Does a farmer's knowledge of minimum support price (MSP) affect the farm-gate price? Evidence from India

by Aditya Korekallu Srinivasa, K.V. Praveen, S.P. Subash, M.L. Nithyashree, and Girish K. Jha

Does a farmer's Knowledge of Minimum Support Price (MSP) Affect the Farm-gate Price? Evidence from India

Aditya, Korekallu Srinivasa, [1] Praveen, K,V.,[1] Subash, S. P.,[2] Nithyashree, M.L.,[2] and Girish, K. Jha[2]

[1]Division of Agricultural Economics, ICAR- Indian Agricultural Research Institute, New Delhi-110012

[2]ICAR- National Institute of Agricultural Economics and Policy Research
Corresponding author: adityaag68@gmail.com

Abstract
Minimum Support Prices (MSP) is the minimum guaranteed price for agricultural commodities announced by Government of India for 24 commodities. To avail the benefits of MSP, farmer has to sell his produce either directly to procurement agency or at the regulated market. Most farmers in India prefer to sell their produce at the farm-gate due to small marketable surplus. There is an argument that if the farmer is aware of MSP of the crop, then he can bargain with the trader during the farm-gate transaction and demand for a better price closer to MSP. In this paper we test this argument using two rich datasets; nationally representative data of 7621 farmers from NSSO survey of 2012-13 and a primary survey of 1097 farmers from 3 states in Eastern India for the period 2018-19. In NSSO data, nearly 65% farmers and from the primary dataset 90% farmers sold the paddy crop in the farm gate, which makes these datasets ideal for testing the hypothesis. We use Coarsened Exact Matching (CEM) and Mahalanobi's matching to estimate the causal relationship between MSP knowledge and the price received. The treatment effect indicates that the knowledge of MSP did not improve the price outcomes.

JEL Codes: *Q13, Q11, C78, D82* *#19101*

Does a farmer's Knowledge of Minimum Support Price (MSP) Affect the Farm-gate Price? Evidence from India

Abstract

Minimum Support Prices (MSP) is the minimum guaranteed price for agricultural commodities announced by Government of India for 24 commodities. To avail the benefits of MSP, farmer has to sell his produce either directly to procurement agency or at the regulated market. Most farmers in India prefer to sell their produce at the farm-gate due to small marketable surplus. There is an argument that if the farmer is aware of MSP of the crop, then he can bargain with the trader during the farm-gate transaction and demand for a better price closer to MSP. In this paper we test this argument using two rich datasets; nationally representative data of 7621 farmers from NSSO survey of 2012-13 and a primary survey of 1097 farmers from 3 states in Eastern India for the period 2018-19. In NSSO data, nearly 65% farmers and from the primary dataset 90% farmers sold the paddy crop in the farm gate, which makes these datasets ideal for testing the hypothesis. We use Coarsened Exact Matching (CEM) and Mahalanobi's matching to estimate the causal relationship between MSP knowledge and the price received. The treatment effect indicates that the knowledge of MSP did not improve the price outcomes.

JEL Codes: *Q13, Q11, C78, D82*

Keywords: *Minimum Support Prices, bargaining, information asymmetry, on-farm negotiations*

1. Introduction

Minimum Support Prices (MSP) in India is the minimum price for 24 agricultural crops, if the ruling market price goes below the assured MSP, then the designated Government agencies will enter the market and buy the product at MSP. MSP is announced by the Government of India for 24 agricultural crops before the sowing season (Das 2020; Aditya et al., 2017; Chand, 2008; Deshpande, 2008). One of the objectives of MSP is to set a floor price for the commodity; a minimum assured price to the farmer. Even though the MSP is announced for 24 crops and applicable to all the farmers who grow these crops in any part of India, due to limitation of storage and availability of procurement channels, the procurement of the commodities is limited only to few surplus states and only few commodities. Many studies have reported inequity in distribution of benefits of the scheme with only food surplus states being benefitted (Das, 2020; Chand, 2003; Desai et al., 2011; Deshpande, 2008). However, there is a counter-argument that announcement of MSP can have a positive influence on the prices even without necessarily being procured by Government directly. The farmers who are aware of MSP for their commodities are assumed to consider MSP as 'fair outcome' or 'status- quo' and bargain more with traders resulting in better price realization. In this paper we test if the farmer who is aware about the MSP of the crop they are growing gets a higher price at the farm gate than those who aren't aware of it using two large survey data.

Minimum Support Prices are announced by Government based on recommendation of Commission on Agricultural Costs and Prices, which gives its recommendation based on the cost of cultivation of crops across different regions in the country. MSP serves the two direct objectives of MSP, one of which we have already mentioned before- to act as floor price. Second, the food grains procured at MSP is also used for maintaining a buffer stock and to

distribute it to vulnerable section at subsidized rate through Public Distribution System (PDS)(Chand, 2008; Parikh & Singh, 2007). Further, it is also used as an economic instrument to incentivize farmers to adopt the socially desirable cropping pattern. For instance, MSP of pulse crops witnessed a disproportionate hike in recent years corresponding Government desire to promote the pulse crop and achieve self-sufficiency in pulse production. However, the procurement of commodities at MSP is limited by the availability of storage facility and is limited to few major crops like rice, wheat and selected pulse crops. Several studies have questioned the relevance and effectiveness of MSP in Indian agriculture (Ali et al., 2012; Singh et al., 2015)

Since rice and wheat are the two major crops procured, the policy is said to incentivized increase in area under those crops. Even the areas which are not traditional rice and wheat growing belts have started to grow them because of assured prices resulting in overexploitation of water, Punjab being a case in point (Mittal & Hariharan, 2016; Tripathi, 2012). The MSP policy is also said to benefit only farmers in some states where the procurement takes place; (Punjab, Haryana, MP and Andhra Pradesh etc). Further, majority of farmers in India are small and marginal and the marketable surplus is small. So, they prefer to market the produce to the village trader than taking them to the market. According to Negi et al., 2018, around 68% of the farmers market their produce at the farm gate through village trader. So, these small farmers also don't benefit from the support prices.

Alternatively, there is an argument that MSP policy can be effective even in places where there is no procurement of grains. Even the farmer who is marketing the produce to village trader will benefit from knowledge of MSP of the crop he has grown. Economic survey of 2016 notes that when farmer is aware of the MSP, he will bargain with the trader and try to get a price which is nearer to the support price (*Economic Survey*, 2016). Even the ministry's report on doubling of farmers income noted that the knowledge of MSP can increase the bargaining power of the farmers and fetch them a better price than those who aren't aware about the MSP of crops that they grow (GoI 2017). This can be explained with the help of behavioral concept of anchoring effect in decision making. We will discuss about anchoring effect in details in the conceptual framework section.

In this paper we have used to two large survey data to examine the effect of MSP knowledge on the price received by farmer at the farm-gate. First data set we use if from the NSSO's Situational Assessment Survey of Farmers data pertaining to year 2011-12. This is the latest data available at the national level. We also use data from the primary survey carried out by us in eastern India, covering 3 states. From both the surveys, we use the data of only rice farmers who sold their produce to village trader and estimate the effect of MSP knowledge on the price received using a suitable econometric identification strategy.

The results indicated that there is no statistically significant effect of MSP knowledge on the price received by the farmers compared to those who aren't aware about the MSP. This could be due to couple of reasons. Farmers have very little marketable surplus limiting their access to markets and they have immediate cash requirements because of which they have less bargaining power with the traders. Secondly, lack of storage facilities and credit constraint means that farmers are always at a disadvantageous position in price negotiation with the trader. It is also possible that the anchoring effect of MSP knowledge is compensated by context effect; giving more importance to shared experiences, and historical transactions. Overall, we conclude that

knowledge of MSP has no statistically significant effect on the price realized by farmer at the farm gate and mere announcement of MSP is not sufficient to ensure minimum price for the produce.

Our paper has two important contributions; 1. The paper throws light on the ineffectiveness of MSP in setting a floor price. Only a small proportion of farmers can sell their produce directly to the Government agency at MSP, and the MSP knowledge is ineffective in increasing the bargaining power and consequently has no statistically significant effect on the price realized as per the results of the study. This calls for revamping the MSP scheme with expansion of the procurement network. 2. The paper also contributes to the model of two actor trade negotiations in the context of agricultural markets. Specifically, the paper examines the effect of cognitive anchor on the price received by farmer at the farm-gate. To the best of our knowledge, this is the first paper attempting to estimate the effect of the support prices as a cognitive anchor on the final outcome of negotiation in the context of two-person trade negotiations at the farm gate.

The remainder of the section is arranged as follows; in section 2 we present the conceptual framework, and in section 3 explain our empirical strategy and data. In section 4 we present and discuss the results. Finally, section 5 concludes.

2. Conceptual framework

Small and marginal farmers with small holding size dominate Indian agriculture. Due to small marketable surplus they prefer to market their produce to village traders rather than taking it to the market. In this context, it is the negotiation between the farmer and the trader which determines the price that farmer receives. According to the model of two player trade negotiations, both trader and farmer has their reservation prices; for trader it is the maximum price they can pay for the produce, and for farmer it is the least price they expect, below which they prefer not to trade their produce. The final outcome of the negotiation (the farm-gate price) is determined by the relative bargaining power of the two parties and on the reservation prices (Blount et al., 1996; Fafchamps & Minten, 2012; Henrik & Tommy, 2000).

Lack of market transparency in terms of asymmetric information is common in this setting (Aker & Fafchamps, 2010; Nakasone et al., 2013; Svensson & Yanagizawa, 2009; Woldie & Nuppenau, 2010) it is observed that trader is well informed regarding prices, arrivals and expected price trends, and the farmer has limited market information (Bergaly Kamdem et al., 2010; Islam & Grönlund, 2010; Mitchell, 2011; Mittal et al., 2012; Sorrentino et al., 2017). Literature suggests that the agent who has more information achieve a more favorable outcome in the negotiation (Courtois & Subervie, 2014; Malak-Rawlikowska et al., 2019). Many studies have attempted to estimate the effect of price information on the price realized by farmer. The results are mixed. Few studies found that price information increases the price realized (Beuermann, 2011; Courtois & Subervie, 2014; Hildebrandt et al., 2014; Nakasone et al., 2013; Svensson & Yanagizawa, 2009), while other studies reported statistically insignificant effect of price information on farm gate prices (Aker & Fafchamps, 2015; Camacho & Conover, 2012; Einiö, 2014; Fafchamps & Minten, 2012; Futch & Mcintosh, 2009; Goyal, 2010; Toledo & Ksoll, 2018)

According to traditional economic theory, the price information is expected to increase the price mainly through access to new markets, where the prices are high(Aker & Fafchamps,

2010; Aker & Ksoll, 2012; Beuermann, 2011). Better market information and lower search costs opens up new marketing avenues to farmer and breaks the monopoly of the trader(Jensen, 2010). However, from a behavioral economic framework, the price information can have an effect on the farm gate price, even when there are constraints in access to new markets(Blount et al., 1996; Fafchamps & Minten, 2012; Woldie & Nuppenau, 2010). According to this framework, the price information acts as a 'cognitive anchor' and this anchoring effect will result in better price realization to farmers(Chuah & Devlin, 2011). Anchoring effect is the disproportionate influence of initial piece of information on the final outcome of the negotiation(Adrian & Hua, 2011). Literature suggest that anchoring effect is robust amongst different heuristics in decision making(Ritov, 1996). Anchoring effect on final negotiation outcome is reported for different contexts like supply chains, asset prices and different bidding games(Galinsky & Thomas, 2012; Korobkin & Guthrie, 2004; Law et al., 2006; Leider & Lovejoy, n.d.).

In the context of the present study, knowledge of MSP of rice is considered as a behavioral anchor in the negotiation between the village trader and the farmer at the farm gate. We expect the farmer with knowledge of MSP of rice to revise his reservation price upward, closer to MSP and negotiate with the trader resulting in a higher price than the farmer who has no knowledge of MSP even when farmer has no direct access to sell his produce to Government agencies at MSP. Farmer with knowledge of MSP is expected to revise his reservation price upward not just because of anchoring effect, but also because they might also consider as a fair outcome or status quo. Another reason to expect the positive effect of MSP knowledge on price is that the anchoring effect is more robust in information poor environment as in case of trader- farmer negotiation.

3. Data and Methodology

We use two large datasets in this study. First data is from National Sample Survey Office (NSSO)'s Situational Assessment Survey of Farmers 2011-12(latest round). The data is collected from 35200 rural households across India in two rounds; Kharif corresponding to June to December, 2011 and Rabi corresponding to January to June, 2012. Data from 'Situational Assessment Survey' is the only nationally representative dataset that has all the variables for intended analysis. From the dataset we have extracted a subset of farmers who grow rice as our analysis requires crop-wise analysis and from the data rice crop has highest number of farmers growing and selling it 8877 farmers in total. Further, Rice is also the major staple crop of India and also it has highest share amongst food grains procured at MSP. The second dataset we use is that of a primary survey of rural households in 3 states of Eastern India; Eastern Uttar Pradesh, Bihar, and Jharkhand. The total sample size is 2700, out of which 1900 agricultural households and 1627 of them grew rice which we consider for our study. Further from both the datasets, we restrict our analysis to only those who sold their produce at the farm gate as the purpose of our paper is to analyze the effect of MSP on farm gate price of rice. The final sample size from NSSO's SASF data is 7671 and from our primary survey is 1097.

For understanding the farmers preference to local trader vis-à-vis a formal market, we use logit model. However, in case of primary survey where more than 90% of the farmers sold the produce to the village trader, we use firth logit which is a penalized logit model to account for skewed distribution. In both the surveys, there is a specific question which asks the respondents about the knowledge of MSP of the crop that they grow. We use the response for this question variable as the treatment variable to explore the causal link between knowledge of MSP with the price realized.

3.1 Identification Strategy

We are interested in estimating the causal effect of knowledge of MSP on the farm gate price farmers receive. However, the estimate of impact cannot be directly estimated due to confounders. The farmers who are aware of the MSP of crops are also expected to have better education, better extension contact and better farmers in general. These variables can also have a direct effect on their bargaining powers, and consequently better price. So the difference in prices across the two groups could result in biased estimates. In a regression framework, this problem is also known as 'imbalance' which could result in biased estimates and model sensitivity. Imbalance refers to significant difference value of independent variables across two treatment arms (here those who have knowledge of MSP and those who don't) which can bias the estimate of impact.

In such scenario, the common estimation strategy is to use quasi experimental designs to mimic the randomization and to overcome the issue of confounding. Matching methods like Propensity Score Matching (PSM) use the value of propensity score of being in the treated group to match the similar units. The units across two groups having similar propensity score are matched and those units without a match will be dropped from the analysis. The objective matching is to ensure that the two groups are similar, on an average, with respect to covariates. Balancing data by matching has found to reduce the bias than using unmatched data. (Ho et al. 2007). Matching methods estimate the Treatment effects based on assumption that after conditioning on X, there will be some randomness which resembles the experimental setting.

The problem with univariate matching techniques like PSM are that they don't necessarily improve the balancing in the dataset. When matching methods are used to drop the observations based on lack of common support, they can end up worsening the imbalance, which Gary and Richard, 2019 call as PSM paradox. It is also observed that since propensity scores are derived from the model, specification of the model is important. It can some times improves the balance with respect to some variables, at the same time worsening the balance with respect to some other (Qin, 2010). Univariate balancing methods aim to obtain balance on mean of covariate but, it may not remove imbalance due to interaction and nonlinear function of X (vector of confounders)

Coarsened Exact Matching belongs to Monotonic Imbalance Bounding (MIB) method.(Blackwell, Iacus, King, & Porro, 2009). These methods use multivariate distributions for balancing and studies have indicated superiority of these methods over other methods of matching in reducing data imbalance and model dependence. Let us denote the pre-treatment variables by a vector X. The method can be best described with the following set of equations following Qin, 2007; Iacus, King and Porro 2008; Kumar et al 2021.

$$\left\{ \begin{array}{c} D\left(f_1\left(x_{m_{T(m)}}\right), f_1\left(x_{m_{C(m)}}\right)\right) \leq \gamma_1(\pi_1) \\ \vdots \\ D\left(f_k\left(x_{m_{T(m)}}\right), f_k\left(x_{m_{C(m)}}\right)\right) \leq \gamma_k(\pi_k) \end{array} \right\}$$

In every dimension of X, Distance D between function f(.) of X in treated and f(.) X in control should be smaller than the monotonically increasing function of $\gamma(\pi)$. This directly lead us to

$$D\left(f_j\left(x_{m_{T(\pi)}}\right), f_j\left(x_{m_{C(\pi)}}\right)\right) \leq \gamma_j(\pi - \epsilon) < \gamma_j(\pi), j = 1, \ldots, k.), \text{ if } \epsilon > 0$$

Here the value of π is specified by the researchers. The treated and control units are matched when the set of covariates X meets the above set of inequalities.

Further, let us consider X_i, one element of vector X. In CEM, X_i is divided to V_i number of classes or intervals based on researchers understanding/ intuitions.

$$\gamma_i(\pi_i) = \gamma_{i1}(\pi_{i1}), \gamma_{i2}(\pi_{i2}) \ldots \gamma_{iV_i}(\pi_{iV_i})$$

The approach of CEM can be summarized in three simple steps following (Datta, 2015; Qin, 2007; Blackwell et al., 2009; Iacus et al., 2012; Gary & Richard, 2019; kumar et al, 2021)

1. Coarsen the important confounding variables either based on apriori criteria's or statistical optimization to create different strata (hyper cuboids)
2. Within each of these strata, sort units by original values of X (not the coarsened values)
3. In each of the strata, there must be atleast one unit in treated and control. Those strata which don't qualify in this criteria are dropped from the analysis
4. The imbalance after dropping the unmatched observation should be compared with imbalance before matching. The imbalance should reduce after matching.
5. The remaining imbalance due to difference in values of X can be accounted by using other methods like regression or other matching methods to estimate the causal relationship.

3.2 Imbalance measure

The difference in mean value of the covariate across the treated and control group is generally considered as a measure of imbalance. However, such measure cannot be used for comparison and also don't account for imbalance due to other moments. Lacus et al., 2012) suggests alternate measure, which is a multivariate measure and also accounts for different degrees of interaction amongst the variables. $\mathcal{L}_1$ represents the distance between the multivariate histograms of X. Let us denote $H(X_1)$ which indicates the number of bins (or unique values) chosen for the variable X_1. Multivariate histograms are constructed by Cartesian product of $H(X_1)\,X\,H\,(X_2) \ldots H(X_k) = H$, which forms the cells for constructing the multivariate histograms. Denote the relative frequency of treated and control group by f and g. Let $l_1 \ldots l_k$ be the relative frequency corresponding to the particular cell. Then $\mathcal{L}_1$ is calculated through the following formulae

$$\mathcal{L}_1(f, g; H) = \frac{1}{2} \sum_{l_1 \ldots l_k \in H(X)} |f\, l_1 \ldots . l_k - g l_1 \ldots . l_k|$$

If the value of $\mathcal{L}_1$ is 1, it indicates perfect separation and if the value is 0, it indicates perfect matching of the multivariate distributions. A good matching process should result in decreased value of $\mathcal{L}_1$.

In this study we measured the value of $\mathcal{L}_1$ for the original data and then CEM algorithm was employed. This is used as a pre-processing step to reduce the imbalance and causal effect was estimated with Nearest Neighbour Matching as suggested by Lacus, King and Porro, 2008; Blackwell, 2009. We use Mahalanobi's distance as the matching parameter with nearest neighbour as the matching rule(Abadie et al 2004). Again a set of covariates which are expected to act as confounders are used to estimate the Mahalanobi's distance which gives additional confidence to the estimate.

4. Results and Discussion

The data of marketing of paddy from both the data source was analysed to see their preference with respect to the agent they sold the product to. We are interested in understanding the role of marketing information, specifically, the information on Minimum Support Prices on the farm gate price farmers get when they sell the product to village traders. From table 1 we can see that nearly 65% of the farmers from the NSSO data and 90% of farmers from the primary data were selling the produce to the village trader. In spite of nearly five decades of marketing reforms, farmers continue to prefer the local itinerant trader. Even to avail the benefit of MSP, farmer has to market the produce to either to procurement centre or to a Mandi (registered market place for agricultural commodities). Since the majority of the farmers are selling the produce to the local trader, they are not directly benefitted from the MSP. Even the MSP awareness was found be very less with 70% of the farmers in both the dataset being not aware.

Table 1 Farmer's preference to local trader and their awareness of MSP.

From NSSO data				
	Private Local Trader		**Aware of MSP**	
Particulars	**Frequency**	**Percent**	**Frequency**	**Percent**
No	2,702	35.22	5,653	73.69
Yes	4,969	64.78	2,018	26.31
Total	7,671	100	7,671	100
From primary data on Eastern India				
No	106	9.66	767	69.89
Yes	991	90.34	330	30.11
Total	1,097	100	1,097	100

Next immediate question that we try to answer is why farmers prefer the village traders? Result of logit regression is presented in table 2 (from NSSO data) and the results of firth logit are presented in table 3. We use firth logit to analyse the correlates of farmers choice of selling the produce to village trader as nearly 90% of the farmers sold the produce to village traders, and in such cases of one sided distribution, the conventional logit/probit doesn't perform well. The results indicate that the small farmers, with less quantity of produce to market often prefer the local traders. When the quantity of produce is small, the cost of transportation per unit produce increases. Also, the unit value of time in terms of opportunity cost is higher for small farmers and mostly they prefer to sell the produce to traders who can come to farm gate and procure the product which is in line with findings of (Hassan et al., 1999). Farmers who belong to lower social strata, having lower access to extension information were also found to prefer the village trader than taking the produce to market.

Literature suggest that there is an interlocking between the input and output market in rural areas (Cariappa & Chandel, 2021). Farmers often take the credit from the traders to meet the liquidity constraints and then sell the produce to them. We find the similar trend in our data, the farmers who have purchased inputs from the local trader have higher probability of selling the produce to them. Though credit from the trader has no significant effect, probably because only 5% of the farmer have reported taking credit from the traders. Another important dimension is distance to market. We have the information on distance to market only in our primary survey. The results indicate that with increase in distance to market, the probability of selling the produce to village trader increases.

Table 2 Correlates of farmers preference to local traders in marketing of paddy (Data from NSSO 2012-13, n=7671)

Dependent variable – Sold to local trader (1 vs 0)	Coefficient	Marginal effect	Standard error	P value
Age	-0.0009	0.000	0.002	0.66
Aware about MSP	-0.3565	-0.087	0.085	0.00
Quantity Sold	0.0000	0.000	0.000	0.02
Credit from local trader	0.1578	0.038	0.273	0.56
Disadvantaged Caste (SC/ ST)	0.0920	0.022	0.120	0.44
Dummy for wage employment	-0.0415	-0.010	0.064	0.52
BPL	0.0154	0.004	0.084	0.86
Gender	0.0488	0.012	0.096	0.61
Received training in Agriculture	0.0046	0.001	0.160	0.98
illiterate	0.0322	0.008	0.070	0.64
Purchased input from local trader	0.3805	0.092	0.092	0.00
Expenditure on agrochemicals	0.0000	0.000	0.000	0.31
State Fixed effects		YES		
Constant	1.9043		0.2281	0.00

Table 3 Correlates of farmers preference to local traders in marketing of paddy (Data from primary survey in Eastern India (2018-19), n=1097)

Dependent variable – Sold to local trader (1 vs. 0)	Coefficient	Marginal effect	P value
Age	7.258	7.250	0.04
Disadvantaged Caste (SC/ ST)	-0.485	-0.485	0.11
Years of education	-0.537	-0.537	0.15
BPL	-0.242	-0.242	0.42
Ln (Land)	-3.436	-3.436	0.00

Membership in cooperative	-0.120	-0.120	0.67
Received training in agriculture	-0.532	-0.532	0.12
Ln (Share of non-farm income)	-0.021	-0.021	0.77
Has access to agricultural information	-0.446	-0.446	0.05
Asset index	-0.268	-0.268	0.36
Principal component for village infrastructure	-0.197	-0.197	0.00
Distance to market	-0.093	-0.093	0.00
District fixed effects		YES	
Constant	-0.305		0.97

Note: Mean values for the independent variables provided in Annexure 1 and 2.

Next we try to examine the impact of knowledge of MSP on the prices that farmer receive in the farm gate. The underlying hypothesis is that knowledge of MSP will act as a price anchor and increases the bargaining power in the farm gate sale. We take the data of only those who sold the produce to the local traders and compare the prices received across the two groups (who are aware and who aren't aware of MSP). However, direct comparison between the groups is not possible to estimate the causal relationship. There are other factors also which differs across the two groups as can be seen by Table 4 and 5.

Table 4 Summary of key variables across MSP awareness groups (data- NSS) 2012-13)

	Not Aware of MSP		**Aware of MSP**		**Mean**
Particulars	**Mean**	**sd**	**Mean**	**sd**	**Difference**
Quantity Sold	3767.79	4054.46	5695.15	7213.98	-1927.361
Credit from local trader	0.01	0.10	0.02	0.13	-0.005**
Disadvantaged Caste (SC/ ST)	0.36	0.48	0.20	0.40	0.180***
Dummy for wage employment	0.50	0.50	0.45	0.50	0.064***
BPL	0.33	0.47	0.25	0.43	0.105***
Gender	0.93	0.26	0.96	0.21	-0.026***
Illiterate	0.32	0.47	0.20	0.40	0.099***
Purchased input from local trader	0.52	0.50	0.55	0.50	0.035***
Age	51.08	13.42	51.95	13.10	-0.900***
Receive information	0.45	0.49	0.60	0.48	-0.16***

Table 5 Summary of key variables across MSP awareness groups (data-Primary survey of eastern India, (2018-19))

	Not aware of MSP		**Aware of MSP**		**Mean**
Variables	**Mean**	**sd**	**Mean**	**sd**	**difference**
Age	3.90	0.27	3.93	0.25	-0.032*
Age^2	15.30	2.03	15.54	1.90	-0.235*
Disadvantaged Caste (SC/ ST)	0.21	0.41	0.12	0.32	0.089***
Years of education	2.67	0.32	2.82	0.32	-0.141***
BPL	0.84	0.37	0.76	0.43	0.074***

Ln (Land)	2.40	0.07	2.43	0.11	-0.037***
Membership in cooperative	0.14	0.35	0.22	0.41	-0.075***
Received training in agriculture	0.06	0.24	0.11	0.31	-0.043**
Engaged in MGNREGA	0.16	0.36	0.15	0.36	0.004
Ln (Share of non-farm income)	3.17	1.46	2.83	1.73	0.341***
Has access to agricultural information	0.44	0.50	0.56	0.50	-0.115***
Asset index	0.26	0.44	0.14	0.34	0.122***
Livestock index	0.23	0.42	0.31	0.46	-0.075***
1st Principal component for village infrastructure	-0.08	1.96	-0.17	1.70	0.09
2nd Principal component for village infrastructure	0.08	0.94	0.24	0.75	-0.159***
Distance to market	4.71	3.56	4.44	3.17	0.274

As detailed in the methodology section, we use Coarsened Exact Matching (CEM) as data pre-processing. We use the key variables like farmer's education, land holding size, marketed surplus and distance to market (only in the analysis using primary data), disadvantaged caste and age as variables which we theoretically expect to influence the awareness of MSP as well as prices in negotiation. The units in unmatched strata were dropped from the analysis and it reduced the imbalance in the data as can be seen in Table 6. We use nearest neighbour matching using Mahalanobi's distance as a matching parameter to estimate the causal impact of MSP knowledge on prices. We use two different outcome variables; one is the price per unit of the produce; another variable is by using a dummy to indicate if the farmer got a higher price than the average price received by the farmers (entire sample). The results are presented in Table 7 indicates that there is no empirical evidence to suggest that the farmers who are aware of MSP gets a higher price as the impact coefficients are not statistically significant. As a robustness check, we repeat the analysis with different matching metrics and the results don't change significantly.

Table 6 Particulars of Coarsened Exact Matching (CEM)

Particulars	From Primary data	From NSSO data
Multivariate L1 before matching	0.68	0.40
Number of Strata	359	85
Matched Strata	113	76
Matched units from control	452	5643
Matched Units from treated	238	2013
Multivariate L1 after matching	0.46	0.34

Table 7 Estimates of Impact of Awareness of MSP on price received in the farm gate

	From primary data			From NSSO data		
Impact Indicator (ATT)	**Coefficient**	**SE**	**P value**	**Coefficient**	**SE**	**P value**
Price received (Rs/Quintal)	16.03	13.72	0.243	-5.79	6.50	0.373
Dummy variable if price received > average price	0.03	0.05	0.497	-0.01	0.02	0.760

Matching estimator - Nearest neighbor using Mahalanobi's distance

Covariates used- Years of education, Distance to market, Marketed Surplus, Land owned, Social category

Coefficients are bias adjusted as suggested by Abadie et al 2008.

There are two important implications of this result. 1. Minimum Support Prices, currently benefits only 6% of the farmers directly. Another expected channel through which MSP can help farmers to get a better price is by improving the bargaining power; however, the result indicated that the MSP knowledge doesn't essentially result in better price outcomes. This raises the question of equity of existing price support scheme in India. 2. Price information in isolation cannot increase the bargaining power of farmers may be due to asymmetric power between farmers and traders. As expectation of traditional economic theory, the main welfare implication of price information is by increasing the access to other markets and lowering the search cost, both of which are not very relevant to the marketing of paddy. But when there are no nearvby procurement centres, this effect is expected to be zero. Only possible welfare implication is through the psychological anchoring effect on the bargaining power. However, as the results of the study indicates that there is no effect in terms of bargaining outcomes, price.

The argument of the Government that MSP benefits even in regions where there is no procurement as farmers who know the MSP of crops bargain with farmers and get a better price is a flawed argument. The bargaining power in one to one farmer trader negotiations depends on alternate options available to farmer, the quantity of produce available to sale, liquidity constraint of farmers etc(Jaleta & Gardebroek, 2007). When the quantity available for sale is less, and the market is far away, the farmer has little bargaining power in the farm gate negotiations and the choice of market is limited due to high transaction cost. Further, if there is no procurement in the region, the farmer as well as trader knows that MSP is just a theoretical concept, so the influence of information of bargaining is expectedly low. As noted by (Ariely & Simonson, 2003), when the negotiator is provided with both global and local context, local context is preferred in the negotiations. Similarly, the fact that knowledge that there is no nearby procurement dominates the bargaining power in our case. This is the reason we see that the farmers who know MSP doesn't get any higher price in the farm gate negotiation than those who aren't aware.

5. Conclusion

The study finds that the knowledge if MSP has no impact on the price that farmer receives when he sells the produce in the farm-gate. The argument that farmers who know MSP can bargain with trader for a better price found no empirical evidence to support. The farmers, particularly the small farmers, sell the produce in the farm-gate as the transaction cost of taking the produce to market is too high. They often have a liquidity constraint which reduces their bargaining power too. Price information (MSP in this case) alone cannot improve the bargaining power and

can't make them better off. In light of the results, the policy of Minimum Support Prices needs a relook. MSP as a safety net fails in absence of procurement by the Government and there are constraints to increase the procurement. Alternative systems like deficiency price systems or direct benefit transfers may be better options than the system of support prices, welfare implications of these vis-à-vis support prices need to be examined.

6. References

Abadie, A., Drukker, D., Herr, J. L., & Imbens, G. W. (2004). Implementing matching estimators for average treatment effects in Stata. *The stata journal*, *4*(3), 290-311.

Aditya, K. S., Subash, S. P., Praveen, K. V., Nithyashree, M. L., Bhuvana, N., & Sharma, A. (2017). Awareness about Minimum Support Price and Its Impact on Diversification Decision of Farmers in India. *Asia & the Pacific Policy Studies*. https://doi.org/10.1002/app5.197

Adrian, F., & Hua, B. C. (2011). A literature review of the anchoring effect. *The Journal of Socio- Economics*, *40*, 35–42.

Aker, J. C., & Fafchamps, M. (2010). How does mobile phone coverage affect farm-gate prices? Evidence from West Africa. *Department of Economics and the Fletcher School, Tufts University*.

Aker, J. C., & Fafchamps, M. (2015). Mobile phone coverage and producer markets: Evidence fromwest Africa. *World Bank Economic Review*, *29*(2), 262–292. https://doi.org/10.1093/wber/lhu006

Aker, J. C., & Ksoll, C. (2012). Information technology and farm households in Niger. *United Nations Development Programme, Regional Bureau for Africa (UNDP/RBA)*.

Ali, S. Z., Sidhu, R. S., & Vatta, K. (2012). Effectiveness of Minimum Support Price Policy for Paddy in India with a Case Study of Punjab §. *Agricultural Economics Research Review*, *25*(2), 231–242.

Blackwell, M., Iacus, S., King, G., & Porro, G. (2009). Cem: Coarsened exact matching in Stata. *Stata Journal*, *9*(4), 524–546. https://doi.org/10.1177/1536867x0900900402

Kumar, A., Sonkar, V. K., & Aditya, K. S. (2021). Assessing the Impact of Lending through Kisan Credit Cards in Rural India, IFPRI Discussion Paper.

Ariely, D., & Simonson, I. (2003). Buying, bidding, playing, or competing? Value assessment and decision dynamics in online auctions. *Journal of Consumer Psychology*, *13*(1–2), 113–123. https://doi.org/10.1207/s15327663jcp13-1&2_10

Bergaly Kamdem, C., Galtier, F., Gockowski, J., David-Benz, H., Egg, J., Kamgnia Dia, B., & David-benz, H. (2010). What determines the price received by cocoa farmers in Cameroon? An empirical analysis based on bargaining theory Sustainable Tree Crops Program, International Institute of Tropical Agriculture (IITA). In *AfJARE* (Vol. 6, Issue 1).

Beuermann, D. (2011). Telecommunications Technologies, Agricultural Profitability, and Child Labor in Rural Peru. In *Serie De Documentos De Trabajo Working Paper Series*.

Blackwell, M., Iacus, S., King, G., & Porro, G. (2009). Cem: Coarsened exact matching in Stata. *Stata Journal*, *9*(4), 524–546. https://doi.org/10.1177/1536867x0900900402

Blount, S., Thomas-Hunt, M. C., & Neale, M. A. (1996). The price is right - Or is it? A reference point model of two-party price negotiations. *Organizational Behavior and Human Decision Processes*, *68*(1), 1–12. https://doi.org/10.1006/obhd.1996.0085

Camacho, A., & Conover, E. (2012). The Impact of Receiving Price and Climate Information in the Agricultural Sector. In *IDB working paper series, No. IDB-WP-220*. https://doi.org/10.2139/ssrn.1858036

Cariappa, A. G. A., & Chandel, B. S. (2021). Interlink between factor and product markets: opportunity for the future of Indian agriculture. *Agricultural Economics Research Review*, *33*(January), 61–75.

Chand, R. (2003). *Government intervention in foodgrain markets in the new context*. New Delhi: National Centre for Agricultural Economics and Policy Research.

Chand R (2008) MSP and Other Interventions in Wheat Market: Are They Contributing to the Buffer Stock Cycles and Market Destabilization? http://citeseerx.ist.psu.edu/ viewdoc/download?doi=10.1.1.620.3112& rep=rep1&type=pdf

Chuah, S. H., & Devlin, J. (2011). Behavioural economics and financial services marketing: A review. *International Journal of Bank Marketing*, *29*(6), 456–469. https://doi.org/10.1108/02652321111165257

Courtois, P., & Subervie, J. (2014). Farmer bargaining power and market information services. *American Journal of Agricultural Economics*, *97*(3), 953–977. https://doi.org/10.1093/ajae/aau051

Datta, N. (2015). Evaluating impacts of watershed development program on agricultural productivity, income, and livelihood in bhalki watershed of Bardhaman District, West Bengal. *World Development*, *66*, 443–456. https://doi.org/10.1016/j.worlddev.2014.08.024

Desai, B. M., Mellor, J. W., Sharma, V. P., & Tamboli, P. (2011). Agricultural Policy Strategy, Instruments and Implementation: A Review and the Road Ahead. *Economic and Political Weekly*, 42–50.

Deshpande RS (Ed) (2008) Impact of Minimum Support Prices on the Agricultural Economy. In Glimpses of Indian Agriculture. Ministry of Agriculture & Academic Foundation, Government of India. New Delhi.

Das, R. (2020). Minimum support price in India: what determines farmers' access?. *Agricultural Economics Research Review*, *33*(347-2020-1416).

Economic Survey (2016) Agriculture: More from Less. http://indiabudget.nic.in/es2015-16/echapvol1-04.pdf

Einiö, E. (2014). R&D Subsidies and Company Performance: Evidence from Geographic Variation in Government Funding Based on the ERDF Population-Density Rule. *Review of Economics and Statistics*, *96*(4), 710–728. https://doi.org/10.1162/REST

Fafchamps, M., & Minten, B. (2012). Impact of SMS-based agricultural information on Indian farmers. *World Bank Economic Review*, *26*(3), 383–414. https://doi.org/10.1093/wber/lhr056

Futch, M. D., & McIntosh, C. T. (2009). Tracking the introduction of the village phone product in Rwanda. *Information Technologies & International Development*, *5*(3), pp-54.

Galinsky, A. D., & Thomas, M. (2012). Adam Galinsky CV. *Journal of Personality and Social Psychology*, *81*(4), 1–20.

Gary, K., & Richard, N. (2019). Why Propensity Scores SHould NOt be Used for Matching. *Political Analysis*, *27*(4), 101–114.

GoI. 2017. Report of committee on Doubling farmers income by 2022. Ministry of Agriculture, Government of India.

Goyal, A. (2010). Information, direct access to farmers, and rural market performance in central india. *American Economic Journal: Applied Economics*, *2*(3), 22–45. https://doi.org/10.1257/app.2.3.22

Hassan, R. A.-, Dorward, A., & Poultan, C. (1999). Improving access to Maize Marketing Opportunities in Remote Areas of Ghana. *Improving Smallhilder Market Access in Remote Areas of Sub Saharan Africa*.

Henrik, K., & Tommy, G. (2000). Anchoring Induced Biases in Consumer Price Negotiations. *Journal of Consumer Policy*, *23*, 445–460.

Hildebrandt, N., Nyarko, Y., Romagnoli, G., & Soldani, E. (2015). Price Information, Inter-Village Networks, and Bargaining Spillovers: Experimental Evidence from Ghana. *Preliminary draft). Retrieved from http://sites. bu. edu/neudc/files/2014/10/paper_345. pdf*.

Ho, Daniel, Kosuke Imai, Gary King and Elizabeth Stuart. 2007. "Matching as Nonpara- metric Preprocessing for Reducing Model Dependence in Parametric Causal Inference." *Political Analysis 15*:199–236. http://gking.harvard.edu/files/abs/matchp-abs.shtml

Iacus, S. M., King, G., & Porro, G. (2012). Causal inference without balance checking: Coarsened exact matching. *Political Analysis*, *20*(1), 1–24. https://doi.org/10.1093/pan/mpr013

Iacus, Stefano M. and Giuseppe Porro. 2009. "Random Recursive Partitioning: a matching method for the estimation of the average treatment effect." Journal of Applied Econo-metrics 24:163–185.

Islam, M. S., & Grönlund, Å. (2010). An agricultural market information service (AMIS) in Bangladesh: Evaluating a mobile phone based e-service in a rural context. *Information Development*, *26*(4), 289–302. https://doi.org/10.1177/0266666910385556

Jaleta, M., & Gardebroek, C. (2007). Farm-gate tomato price negotiations under asymmetric information. *Agricultural Economics*, *36*(2), 245–251. https://doi.org/10.1111/j.1574-0862.2007.00202.x

Jensen, R. T. (2010). Information, efficiency, and welfare in agricultural markets. *Agricultural Economics*, *41*(SUPPL. 1), 203–216. https://doi.org/10.1111/j.1574-0862.2010.00501.x

Korobkin, R., & Guthrie, C. (2003). Heuristics and biases at the bargaining table. *Marq. L. Rev.*, *87*, 795.

Law, S., Guthrie, C., & Orr, D. (2006). Anchoring, Information, Expertise, and Negotiation: New Insights from Meta-Analysis. In *Ohio State Journal on Dispute Resolution* (Vol. 597). http://heinonline.org

Leider, S., & Lovejoy, W. S. (2016). Bargaining in supply chains. *Management Science*, *62*(10), 3039-3058.

Malak-Rawlikowska, A., Milczarek-Andrzejewska, D., & Falkowski, J. (2019). Farmers' bargaining power and input prices: What can we learn from self-reported assessments? 1. *Social Sciences*, *8*(2), 1–13. https://doi.org/10.3390/socsci8020063

Mitchell, T. (2011). Middlemen, Bargaining and Price Information: Is Knowledge Power? *London School of Economics and Political Science*, 1–43.

Mittal, S., & Hariharan, V. K. (2016). Crop Diversification by Agro-climatic Zones of India-Trends and Drivers. *Indian Journal of Economics and Development*, *12*(1), 123-132.

Mittal, S., Gandhi, S., & Tripathi, G. (2012). *Socio-Economic Impact of Mobile Phones on Indian Agriculture* (No. 23188). East Asian Bureau of Economic Research.

Nakasone, E., Torero, M., Leonard, K., Hoffman, V., Martins-Filho, C., Almanzar, M., & Frisancho, V. (2013). The Role of Price Information in Agricultural Markets: Experimental Evidence from Rural Peru. *Agricultural & Applied Economics Association*, 1–54.

Negi, D. S., Birthal, P. S., Roy, D., & Khan, M. T. (2018). Farmers' choice of market channels and producer prices in India: Role of transportation and communication networks. *Food Policy*, *January*, 1–16. https://doi.org/10.1016/j.foodpol.2018.10.008

Parikh J, Singh C (2007) Extension of MSP: Fiscal and Welfare Implications. http:// planningcommission.nic.in/reports/sereport/ ser/ser_msp.pdf

Qin, S. (2011). Comparing the matching properties of Coarsened Exact Matching, Propensity Score Matching, and Genetic Matching in a nationwide data and a simulation experiment. *University of Georgia. ATHENS, GEORGIA*.

Ritov, I. (1996). Anchoring in simulated competitive market negotiation. *Organizational Behavior and Human Decision Processes*, *67*(1), 16-25.

Singh, R., Mehta, U. S., Shukla, G., & Singh, N. K. (2015). Minimum Support Price and Farmers ' Income. CUTS internationals.

Sorrentino, A., Russo, C., & Cacchiarelli, L. (2017). Strengthening Farmers' Bargaining Power

in the New CAP. *Proceedings in Food System Dynamics*, 123-127.

Svensson, J., & Yanagizawa, D. (2009). Getting prices right: The impact of the market information service in Uganda. *Journal of the European Economic Association*, *7*(2–3), 435–445. https://doi.org/10.1162/JEEA.2009.7.2-3.435

Toledo, C., & Ksoll, C. (2018). Chapter 6. Information technology and farm households in Niger. *Fostering Transformation and Growth in Niger's Agricultural Sector*, *February*, 117–146. https://doi.org/10.3920/978-90-8686-873-5_6

Tripathi, A. K. (2012). Agricultural price policy, output, and farm profitability—Examining linkages during post-reform period in India. *Asian Journal of Agriculture and Development*, *10*(1362-2016-107639), 91-111.

Woldie, G. A., & Nuppenau, E. A. (2010). The influence of marketing cooperatives on the bargaining position of producers in farm-gate banana prices: Evidences from smallholders in Southern Ethiopia. *Acta Horticulturae*, *879*(January 2008), 161–168. https://doi.org/10.17660/ActaHortic.2010.879.14

7. Annexure

Annexure 1: Summary of key variables by preference to village trader (data- NSSO)

	Sold to Mandi		Sold to local traders(		
Sold to village trader	**Mean**	**sd**	**Mean**	**sd**	**Mean difference**
Quantity Sold	6406.66	10719.69	4324.31	5241.56	-2082.35
Credit from local trader	0.01	0.09	0.01	0.11	-0.003
Disadvantaged Caste (SC/ ST)	0.27	0.44	0.32	0.47	-0.050***
Dummy for wage employment	0.45	0.50	0.49	0.50	-0.037***
BPL	0.27	0.44	0.31	0.46	-0.038***
Gender	0.93	0.25	0.93	0.25	-0.002
Received training in Agriculture	0.04	0.21	0.04	0.20	0.003
Illiterate	0.28	0.45	0.28	0.45	0.001
Purchased input from local trader	0.37	0.48	0.53	0.50	-0.163***
Expenditure on agrochemicals	4119.49	12550.07	4714.03	14596.56	-594.538**

Annexure 2: Summary of key variables by preference to village trader (data- Primary survey in Eastern India)

	Sold to Mandi		Sold to local trader		Mean
Variables	**Mean**	**Sd**	**Mean**	**Sd**	**difference**
Age	3.92	0.33	3.91	0.26	0.011
Age2	15.49	2.30	15.36	1.96	0.129
Disadvantaged Caste (SC/ ST)	0.18	0.39	0.18	0.38	-0.001
Years of education	2.79	0.34	2.71	0.32	0.082**

BPL	0.84	0.37	0.81	0.39	0.026
Ln (Land)	2.44	0.10	2.40	0.08	0.036***
Membership in cooperative	0.21	0.41	0.16	0.37	0.046
Received training in agriculture	0.12	0.33	0.07	0.26	0.052*
Engaged in MGNREGA	0.09	0.28	0.16	0.37	-0.077**
Member of political party	0.15	0.36	0.07	0.26	0.078***
Ln (Share of non-farm income)	2.96	1.70	3.08	1.54	-0.117
Has access to agricultural information	0.59	0.49	0.47	0.50	0.129**
Have access to livestock	0.84	0.37	0.83	0.38	0.01
Asset index	0.21	0.41	0.22	0.42	-0.015
Livestock index	0.24	0.43	0.26	0.44	-0.019
1st Principal component for village infrastructure	0.67	2.32	-0.19	1.82	0.861***
2nd Principal component for village infrastructure	-0.20	1.15	0.17	0.85	-0.369***
Distance to market	5.66	5.00	4.51	3.21	1.151***