Paddy prices and marketing agencies in India: an empirical analysis of effectiveness of public procurement

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Abstract Ensuring remunerative prices to farmers through price and non-price interventions by the government is an essential component of sustainable development of agriculture in India. This paper identifies market and non-market factors responsible for higher price realisation by farmers over the government-determined minimum support price (MSP). Our findings show that small and marginal farmers (with less than 2 hectares of land) in the states with low quantum of procurement are more likely to sell below MSP to local private traders. However, the probability of receiving higher prices increases if they shift from private traders to wholesale markets (mandis) and government agencies, and this is much higher in states with higher levels of procurement. The probability of better price realization also improves with increase in land size and access to institutional credit.

Keywords Producer prices, Marketing agencies, Price policy, Agriculture markets

JEL classification Q110, Q180, Q130, O20

1 Introduction

Policy interventions in agricultural markets have been an integral component of the development policies in India. These can be categorised into: (a) regulatory measures, (b) market infrastructure, and (c) price policy (Chand 2012). The first category deals with the development and regulation of wholesale markets, and legal framework that regulates their functioning. Market infrastructure consists of two facets, viz. quantity and quality. The regulated markets and infrastructure have grown at a lesser pace relative to the growth of agricultural output. The third components i.e. agricultural price policy aims at ensuring remunerative prices to producers through minimum support prices (MSP) and stability in prices for the consumers. This is achieved through procurement of grains from farmers and their distribution to consumers through public distribution system (PDS) (Swaminathan 1999; Bajar & Chand 2012).

In this paper, we focus mainly on (b) and (c). Market infrastructure and institutions along with production relations determine the prices that farmers realise from different buyers. In a neo-classical framework, efficient functioning of markets is important to strike a balance between demand and supply. However, market distortions are widely prevalent and contribute to inefficiencies and discrepancies in marketing as well as prices. The "middle-men" in the marketing chain often bring distortions in the commodity prices through cartelization or hoarding. This happens because of weak infrastructure and market fragmentation (Jan & White 2012; Tripathi 2013).

This paper attempts to examine the variability in the producer prices of paddy across different marketing agencies including the government that procure for public distribution and buffer stocking. Additionally, we extend this analysis by land size and socio-economic conditions that determine the exchange relations. The basic premise is to elucidate the factors responsible for deviations in farmers' realised prices (FRP) from the government-determined minimum support price (MSP).

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2 Data and empirical model

The empirical analysis is based on data extracted from various secondary sources. The data on paddy procurement were taken from the "Agricultural Statistics at a Glance", Ministry of Agriculture and Farmers' Welfare, Government of India. A larger part of this paper is based on household-level data extracted from a nationally representative survey - "Situation Assessment Survey (SAS)" carried out by the National Sample Survey Office (NSSO), Government of India in 2012-13. A similar survey was conducted in 2002-03 also. This survey provides information on several aspects related to cultivation and socio-economic characteristics of agricultural households. In addition, this survey provides information on disposal of farm produce and prices realized from different buyers. We have selected Andhra Pradesh, Chhattisgarh, Haryana, Madhya Pradesh, Odisha, Punjab, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal for our analysis.

We begin with an analysis of temporal and spatial variations in price and procurement of paddy and then undertake an exploratory analysis of the factors that determine price or deviation therein using a binary logistic regression.

$$Ln\left(\frac{p}{1-p}\right) = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + ... + b_kX_k$$

Where, p is the probability of outcome; b_0 is the intercept, and X_1 to X_k represent predictors in the equation. The detailed description on dependent and independent variables are given in table 1. A few interaction terms are also included to understand the joint effect of categorical predictors in explaining the probability of the dependent variable.

3 Results and discussion

3.1. Trends in paddy procurement and prices

Procurement of cereals, mainly wheat and paddy (rice) is an important policy instrument to ensure food security in the country. This policy is also helpful in assuring administered prices to the producers to incentivise and safeguard them from price shocks and maintain price stability. For long, Andhra Pradesh and Punjab have a bulk share in total procurement of paddy

Table 1. Description of variables used in the logistic regression

Dependent variable (Y_i)	Type	Units/ categories	No. of observations
Paddy sold at price more than MSP	Categorical	1- if Yes, 0 if No	4978
Independent Variable (X_i)			4978
X_1 Land possessed	Continuous	in hectares	
X_2 Land size-class	Categorical		
i. Marginal		Land possessed <1ha.	4978
ii. Small		1-2ha.	
iii. Medium		2-4ha.	
iv. Semi-medium		>4ha.	
X_3 Buying agency	Categorical		4978
i. Local private trader		1	
ii. Mandis		2	
iii. Input dealers		3	
iv. Government agencies		4	
v. Processors		5	
vi. Others		6	
X_4 Credit Categorical		4978	
i. No loan		0	
ii. Loan from private lenders		1	
iii. Institutional loan		2	
X_5 Procurement status of state	Categorical	High=1 Low=0	4978
X_6 Whether accessed any technical advice	Categorical	Yes=1 No=2	4978

Table 2. Share of procurement in total paddy production

State	2001-02	2011-12	2012-13	2013-14	2014-15
Andhra Pradesh	56.41	97.34	94.19	53.62	49.71
Chhattisgarh	37.86	68.26	72.69	63.87	54.14
Haryana	54.44	53.39	65.62	60.18	50.30
Madhya Pradesh	16.19	28.51	32.36	36.73	22.26
Odisha	17.53	49.32	49.52	36.79	40.45
Punjab	82.60	73.34	75.24	71.94	70.10
Tamil Nadu	12.94	21.40	11.88	12.79	18.35
Uttar Pradesh	15.06	23.93	15.86	7.70	13.95
Uttarakhand	38.25	63.64	85.72	80.02	77.03
West Bengal	0.31	13.94	11.75	8.84	13.84
All-India	23.71	33.28	32.35	29.86	30.37

Source: Authors' calculations

(Chand 2003). This pattern has changed in recent times with increasing proportions contributed by Odisha and Chhattisgarh (GoI 2017).

Table 2 presents the share of procurement in total production in major paddy/rice growing states. At all India level, in 2014-15 on an average about 30% of the total paddy production was procured by the government, about 7 percentage points more than in 2001-02. The trend is different across the states. It strikingly increased in Andhra Pradesh until 2011-12, but declined steeply after 2012-13. A similar trend can be observed in Tamil Nadu, Odisha, Chhattisgarh, Madhya Pradesh, Uttar Pradesh, Uttarakhand and West Bengal. It is comparatively much higher in Punjab.

Price policy for agricultural crops and their procurement are interlinked. Public procurement of food grains (wheat and paddy) is done by the Food Corporation of India (FCI), and of pulses, sugarcane and jute by central and state marketing agencies. These agencies procure at administered prices that are announced every year. The rationale of ensuring MSPs is not only limited to public procurement but applicable to all the marketing transactions. However, several past studies have pointed out about the poor implementation of support prices resulting in sales below the announced support prices (Ali et al. 2012, Dev & Rao 2010).

The trend in paddy prices received by farmers varies regionally. Haryana has the highest realised prices from 2006-07 onwards. The lowest prices were received by producers in Odisha, West Bengal and Uttar Pradesh.

Observations from figure 1 and table 3 substantiate this difference between farmers' realised price (FRP) and minimum support price (MSP). Average FRP has never been below MSP in Haryana, Punjab and Tamil Nadu. On the other hand, states like Odisha, West Bengal and Uttar Pradesh have witnessed more frequent negative deviations between the realised price from the MSP (table 3).

Analysis so far is indicative of lower paddy sale prices in states having lower procurement (Odisha, West Bengal and Uttar Pradesh). However, the relationship between higher prices and procurement share is not very clear. Haryana and Punjab have maintained higher

Table 3. Frequency of deviation between FRP and MSP in selected states, 2001-02 to 2014-15

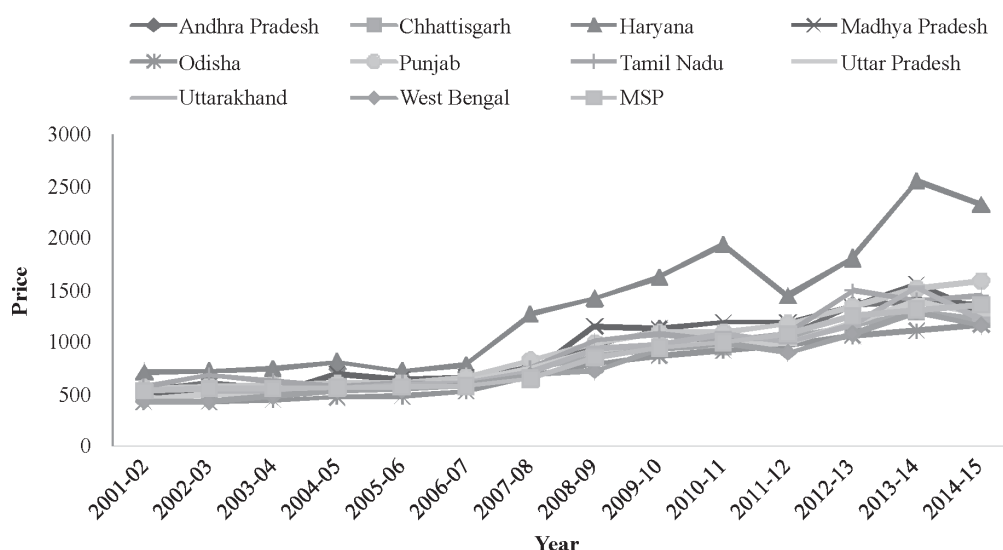| States	Positive deviation	Negative deviation
Andhra Pradesh	12	2
Chhattisgarh	6	7
Haryana	14	0
Madhya Pradesh	10	4
Odisha	1	13
Punjab	14	0
Tamil Nadu	14	0
Uttar Pradesh	5	9
Uttarakhand	7	6
West Bengal	2	12

Source: As for table 2.

Fig. 1. Farmers realised price and minimum support price for paddy at 1993-94 prices in selected states, 2001-02 to 2014-15 (Rs./quintal)
Source: Authors' calculations based on data in Agricultural Statistics at a Glance.

Table 4. Two-way classification of paddy procuring states by deviation from MSP and procurement share

	High procuring	Low procuring
Positive deviation	Andhra Pradesh, Haryana, Punjab, Uttarakhand	Madhya Pradesh, Tamil Nadu
Negative deviation	Chhattisgarh	Odisha, Uttar Pradesh, West Bengal

prices and procurement, Tamil Nadu is an exception. In Tamil Nadu, the prices realised are higher despite lower procurement.

3.2 Paddy prices, marketing agencies and price realised

It is often argued that the presence of middlemen in the marketing chain impedes the realisation of higher prices by the farmers (Jan & White 2012). On the other hand, public procurement through government agencies improves prospect of achieving remunerative prices even above MSP. However, there have been instances in the past, wherein, even with sizeable public procurement, the prices realised were not above the MSP. We study the marketing mechanisms and its impact on facilitating remunerative prices to farmers based on the NSSO-SAS (2013) data.

At first, we classify the paddy procuring states into four categories following two criterion; one, the share of total paddy output procured in each state[1], and two, the deviation of FRP from MSP[2]. Andhra Pradesh, Haryana, Punjab, and Uttarakhand have FRP above MSP, and also have high public procurement of paddy. Madhya Pradesh and Tamil Nadu, despite low procurement, have relatively higher FRP than MSP (table 4).

The marketed surplus, defined as the ratio of quantity sold to total produce is presented in table 5. In 2012-13, the overall marketed surplus was around 82% in India. In most of the states, the marketed surplus ratio was higher than 80% barring Odisha and West Bengal. Similar estimates are also obtained from the analysis of the unit-level data of NSSO-SAS (2013). However, the estimates are not concurrent with the official

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[1] High procurement states are those that have witnessed more than or equal to 50 per cent of procurement in total paddy output for more than or equal to 7 times out of 14 years. Low procurement states on the other hand, are those with less than 50 per cent of procurement in total paddy output for more than or equal to 7 times out of 14 years.

[2] Positive deviation states are those that have FRP ≥ MSP for more than or equal to 7 times out of 14 years. Negative deviation states are those that have FRP ≤ MSP for more than or equal to 7 times out of 14 years.

Table 5. Marketed surplus ratio of paddy, in selected states, 2012-13 (%)

States	Marketed surplus ratio
Andhra Pradesh	87.86
Chhattisgarh	NA
Haryana	93.47
Madhya Pradesh	87.91
Odisha	73.96
Punjab	99.48
Tamil Nadu	91.08
Uttar Pradesh	83.11
Uttarakhand	NA
West Bengal	67.48
All-India	81.51

Source: Agricultural Statistics at a Glance (2016).
NA: Data not available

estimates. For example, marketed surplus in 2012-13 was lower (69%) in NSSO-SAS at the all India level (table 6). Nonetheless, paddy being predominantly a market-oriented crop in India is endorsed in both the data sources.

Table 6 provides the results on the ratio of sold output to the total production of paddy by each household disaggregated across the states and land size-classes. It is noticed that in higher procuring states (Andhra Pradesh, Chhattisgarh, Haryana, Punjab and Uttarakhand), there is not much disparity in the extent of marketed output across farm classes. On the contrary, in case of low procuring states (Madhya Pradesh, Odisha, Tamil Nadu, Uttar Pradesh and West Bengal), there is considerable difference in the marketed surplus by farm size.

Agricultural prices are also differentiated by farm size. Some earlier studies, for example by Bharadwaj (1985) and Adnan (1985) indicate a possible translation of power from production to the spheres of exchange. Rich farmers, who usually are large farmers were the benefactor from the sale of produce in the rural markets. These results were re-assessed in the present section using the NSSO-SAS data of 2012-13 and are presented in table 7. At all-India level, paddy price differences were prominent across land size-classes, and a gradual scale-effect can be noted for prices. However, such a scale effect is not clear when we look at the state level estimates.

The minimum support price for paddy (common) was fixed at Rs. 12.5 per kg for 2012-13. Table 7 displays results of realisation of support prices in different states in 2012-13. States like Andhra Pradesh, Haryana, and Punjab, where there is a significant proportion of public procurement of paddy, the realised prices are above MSP. The pattern in Tamil Nadu is also similar despite of lower presence of the government in paddy market. Such differences can arise due to variations in farmers' access to different marketing agencies, which in turn depends on the socio-economic status of the farmers.

Table 6. Marketed surplus ratio of paddy for selected states by size-class, 2012-13 (%)

States	Marginal (<1ha)	Small (1-2ha)	Semi-medium (2-4ha)	Medium and large (> 4ha)	All
Andhra Pradesh	78.5	84.5	87.2	80.2	80.8
Chhattisgarh	56.4	56.7	60.4	62.7	57.0
Haryana	93.8	97.0	97.0	99.6	95.7
Madhya Pradesh	59.7	50.6	71.4	66.7	57.8
Odisha	58.1	49.7	55.3	73.0	56.3
Punjab	95.6	97.0	98.7	99.5	97.2
Tamil Nadu	93.3	90.4	94.0	71.3	92.4
Uttar Pradesh	62.3	73.7	71.6	73.8	64.3
Uttarakhand	79.1	74.7	79.8	83.3	77.8
West Bengal	54.0	61.6	63.8	67.5	55.1
All-India	69.3	65.8	73.6	80.3	69.1

Source: Authors' calculations from NSSO-SAS (2013)

Table 7. Average price received for per unit paddy sales across size-class for selected states, 2012-13 (Rs./kg)

States	Marginal (<1ha)	Small (1-2ha)	Semi-medium (2-4ha)	Medium and large (> 4ha)	All
Andhra Pradesh	13.3	13.0	12.3	12.5	13.1
Chhattisgarh	11.7	11.6	11.9	12.3	11.7
Haryana	17.9	17.7	18.1	19.7	18.0
Madhya Pradesh	13.5	13.0	13.0	13.3	13.3
Odisha	10.7	10.7	12.0	11.9	10.8
Punjab	29.4	15.2	16.8	33.0	22.2
Tamil Nadu	14.4	12.9	15.0	12.8	14.2
Uttar Pradesh	10.8	12.7	11.6	10.4	11.1
Uttarakhand	10.5	12.0	9.8	8.0	10.9
West Bengal	10.4	10.3	10.4	10.5	10.4
All-India	11.4	12.2	13.1	16.8	11.7

Source: Authors' calculations from NSSO-SAS (2013)

3.3 Role of marketing agencies

The following section focuses on the variations in the shares of sales to different marketing agencies, and the average prices realised by farmers by land class. These channels are: local private traders, mandi, input dealers, and government and cooperative agencies. However, the NSS data include two more agencies, processors and others. For the analysis, we restrict our analysis to the first four channels.

Table 8 shows spatially differentiated participation of marginal farmers in terms of share of sales to different agencies, and average prices realised from them as well. Except Haryana and Uttarakhand, all the other states conform to the pattern where more than 30% of the

Table 8. Share of sales and average price received by marginal farmers (less than 1 ha), 2012-13

States	Local private		Mandi		Input dealers		Cooperative and govt. agency	
	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)
AP	81.9	13.5	1.2	13.4	15.2	12.6	0.0	0.0
CH	32.9	10.5	20.7	12.1	8.6	10.7	37.7	12.6
HR	1.7	24.0	58.3	15.5	0.0	0.0	24.1	20.1
MP	58.7	13.8	6.7	11.2	17.3	11.7	10.8	15.3
OD	72.9	10.3	19.6	11.9	1.5	11.1	5.1	11.9
PB	32.9	60.5	47.6	14.7	5.2	12.8	13.7	12.7
TN	72.2	14.8	5.9	14.9	0.0	0.0	21.8	12.9
UP	70.7	10.1	16.7	14.2	11.2	10.4	0.4	10.2
UK	0.6	25.0	74.3	9.6	0.0	0.0	5.8	12.0
WB	73.4	10.4	21.8	10.4	1.6	9.4	1.2	12.2
All-India	57.7	11.4	15.4	12.8	8.8	11.1	4.9	13.1

Source: Authors' calculations from NSSO-SAS (2013).
Note: AP = Andhra Pradesh, CH = Chhattisgarh, HR = Haryana, MP = Madhya Pradesh, OD = Odisha, PB = Punjab, TN = Tamil Nadu, UP = Uttar Pradesh, UK = Uttarakhand, WB = West Bengal.

marginal farmers' sell their output to the local private traders. Chatterjee and Kapur (2016) attribute this to higher fixed transport costs and poor bargaining power that push marginal farmers to sell to local traders. In states with high procurement shares, the local private traders also offer prices higher than MSP, whereas in the low procuring states like West Bengal and Odisha, more than 70 % marginal farmers sell to local traders and they also receive lower prices. The presence of government agencies as a marketing channel for marginal farmers is sparse. Average prices realised if sold to government marketing channels are higher even in low procurement states like Tamil Nadu and Madhya Pradesh. Strikingly, in Haryana, Punjab and Uttarakhand, marginal farmers sell more than 40% of their produce in mandis.

A similar pattern emerges when the analysis is extended to small farmers. As the size of landholding increases, shift to marketing agencies like mandis can be noticed in a few states like Tamil Nadu and Uttar Pradesh. Interestingly in Uttar Pradesh, the average prices realised by small farmers from sales in mandi is higher than in other states (table 9).

Consequently, in the case of small and marginal farmers it can be noticed that more than 50% of the sales are through local private traders and at less than the MSP. However, there are regional deviations in this pattern. Another feature is in higher procuring states, the average prices realised by farmers are higher than or equal to MSP.

The class of semi-medium farmers (2 to 4 hectares) is not apt for states like West Bengal and Uttarakhand because of small sample size. In states like Haryana and Punjab, semi-medium farmers sell more than 40% of their produce in mandis (table 10). The prices are remunerative, and farmers realise prices above MSP. However, there are variations across states. A similar issue arises while discussing the case of medium and large farmers as well. It would be more appropriate to focus on the results for Punjab and Haryana as this category is more pronounced in these states. In Punjab, these farmers sell their output either to mandis or government agencies. However, in Haryana, they mostly sell to mandis. Average prices received by these farmers are remunerative and much higher than MSP (table 11).

A few generalization can be made from this. One, farmers from small and marginal categories belonging states having lower procurement, sell to local traders

Table 9. Share of sales and average price received by small farmers (1-2 ha), 2012-13

States	Local private		Mandi		Input dealers		Cooperative and govt. agency	
	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)
AP	82.6	13.1	0.8	21.4	15.5	12.6	0.0	0.0
CH	32.2	10.5	14.9	12.5	11.3	10.7	41.6	12.5
HR	34.9	18.6	42.8	16.3	5.0	25.0	6.9	20.3
MP	19.3	12.0	9.3	17.2	15.8	11.6	55.6	13.1
OD	65.9	10.4	13.5	11.4	3.6	10.4	8.7	11.9
PB	9.5	11.8	57.4	14.0	1.3	12.8	31.0	18.4
TN	47.4	12.3	23.2	12.7	0.0	0.0	29.5	14.5
UP	57.4	10.5	23.8	19.2	17.6	11.6	0.9	12.4
UK	0.5	12.0	40.3	12.0	0.5	12.0	58.6	12.0
WB	57.3	10.4	13.3	10.2	0.4	10.7	0.1	12.5
All- India	51.9	11.5	17.6	14.3	9.6	11.9	15.4	13.2

Source: Authors' calculations from NSSO-SAS (2013).
Note: AP = Andhra Pradesh, CH = Chhattisgarh, HR = Haryana, MP = Madhya Pradesh, OD = Odisha, PB = Punjab, TN = Tamil Nadu, UP = Uttar Pradesh, UK = Uttarakhand, WB = West Bengal.

Table 10. Share of sales and average price received by semi-medium farmers (2-4 ha.), 2012-13

States	Local private		Mandi		Input dealers		Cooperative and govt. agency	
	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)
AP	89.9	12.3	0.0	0.0	9.7	12.2	0.0	0.0
CH	12.4	10.8	11.4	12.4	11.2	10.1	64.9	12.4
HR	6.8	16.0	44.8	16.7	7.6	25.0	25.6	18.9
MP	32.1	14.0	23.4	11.4	16.0	13.2	28.5	13.5
OD	40.9	12.1	32.9	12.2	3.1	10.9	17.9	11.8
PB	6.6	59.0	61.8	14.3	0.0	0.0	31.5	12.8
TN	94.5	15.1	0.8	10.0	1.3	10.6	3.4	15.2
UP	50.9	12.1	13.7	11.8	12.2	14.0	1.9	13.1
UK	0.0	0.0	44.2	10.8	0.0	0.0	0.0	0.0
WB	74.9	10.4	19.2	10.0	0.3	9.2	3.9	12.0
All- India	47.5	13.0	20.8	13.6	6.5	12.7	20.2	13.0

Source: Authors' calculations from NSSO-SAS (2013).
Note: AP = Andhra Pradesh, CH = Chhattisgarh, HR = Haryana, MP = Madhya Pradesh, OD = Odisha, PB = Punjab, TN = Tamil Nadu, UP = Uttar Pradesh, UK = Uttarakhand, WB = West Bengal.

Table 11. Share of sales and average price received by medium and large farmers (more than 4 ha), 2012-13

States	Local private		Mandi		Input dealers		Cooperative and govt. agency	
	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)	Sales share (%)	Average price (Rs./kg)
AP	64.3	12.4	0.0	0.0	8.4	12.5	0.7	11.3
CH	0.0	0.0	26.6	12.3	3.3	10.7	70.2	12.3
HR	5.1	18.0	87.7	19.7	0.0	0.0	0.6	12.8
MP	11.0	12.0	37.9	13.4	0.0	0.0	51.0	13.5
OD	24.5	10.7	35.8	12.0	0.0	0.0	39.7	12.5
PB	6.6	15.2	50.4	51.6	1.3	14.4	41.1	14.0
TN	10.2	13.3	0.0	0.0	6.0	16.0	83.7	12.4
UP	48.4	10.0	13.1	13.9	19.3	9.9	2.4	12.3
UK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WB	88.7	10.5	5.8	11.0	0.0	0.0	0.0	0.0
All- India	22.5	12.2	32.1	25.8	8.7	13.3	32.3	12.8

Source: Authors' calculations from NSSO-SAS (2013).
Note: AP = Andhra Pradesh, CH = Chhattisgarh, HR = Haryana, MP = Madhya Pradesh, OD = Odisha, PB = Punjab, TN = Tamil Nadu, UP = Uttar Pradesh, UK = Uttarakhand, WB = West Bengal.

at lower prices. In some states, with an increase in the size of landholding, a shift in marketing channel is observed. Medium and large farmers in these states realise better prices selling in mandis and to government agencies. State-specific differences make us undertake an exploratory analysis to underline some factors that might be responsible for the farmers realising prices above MSP.

Table 12. Factors influencing farmers' realisation of prices more than MSP

Variable	Coefficient	S.E	Z	P-Value	Model summaries
Constant	-1.89	0.14	-13.18	0.000**	Log Likelihood= -2303.31
Total land possessed	0.10	0.03	3.88	0.000**	Likelihood Ratio
Buying agency					$(\chi^2, 28)$=1754.04
Local private	(Base)				$P > \chi^2$=0
Mandi	1.03	0.12	8.24	0.000**	Pseudo R^2= 0.275
Input Dealer	-0.46	0.22	-2.14	0.033*	
Government Agencies and Cooperative	2.20	0.22	9.87	0.000**	
Procurement Status of State					
Low		(Base)			
High	1.76	0.08	21.93	0.000*	
Source of Loan					
No Loan	(Base)				
Institutional Credit	0.22	0.09	2.48	0.013**	
Interaction Between Land Size-class and Selling Agency					
Marginal#LocalPrivate	(Base)				
Marginal#Mandi	(Base)				
Marginal#InputDealer	(Base)				
Marginal#Govt	(Base)				
Marginal#Processor	(Base)				
Marginal#Other	(Base)				
Small#LocalPrivate	-0.67	0.13	-5.30	0.000**	
Medium#LocalPrivate	-0.47	0.17	-2.86	0.004**	
Large#LocalPrivate	-0.94	0.33	-2.89	0.004**	

Note: * and ** in the superscript refers to significance at 5% and 1% level. Variables which are significant at least at 5% are only reported.

3.4. Determinants of price realisation above MSP

A binary logistic regression has been applied to identify market and non-market factors that explain price realisation in paddy over and above MSP during 2012-13. A similar model was employed by Peshin et al. (2017) to explain the effect of public procurement in Jammu and Kashmir. Table 12 furnishes the results.

The pseudo R^2 (Nagel-karke) is 0.27. The empirical analysis suggests a likelihood of realising higher than MSP if the size of land possessed is larger. Further, we find higher chances of realising better prices if sold in mandies and to government agencies. However, a shift towards input dealers from private traders has a negative impact. Therefore, our findings with respect to the marketing channels and their impact on realisation of prices are in conformity with those reported in Chatterjee and Kapur (2016). Corresponding to Peshin et al. (2017), we also included farmers' access to technical advice as a proxy for information. However, this variable is not significant. In states with higher procurement shares (more than 50%) farmers stand higher chances of better price realisation. Chances of higher price realization improve with farmers' access to institutional credit and this finding has resonance with existing literature (Bhattacharya 1985). . Finally, to understand the production and exchange together, we included an interaction term between land size-class and marketing agencies. The results show that irrespective of land size-class, chances of realising prices more than MSP are negatively associated with the local private traders.

4 Conclusions

The basic tenet of the study is to understand price deviations (i.e. realisation of prices above MSP) faced by farmers belonging to different land size-classes when they sell produce to different marketing channels. The key findings are, first, in states with higher procurement shares in total production, farmers have a higher probability of realising better prices. Second, in states with higher marketed surplus, the small and marginal farmers also have a larger marketed surplus than in the states with a low marketed surplus. Third, there are significant variations in prices because of the differences in the marketing channels used by the farmers of different size-classes. At all India level, average prices offered by local private traders and mandis are much lower than the MSP. Four, small and marginal farmers in most states sell their produce to local private traders and receive relatively lower prices. Furthermore, in states like Odisha, Uttar Pradesh and West Bengal (states with low procurement share), the average prices offered to small and marginal farmers by the government and cooperative agencies are also below MSP. Fifth, in states like Punjab and Haryana, where the state has been very active in undertaking procurement, farmers realize higher prices even from sales to private traders. Perhaps, competition in the market enables farmers receive better prices. Lastly, large land size, and access to institutional credit help farmers realize better prices.

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