specific factors that are found to influence the size

of the farm-gate price are level of education, access to price information and kinship ties. Farmers who have attained secondary education have a higher farm-gate price of ZMK61.79 than those with no formal education. The farmers with access to price information receive a higher farm-gate price of ZMK68.05 and the households with kinship ties receive a lower farm-gate price by ZMK70.94.

Table 7: Maize Farm-Gate Price Regression Results

Variables	Regression 1	Regression 2	Regression 3
Retail Price Per Kg (ZMK)			0.118
			(0.106)
Age Of Household Head In Years			-0.233
			(0.714)
Sex (1= Male, 2= Female)			-0.118
			(43.71)
Primary (1= attended, 0=otherwise)			19.27
			(31.96)
Secondary(1=attended,0=otherwise)			61.79*
			(35.34)
Tertiary(1= attended, 0=otherwise)			70.87
			(70.27)
Never Married (1= Yes, 0=No)			181.7
			(117.7)
Divorced (1= Yes, 0=No)			54.20
			(62.22)
Widowed (1= Yes, 0=No)			14.87
			(47.21)
Separated (1= Yes, 0=No)			32.46
			(64.20)
Number Of Household Members			-0.438
			(4.288)
Farm size			-1.699
			(3.308)
Productive Assets (ZMK)			-4.31e-07
			(2.76e-07)
Kinship Ties Dummy,1=Yes 0=No			-70.94***
			(26.88)
Number Of Traders Entering A Village			0.0714
			(1.837)
Distance To Nearest Boma (Km)			0.311
			(0.537)

Distance To Nearest Road (Km)			0.244
			(0.594)
Transport Cost Of Transporting A Kg Of Grain To District Sale point			0.453
			(0.306)
Price Information(1=Yes, 0=No)			68.05**
			(33.70)
District dummies included	Yes	Yes	Yes
Month dummies included		Yes	Yes
Constant	805.9***	836.2***	599.5***
	(41.23)	(75.67)	(166.4)
Mean Farm-gate Price	822.735	822.735	822.735
Observations	579	579	579
R-squared	0.254	0.296	0.350
Adj.R-squared	0.188	0.218	0.250

Note: Robust standard errors in parentheses   *** p<0.01, ** p<0.05, * p<0.1

This article focuses on the marketing margin of the household that sold to assembly traders. However, a further examination of all households selling maize through other market channels shows that households that sold using the assembly trader channel have the highest marketing margin as compared to the other market channels (Table 8, below). This is expected as the assembly traders incur a large cost by following the farmers to their farm-gates, thus the mark-up price is larger so that they are able to break even. Households that used the cooperative market channel had the lowest marketing margin, as the farm-gate price they obtained was higher than the retail price in the nearest market.

Table 8: Farm-gate Price, Retail Price and Marketing Margin by Private Trader Market Channel

Market Channel	Observations	Farm-gate Price (ZMK)	Retail Price (ZMK)	Marketing Margin (ZMK)
Assembly Trader	579	822.74	1018.44	195.7
Large scale trader	88	905.91	983.78	77.87
Retailer / Marketeer	189	948.65	1054.89	106.24
Cooperative (not destined for FRA)	9	1156.02	1000	-156.02
Directly to miller/processor	45	879.9	996.06	116.16
To miller/processor through an agent	38	1000.92	955.27	-45.66

Source: Authors computations from RALS 2012

6. Conclusions and Policy Implications

The study has shown that spatial factors account for the largest source of variation in the marketing margin and farm-gate prices obtained by farmers. The wide variation in marketing margins observed in different districts show that the price farmers obtain differs from one area to another, and this is mostly based on the distance to the retail centre. Temporal factors account for a minimal variation in the marketing margin and the price obtained by farmers. During months of grain availability, which is from June to August, the farm-gate prices are lower and in times of low grain availability, the farm-gate prices are higher. Thus, seasonality plays a role in the farm-gate price and the marketing margins obtained by farmers. These variations in farm-gate prices are also evident in the same villages and holding time constant as shown.

We find that household-specific factors do have an effect on the farm-gate price and the size of the marketing margin, but their influence is less important than the spatial factors and slightly less important than the temporal factors. The household factors that were found to significantly affect the size of the maize marketing margin were marital status, kinship ties to either the chief or village elders, and access to price information. However, our models explained roughly 29 percent of the variation in the marketing margins.

Therefore, these results indicate that the prices that maize farmers in Zambia obtain might not be exogenous of the farmer characteristics and attributes. The individual farmer attributes influence the price they obtain at the farm-gate and hence it can be said that maize farmers in Zambia are not necessarily price takers. Hence, it can be noted that the large marketing margins observed do not necessarily mean farmer exploitation and the small marketing margins do not mean market competiveness, but these might mean that farmers have different attributes and these attributes affect the prices that they are able to obtain.

With spatial factors accounting for the largest source of price variation, and the farmers in villages further away from the central retail centres fetching lower prices than those near the retail centres. Therefore, in order to help reduce price variation among farmers and raise maize prices received by the farmers in Zambia, policies aimed at improving infrastructure to better link rural villages to urban markets ought to be implemented. Rather than trying to engage in markets in an effort to overcome perceived private trader exploitation, the government and donors need to help farmers better engage in the existing market channels. As it has been seen that the type of channel a farmer uses, will influence the price they obtain. Helping farmers have access to both these existing channels should be a priority and equipping farmers with timely price information. Having access to price information has been found to be a significant factor in determining the price a farmer will obtain. Farmers that have access to reliable and timely price information are in a better position to engage in the market and are able to negotiate better prices than those farmers without access to price information.

Seasonality and time of sale play a big role in the maize price obtained by farmers as temporal factors account for the second largest source of variation in maize grain prices. To help reduce maize price variation and improve the prices received by farmers, the Zambian government and other private sector participants, need to assist smallholder farmers in ensuring they are able to market grain at the times when it is most profitable and this can be achieved by investing in storage facilities that farmers can use for instance warehouses. Farmers are unable to take advantage of higher prices in off-season times due to lack of storage facilities.

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