Price deficiency payments mechanism: Evidence from the Indian agricultural market*

Abhinav Narayanan[†]
Reserve Bank of India

Shekhar Tomar[‡]
Reserve Bank of India

Preliminary Draft - Please do not quote or circulate.

September 15, 2018

Abstract

What is the optimal policy for supporting farm income? This papers looks at the transmission mechanism of Price Deficiency Payments (PDP) scheme into prices and market outcomes for agricultural crops. We leverage a policy change in Madhya Pradesh, India which implemented a PDP scheme (Bhavantar Bhugtan Yojana) during 2017 for eight crops. Among the major crops covered, we find that the policy decreased Urad prices by 5% in Madhya Pradesh and increased quantity arrivals by 30%, but had no impact on Soyabean. To explain these results, we build a model and show that under PDP, reservation price of farmers goes down which can eventually lead to a supply glut in the market. However, the crop-wise heterogeneity in terms of storage costs, past price distribution, play a major role in explaining why PDP schemes are successful in some crops while they fail to meet the objective in some other crops. We supplement our empirical findings with a matching model between farmers and traders. We show that overall prices get depressed in the presence of PDP, while an increase in relative bargaining strength of the farmer increases the overall prices.

JEL Codes: Q11, Q14, Q18, C78

Keywords: price deficiency, farm support, equilibrium price, quantity

*The views and opinions expressed in this paper are those of the authors and do not necessarily represent the views of the RBI. We are thankful to the conference participants in RBI, CAFRAL and IIT Kanpur for their valuable feedback. We also thank Anup Tiwari, Shakti Takkar and Twinkle Roy for their research support. Finally, we would like to thank the Mandi Board officials in Bhopal, Madhya Pradesh, for the discussions which were very helpful in understanding the policy details without which this paper would not have been possible.

[†]Strategic Research Unit. Reserve Bank of India. Mumbai. Email: abhinavnarayanan@rbi.org.in
[‡]Strategic Research Unit. Reserve Bank of India. Mumbai. Email: stomar@rbi.org.in

1 Introduction

The contribution of the agricultural sector in India to the overall Gross Value Added is 15.3 percent as of 2016-17, and has been decreasing over the years.[1] However, around 60% of Indian population still lives in rural areas, and is dependent on agriculture in a direct or indirect way.[2] Given this high agricultural dependence of majority of the population, it is natural for the state to enact various farm support policies over the years. In the budget for financial year 2019, Government of India allocated roughly 25 billion USD for farm support, approximately 1% of Indian GDP. So, it is imperative to ask questions on the feasibility and market distortion of such policies, both for fiscal prudence as well as welfare of a large section of population.

Given the diversity of agricultural issues faced by farmers in different states of India, there have been many experiments with various policies. One such policy, "Bhavantar Bhugtan Yojana", for farm support was recently implemented in Madhya Pradesh in the Kharif season of 2017 and involved Price Deficiency Payments (PDP). Under this scheme, the farmers were compensated by the state for the price difference between a price floor, set by the state, and market price. We find that the scheme decreased Urad prices by 5% while increasing quantity arrivals by 30% during the period the policy was in effect, while there was no impact on Soyabean.

A decrease in market price under PDP scheme can be caused by excess production, collusion between farmers and market intermediaries, or lack of bargaining power of farmers as studied by Alston and James [2002] and Russo et al. [2007] in the context of US. Both these papers present theoretical arguments to evaluate the welfare incidence under PDP and Russo et al. [2007] even estimates the gains cornered by market intermediaries using their market power in the wheat and milling industry. However, our paper is the first one, to the best of our knowledge, that uses a natural policy experiment to derive causal estimates of

[1] CSO [2018]
[2] NSSO [2011-12]

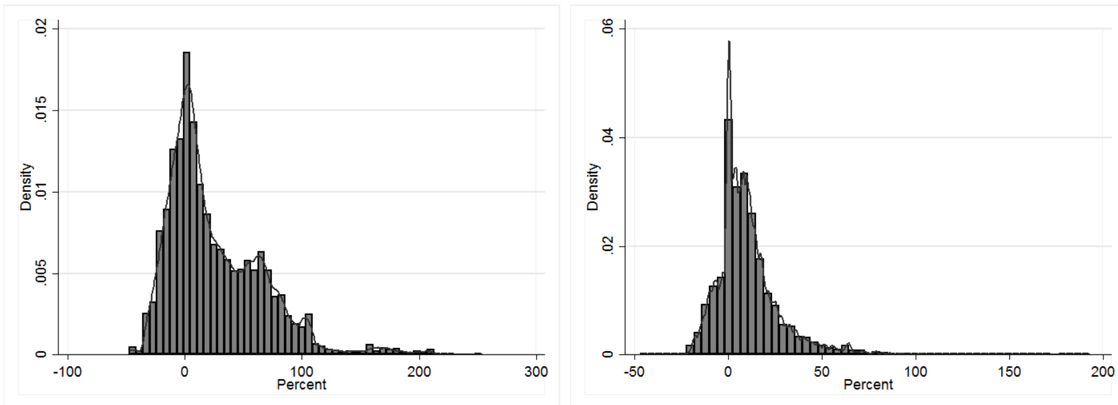
the impact of PDP scheme on prices and quantity. Another important difference from the literature is that we show how PDP can impact prices even in the short run without any changes in the cropping pattern or market power of different players.

Moreover, the specifics of this policy roll out allow us to show that prices can decrease even in the absence of above issues which sheds light on a new price distorting mechanism active under PDP. For example, in the long run if only a few crops are eligible under PDP scheme, it can shift cropping pattern in favor of such crops, thereby leading to excess production and fall in market prices. We show that market price can fall even in the short run, through a fall in reservation price at which farmers are ready to sell. This fall in reservation price can have a cascading effect on prices as it decreases the waiting time for the farmers to sell their produce. So, more supply can enter the market in a short period of time further suppressing the prices. Bhavantar Bhugtan Yojana (BBY) was one of the first instances of implementation of PDP by any state government in India and thus there is not much work on it. However, it is important to mention Chatterjee et al. [2018] who give a detailed discussion on the rollout of BBY in Madhya Pradesh. But their focus is more on the fiscal evaluation of PDP vis-a-vis other farm support policies rather than use BBY as a natural policy experiment for impact evaluation.

Before we discuss the details of BBY, it is important to understand where this scheme fits in the larger context of farmer support. The benchmark farm support policy followed in India is Minimum Support Price (MSP), where the government declares floor price for some commodities each year before the sowing season. In some states, there exists abundant infrastructure for public procurement of these crops. However, in case of most crops (except wheat and rice) and many states this infrastructure is missing which implies that MSP is non-binding.

Figure 1: Markup over MSP

(a) Arhar (b) Wheat



This is shown through a distribution of markup over MSP in Figure 1 for arhar and wheat. We use daily price data from around 3000 Mandis for the period 2010-2017. At the day-market level, we then calculate the markup over MSP. A value of 0 implies zero mark-up over MSP, while a value less than 0 implies that market price was lower than MSP. Figure 1 gives the density function for this markup over MSP. One can clearly see that a significant part of this density falls below MSP for both these crops, thus highlighting the non-binding nature of MSP. This result holds even for wheat where a good public procurement infrastructure exists in the states of Punjab and Haryana, the major wheat producing states. If the prevailing market prices are below MSP, private traders will not buy at above MSP prices. This in general means that without state commitment to procurement, MSP as a policy cannot deliver on farm support.

This inefficacy along with market distortion effect make the MSP policy less desirable. As a result, the debate on the optimal policy for farm support is always alive. Right now, there are two such policies which are being tested as an alternative to the MSP policy. First is the direct income support policy on a per hectare basis, announced recently by Telangana and Karnataka. Second is the price deficiency payments scheme like BBY, where farmer gets paid the difference between the market price and some administered price level. Thus it is important to understand the nuances and differences between these various policies, both in terms of welfare delivery and fiscal cost.

Under this backdrop, the implementation of BBY scheme in Madhya Pradesh provides a rich setting to evaluate Price Deficiency Payments (PDP) policy. The scheme was announced after the Kharif sowing season on September 06, 2017. Since the policy announcement came as a surprise for the farmers, it can be seen as a natural policy experiment. In the long run, based on similar policies in US (Westcott et al. [2001]), PDP can change cropping patterns through which it may have an impact on market prices. In contrast to the PDP in the developed world, the setting here allows us to study the impact of PDP on prices and quantity supplied on the market, even in the absence of any long run changes in market structure or cropping pattern.

To estimate the impact of PDP scheme in Madhya Pradesh, we use a difference-in-difference approach. We evaluate its impact on prices and quantity by comparing the border districts in Madhya Pradesh with the border districts in the neighboring states. Since the scheme was implemented only in Madhya Pradesh, the districts on two sides of the state border act as treatment and control groups. We conduct this exercise for two major Kharif crops in Madhya Pradesh, Urad and Soyabean, and find that policy has a decreasing influence on Urad prices but no impact on Soyabean prices. We also find that this decrease in Urad prices was matched by extra quantity arrivals in the mandis (local markets where farmers sell the produce to intermediaries) in Madhya Pradesh, highlighting the fact that PDP can decrease waiting time before farmers sell on the market.

In order to explain these empirical findings, we build a theoretical model in line with the policy restrictions that were in action during BBY. Using minimal assumptions, we build a variant of optimal stopping time model to analyze the impact of PDP scheme on optimal waiting time for farmers. Each period, the farmer has to decide whether to hold back his produce, which involves a holding cost, or sell it on the market. We find that presence of PDP reduces the reservation price at which farmers are willing to sell their produce. This in turn reduces their optimal waiting time which brings more produce to the market over a short period of time. So, coupled with farmer willingness to sell at a lower reservation price, this excess supply then leads to a further reduction in the market prices.

In the next section, we discuss the institutional details of BBY scheme in Madhya Pradesh and how it can be used to guide our empirical strategy. Section 3 presents the main data sets used in this paper. Section 4 presents the details on estimation strategy and main empirical findings. In section 5, we present a theoretical model that explains these empirical results. Finally, section 6 concludes.

2 Bhavantar Bhugtan Yojana

Timeline and Details: The Kharif sowing season in north India is between June and August followed by a harvest period from October onward. As discussed in the introduction, Bhavantar Bhugtan Yojana (BBY) is a Price Deficiency Payments (PDP) scheme launched in Madhya Pradesh in 2017. It was announced on September 06, 2018 and registration under the scheme was open to farmers between September 15 to October 15, 2017. The scheme was rolled out on October 16, 2017 after which the produce sold on the markets was eligible for deficiency payments. BBY covered eight major Kharif crops as shown in Table 1. The scheme was rolled out across all Mandis in Madhya Pradesh and was publicized among farmers by the government through fliers, TV advertisements, radio announcements, brochures etc.

The registration of farmers was possible at any of the APMC (Agricultural Produce Market Committee) yards[3], also knows as *Mandi*, or local farmer societies, where farmers had to furnish their details like identity card, bank account number, mobile number etc. (Sample form is reported in the Appendix) and most importantly the area sown under a BBY eligible crop. The process of registration was smooth as similar registration for wheat and paddy has been going on since 2009-10 in Madhya Pradesh, under a scheme called e-Uparjan. Madhya

[3]APMCs are government mandated local markets where farmers can go and sell their produce. Each district in India has roughly 2-3 APMC markets. The important feature of the APMCs is that the number of active traders on the market is usually determined by the state.

Pradesh government leveraged the e-Uparjan platform during the registration process for BBY as well. There were some 300 centers for registration in case of BBY apart from the *Mandis*. The system was 'sow and register' and not 'register and sow' as the farmers did not know about the roll out of the scheme.

Once a farmer registers himself under the scheme, he is given a unique identification number (URN) under BBY to track and deliver benefits under the scheme. After registration, the next step involves verification of the details provided by the farmer. This step is important because the verified land holdings is then multiplied by the average yield to arrive at the permissible quantity the farmer can sell under BBY. The verification is done by a local *patwari* (public official who maintains land records in a given area) who confirms the validity of the reported acreage under a given crop by a given farmer. Post verification, changes were made in accordance with the report submitted by the *patwari*. There are approximately 17,400 Patwaris for around 52,000 panchayat villages in MP[4]. In summary, one Patwari handles an average of around three villages.

Were there any restrictions on specific farmers or number of crops registered? No. Any farmer can get registered under any eligible BBY crop. Also, there was no restriction on the number of crops he can register under the scheme. The farmer is also free to choose any Mandi to sell his produce. Also, there was no restriction on the size of land holdings or the size of the sown land under BBY crops. However, it was mainly the large farmers who registered as they are more organized and better informed (anecdotal evidence based on discussions with Mandi officials). It is possible that small farmers did not get registered under the scheme as much as large farmers.

Since the farmers might want to hold on to their produce expecting a better return in the future, they were also given the option of warehousing facility under the scheme. However warehousing facilities were not used (weak/non-existent infrastructure can be one of the reasons) by the farmers. Technically, a farmer from a bordering state can also sell his excess

[4]Based on discussions with Mandi officials

produce (through his contacts in neighboring village. According to anecdotal evidence, some areas saw it but there is no proof supporting such claims.). But since the eligible quantity under BBY was bounded from above for an individual farmer, cross selling from border districts should not be a big concern.

Pricing: The farmers were paid a price differential payment (PDP) given by-

$$PDP = \begin{cases} 0 & if \quad SP > MSP \\ min\{MSP - SP, MSP - ASP\} & otherwise \end{cases}$$

The PDP was a minimum of the difference between Minimum Support Price (MSP), set by the government during every sowing season, and actual Sale Price (SP) or MSP and Average Sale Price (ASP).

The ASP for a crop was calculated by taking average of modal prices in a month over Madhya Pradesh and two adjoining states. The idea behind choosing PDP as defined above was to prevent any collusion and thus under-reporting of sale price by farmers and traders. Since the average was taken over two neighborhood states other than Madhya Pradesh, the above PDP calculation would put an upper bound on payments in case there was under-reporting of prices all across MP. The ASP for different months for different crops is reported in Table 1.

Payments: The final payments to the farmer were a function of PDP as calculated above and the quantity sold under BBY. But instead of being paid for their entire produce, the farmers were paid an average quantity as calculated from their reported acreage and expected average district productivity for that crop. The average yield was calculated through Crop Cutting Experiments carried out by the government in 2017. This put a cap on the total quantity/acre that could receive PDP in order to reduce over-reporting of production by the farmers (otherwise farmers could have bought produce from neighboring states and sold it as excess production under BBY).

This puts an upper bound of the quantity that a registered farmer can sell under BBY. However, the farmer is not required to sell all his produce at one time and he can sell it over multiple days. As an example, suppose a farmer is allowed to sell 100 quintals of Urad under BBY. First, this farmer brings only 50 quintals on Date 1. He receives a payment for this 50 quintals on Date 1. At a later date, he is eligible to sell the remaining 50 quintals for which he will receives a separate payment under BBY. On the other hand, if he brings 150 quintals to the Mandi, he gets PDP only for 100 quintals, while for the remaining 50 quintals he receives only the market rate.

Table 1: Prices for different crops

		16 Oct-31 Oct 2017		01 Nov- 30 Nov 2017		01 Dec to 31 Dec 2017	
Crop	MSP	ASP	Difference	ASP	Difference	ASP	Difference
Maize	1425	1190	235	1110	315	1127	298
Soybean	3050	2580	470	2640	410	2829	221
Moong	5575	4120	1455	4120	1455	4522	1053
Urad	5400	3000	2400	3070	2330	3291	2109
Groundnut	4450	3720	730	3570	880	3605	845

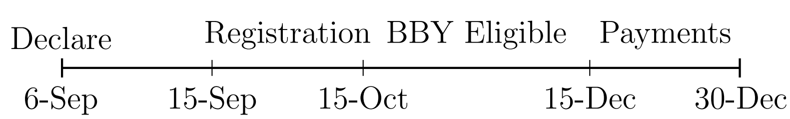


Figure 2: Sample timeline for Urad

Implementation: To benefit under the BBY scheme, farmers had to bring their produce and sell at the local *Mandi*, run by the APMCs. The selling mechanism under BBY was no different when compared to the previous years. At the entry gate of *Mandi* when a farmer arrives with his produce, he is given a unique Lot ID (corresponding to the whole produce brought to market on that day). Also, farmer had to report his URN in order to qualify the lot under BBY. This unique Lot ID is then used at every stage of the process inside the *Mandi*. The first step is auction where the registered traders on the *Mandi* bid for each lot. Once the auction is complete, the *Mandi* officials from APMC record the quantity of sale and rate of sale on the Agreement Slip, Weight Slip and Payment slip. The farmer receives the payment from the trader based on sale price. The PDP under BBY is also credited to his account later between 20-30th of the month.

Coverage: There were eight *Kharif* crops covered under BBY: Urad, Soyabean, Maize, Moong, Tur, Groundnut, Sesamum and Nigerseed. Out of these crops, Urad and Soyabean are the major crops during this season. In terms of coverage we find that 66% of the area under Urad and 50% of the area under Soyabean were registered under BBY (in terms of sowing these are the highest, see Table 1). The price differential between MSP and actual sale price was high for Urad which led to a high payment by the government. The government also revised the ASP at different time periods which is shown in Table 2.

Table 2: Summary Statistics, crop-wise

	Maize	Urad	Moong	Tur	Soybean	Groundnut	Sesamum	Nigerseed
Cropped area (Lakh ha)	13.17	17.89	2.28	6.47	50.1	2.18	4.24	0.61
Registered area (Lakh ha)	4.41	11.98	0.13	1.17	24.86	0.46	0.38	0.04
Compensation Paid (Crore)	154	1297	3	NA	471	11	0	0

Summary: Given the salient features of the policy above, we can summarize the policy as follows (will be helpful in designing the empirical strategy):

- Scheme announcement post sowing decision (No distortion on production decision)

- Cap on individual farmer quantity ensured that market was not flooded substantially from other states
- Registration was higher in regions with higher historical production (No systematic regional variation)

3 Data

There are two primary data sources that we have used for this exercise. First, we use Mandi-level price and quantity arrival data from Agmarket portal. This data is available at a daily frequency and provides information on prices and quantity arrivals for each Mandi at each date. We see three moments of prices (mode, max and min) for all transactions during the day. Second, we use information on farmers registered under the program for each crop for each district [5]. We use this farmer level registration data to find if there were any regional and/or crop-wise variations in the registration process for the farmers.

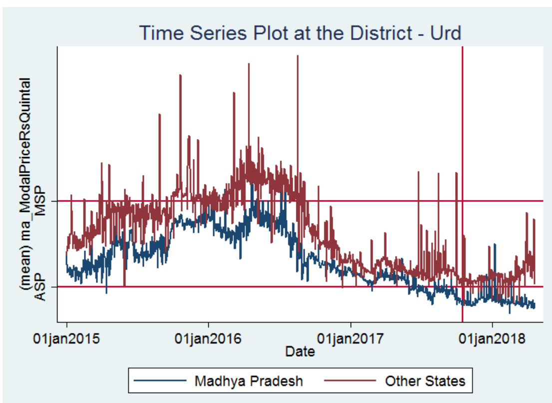
As discussed earlier, BBY covered eight Kharif crops during 2017. Out of the eight crops, Urad and Soyabean seem to have been the target crops based on the area registered and the compensation paid. Thus, in this paper, we restrict our attention to these two crops only. Figure 1 and Figure 2 below plot the prices and arrivals for Urad and Soyabean starting September-2015. The vertical line denotes the date on which BBY was implemented (i.e October 16, 2016). For the figures for prices, the first horizontal line is the average MSP for the last three years. The second horizontal line is the Average Selling Price (ASP) for the period when BBY was applicable. The blue lines denote the average price and arrival for MP (across all Mandis). The red line denotes the average for all mandis located in for all bordering districts (other states) of MP, namely: Rajasthan, Uttar Pradesh, Maharashtra, Chattisgarh and Gujarat. We see that Urad prices in MP have been historically low compared to other states. This trend continued even in 2015 and 2016 when Urad prices increased

[5]The MP Mandi board officials have been kind enough to share these details with us.

following two consecutive bad monsoons. After BBY was introduced, Urad prices in MP remained low when prices in other markets were increasing. Prices in both the markets although remained below the MSP through out the 2017-18 Kharif season. Interestingly however, Urad prices in MP remained below ASP through out the period post-BBY, while prices in other markets was prevailing above the ASP set by the MP government. This gives some indication that BBY caused Urad prices to go down. For Soyabean however, we see a completely different picture. The ASP was set so low, that it never became binding for MP, except for a small window after BBY was implemented.

Figure 3: Urad: Price and Arrival

(a) Price



(b) Arrival

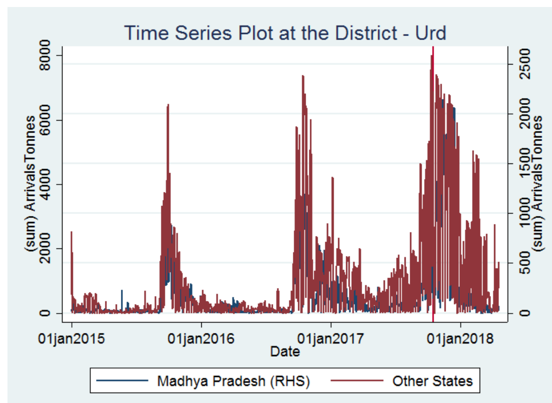
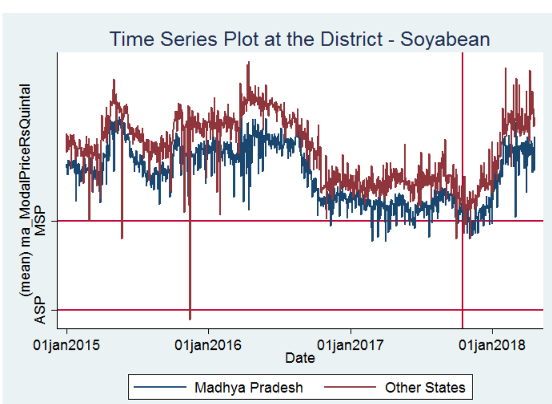


Figure 4: Soyabean: Price and Arrival

(a) Price



(b) Arrival

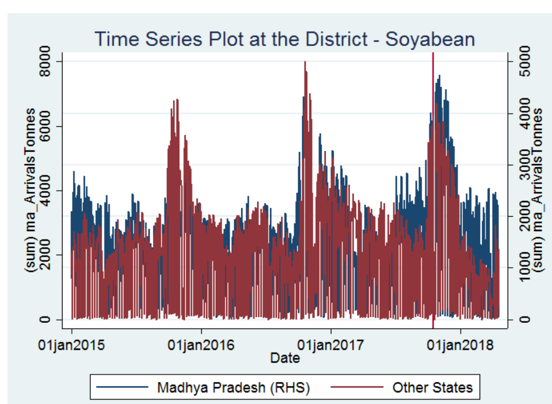
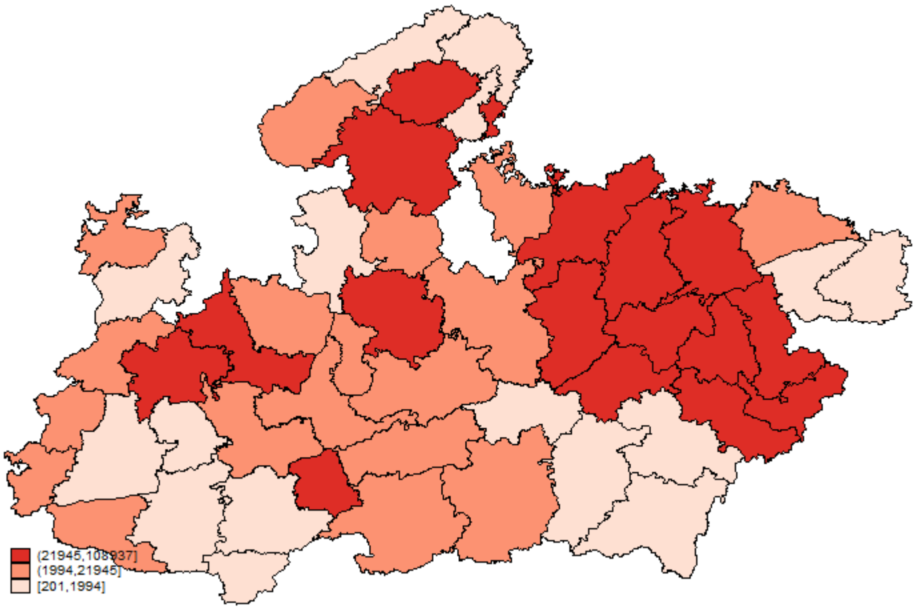
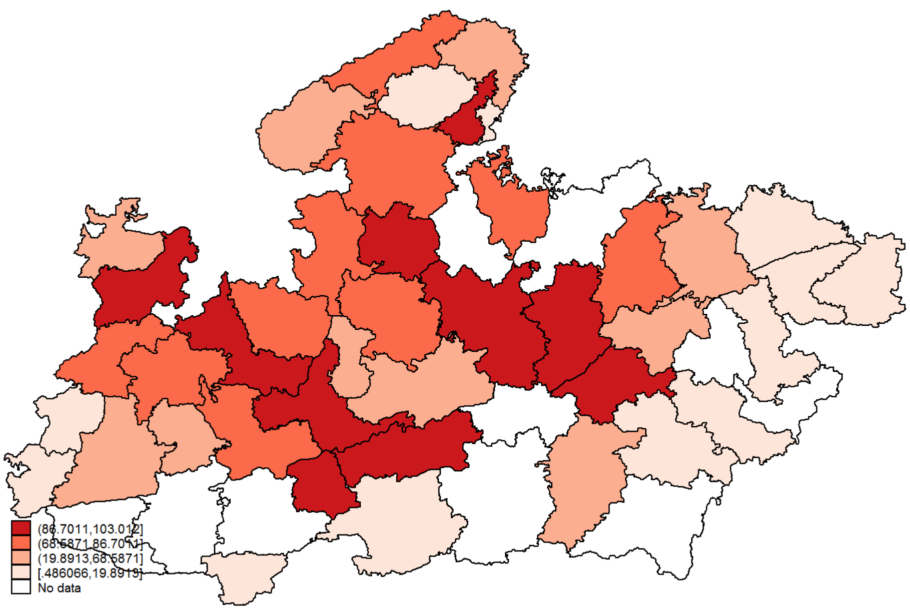


Figure 5: Registration Statistics

(a) Area registered



(b) Farmers registered and farmers paid



4 Empirical Strategy and Baseline Results

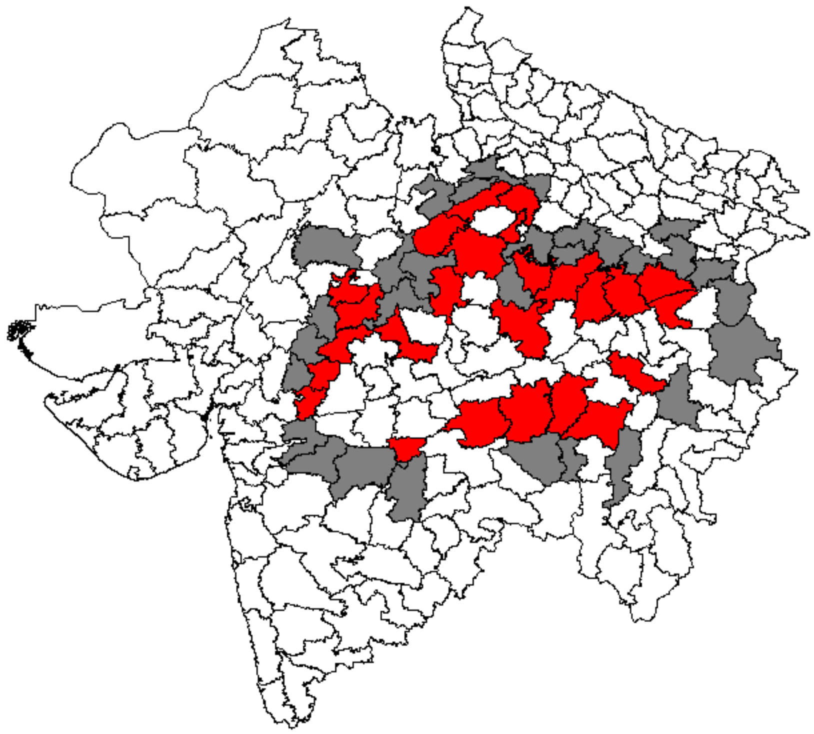
We are primarily interested in understanding the impact of BBY on prices and arrivals in Madhya Pradesh. To do this, we employ a difference-in-difference methodology where we compare prices and arrivals in mandis in Madhya Pradesh that implemented PDP against other states that did not. In terms of equation, it is given by:

$$y_{cmt} = \beta_1 \boldsymbol{D}(PDP)_{cmt} + \beta_2 \, \boldsymbol{X_t} + \gamma_{cm} + \delta_{ct} + \varepsilon_{cm,t} \tag{1}$$

where $y_{cm,t}$ denotes our variable of interest- quantity and price of crop c in mandi m at time t. $\boldsymbol{D}(PDP)_{cmt}$ is a dummy variable and takes a value **1** if BBY was active for crop c in mandi m at time t. Since the policy was implemented on October 16, 2016, $\boldsymbol{D}(PDP)_{cmt}$ takes a value 1 for any date post the policy for mandis in Madhya Pradesh. The coefficient on $\boldsymbol{D}(PDP)_{cmt}$ i.e. β_1 thus captures the deferential effect of BBY on outcome variables in Madhya Pradesh with respect to the control group. The time varying control variables at the mandi level are included under $\boldsymbol{X}_t$ while γ_{mc} and δ_{ct} capture mandi and time fixed effects respectively for the crop c.

In the main specification we restrict the treatment and control group to the border districts of Madhya Pradesh that implemented PDP against the border districts in neighboring states respectively, which is essentially a geographical difference-in-difference approach. The choice of the treatment and control groups however needs some discussion. Madhya Pradesh has around xx mandis operating in the state which can be safely identified as the treatment group. However, in order to get unbiased estimates of differential impact of BBY, we need a control group i.e. mandis, that did not implement BBY, similar to the treatment group of mandis in Madhya Pradesh. We thus only consider the mandis located in the neighboring states of Madhya Pradesh: Rajasthan, Maharashtra, UP, and Karnataka. However, it is very likely that even now the mandis in the treatment and control group in the above mentioned sample are very different from each other in terms of their size, crop arrivals, and region they operate. For example, a Mandi located in an interior district in neighboring Rajasthan may be very different from a mandi operating in the interior region Madhya Pradesh. Thus, we further restrict the treatment and control group only to the mandis located in the bordering districts of these states as shown in figure below.

Figure 6: MP Bordering districts



In order to justify this choice of estimation methodology, we can look at Figure xx on prices and arrivals in the treatment and control groups. We can see from Figure xx that the parallel trend assumption holds in the data and the prices and quantities go in the same direction for the treatment and control groups. The results from our baseline specification of equation (1) are reported in Table xx below.

Table 3: DiD estimates for Price and Arrivals: All bordering districts (Baseline)

(a) Price

	(1) Urad	(2) Soyabean
Treatment:Urad	-0.047***	
	(0.006)	
Treatment:Soyabean		0.005
		(0.008)
Time FE	Yes	No
Mandi FE	Yes	Yes
N	32159	61603

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Arrivals

	(1) Urad	(2) Soyabean
Treatment:Urad	0.282***	
	(0.072)	
Treatment:Soyabean		0.041
		(0.051)
Time FE	Yes	Yes
Mandi FE	Yes	Yes
N	26206	57019

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The left panel in Table 3 reports the impact of BBY on prices of Urad and Soyabean. It shows that the Mandis which were covered under BBY witnessed a 4.7% decrease in prices for Urad, while there was no such impact on Soyabean prices. The right panel of Table 3 further shows that this reduction in Urad prices was accompanied by a higher arrival on the Mandis in bordering districts of Madhya Pradesh. Once again, the results are insignificant for Soyabean but in case of Urad, arrivals went up by as much as 28% during the time that BBY scheme was valid.

We further test whether the additional difference in prices and quantities between the bordering Mandis existed even before the implementation of BBY. So instead of using a single dummy $\boldsymbol{D}(PDP)_{cmt}$ in equation 1 with a value equal to 1 during the period of BBY, we use a dummy for each of the months- Oct '16, Nov '16, Dec '16 and Oct '17, Nov '17, Dec '17. Since October-December is the harvest period for Urad and Soyabean, we want to test whether the gap in prices and quantities for the treatment and control group existed in the pre-BBY period in 2016. Only a null impact on prices and quantities in the pseudo treatment period of Oct-Dec '16, will corroborate the results from the baseline specification as a causal impact of BBY.

The results for this pseudo treatment are shown in Table 4. The panels on the left and right report the results for prices and quantities respectively. We find that for the months in 2016, there is no significant difference in prices and arrivals of Urad between the treatment and control group of Mandis (Column (1) in both panels). However, prices are lower and arrivals are higher in Madhya Pradesh for the months in 2017, i.e. the time period when BBY was implemented. This shows that in the case of Urad, the impact we see on prices and quantities in 2017 is primarily due to BBY scheme. Once again, there is no impact on Soyabean prices and arrivals both before and during the time period of BBY.

Table 4: DiD estimates for Price and Arrivals: All bordering districts

(a) Price

	(1) Urad	(2) Soyabean
Oct 16	-0.00	0.00
	(0.01)	(0.04)
Nov 16	-0.00	0.005
	(-0.7)	(0.008)
Dec16	0.00	0.00
	(0.006)	(0.1)
Oct 17	-0.05***	0.01
	(0.02)	(0.02)
Nov 17	-0.06***	0.00
	(0.00)	(0.01)
Dec 17	-0.04***	0.00
	(0.00)	(0.00)
Time FE	Yes	No
Mandi FE	Yes	Yes
N	32159	61603

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Arrivals

	(1) Urad	(2) Soyabean
Oct 16	-0.00	0.00
	(0.01)	(0.04)
Nov 16	-0.00	0.005
	(-0.7)	(0.008)
Dec16	0.00	0.00
	(0.006)	(0.1)
Oct 17	-0.05***	0.01
	(0.02)	(0.02)
Nov 17	0.27***	0.03
	(0.00)	(0.01)
Dec 17	0.35***	0.05
	(0.00)	(0.00)
Time FE	Yes	No
Mandi FE	Yes	Yes
N	32159	61603

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The decrease in prices and increase in arrivals of Urad in Madhya Pradesh also hint towards the mechanism driving these results. Since the quantity arrivals almost went up by 30% during the time of BBY in Madhya Pradesh, it might have led to a supply glut in the market and crash in prices. Since farmers could claim benefit under BBY only for a brief period, it is likely that this increased the overall arrivals on the market (also seen in the empirical results). If the supply glut mechanism holds true under BBY, this raises the question why don't we see similar results in case of Soyabean?

We think that the discussion on Soyabean is important not only to explain why on average Soyabean did not show results similar to Urad, but also to corroborate the mechanism we hinted above. One simple reason that Soyabean did not show as big an impact as Urad is due to the fact that Soyabean prices were very close to MSP during this period. This gave enough reason to farmers both in the BBY and non-BBY group to dump their produce on the market. The BBY benefits are more lucrative when the farm gate prices are far from

MSP, which increases the tendency of BBY eligible farmers to go and sell on the market, while non-BBY farmers wait while expecting the prices to increase. Since Urad prices were far below MSP, this can explain the reluctance of non-BBY eligible farmers to go and sell on the market.

However, we can further test this mechanism by restricting our sample to 15 days before and after the expiry of BBY scheme and use the same specification as in equation 1. The cut-off date for BBY scheme was 15 December for Urad and 31 December for Soyabean. In case of Urad we thus use the data from 1 December-30 December and similarly for Soyabean. The results for this sub-sample are reported in Table 5.

Table 5: DiD estimates for Price and Arrivals: Horizons (15 day window)

(a) Price

	(1) Urad	(2) Soyabean
Treatment:Urad	-0.003	
	(0.010)	
Treatment:Soyabean		-0.019***
		(0.005)
Time FE	Yes	No
Mandi FE	Yes	Yes
N	293	621

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Arrivals

	(1) Urad	(2) Soyabean
Treatment:Urad	-0.184	
	(0.102)	
Treatment:Soyabean		0.409*
		(0.199)
Time FE	Yes	Yes
Mandi FE	Yes	Yes
N	95	530

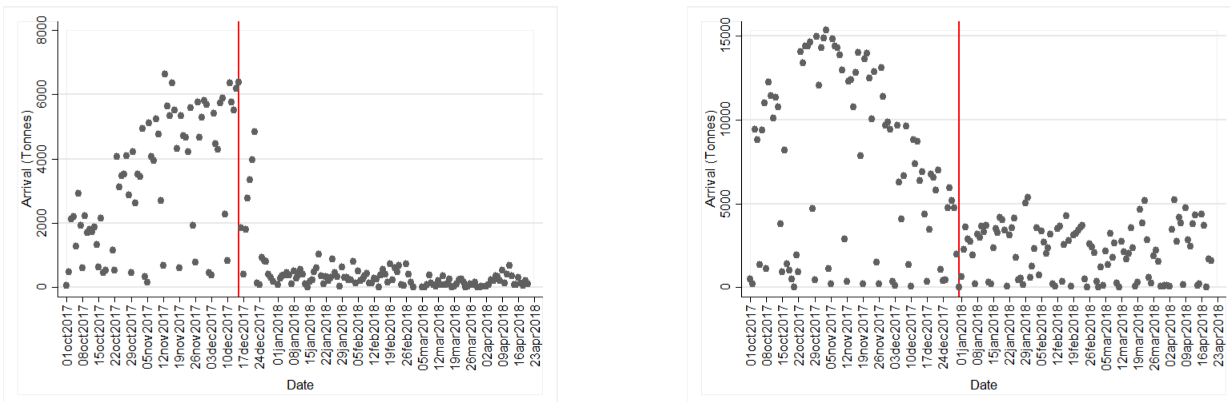
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We now find that there was no significant impact on prices and quantity of Urad in Madhya Pradesh, however Soyabean prices went down by roughly 2% and arrivals increased by 40% during the last days when BBY scheme was valid. The results for Urad can be partially explained by the fact that farmers dumped their produce on the market all during the BBY period and had no significant quantities left to bring on the market during the last days of the scheme. However the results in Table 5 only show that there was no significant difference in price and quantity arrivals 15 days before and after the scheme ended for Urad.

But the raw data on quantity arrivals gives a better understanding of this difference in results between Urad and Soyabean. The daily arrivals for all Mandis in Madhya Pradesh for Urad (panel (a)) and Soyabean (panel (b)) is shown in Figure 7, where x-axis is date and y-axis is the quantity arrival in quintals. Each dot on the graph represents the total quantity arrival on a given day. The red line in both panel represents the end date for BBY scheme, 15 December for Urad and 31 December for Soyabean.

Figure 7: Quantity arrivals in Madhya Pradesh by date

(a) Urad (b) Soyabean



One can clearly see from the left panel for Urad that high quantity continued to arrive in MP mandis for a few days even after 15 December i.e. the cutoff date. It probably implies that farmers were not entirely sure about the cutoff date for the scheme and continued to flood the market even post the cutoff date. So, for the specification as reported in Table 5, i.e. 15 days before and after the scheme end of BBY scheme, the difference-in-difference fails to pick up the impact on Urad prices (prices being depressed for the whole period, both before and after the cutoff date).

Since the cutoff date for Soyabean was 31 December, farmers had had the chance to learn from Urad experience and responded to the precise cutoff date. Thus in the right panel of Figure 7 for Soyabean arrivals, there is not a single day after cutoff date where arrivals are higher than before the cutoff date. This is formally captured in the results in Table 5, where Soyabean prices were lower by 2% and quantity arrivals higher by 40% in Madhya Pradesh in the 15 day pre-period of the end of BBY scheme. This shows that BBY did not impact the Soyabean prices throughout the whole season, but was important in the penultimate days of the scheme. Also, high arrivals along with decreased prices once again supports the supply glut theory.

Discussion: The empirical results above give a causal interpretation of the impact of BBY on both prices and quantity and specifically on the channel of supply glut to explain it. However there might be alternate explanations which cannot be ruled out without a discussion on the implementation of the policy.

The first challenge comes from the idea that it is possible for farmers from bordering districts in non-BBY states to sell their produce in bordering districts of Madhya Pradesh. This will also increase the quantity arrivals and depress prices in Madhya Pradesh, but it cannot be counted as a direct impact of Price Deficiency Payments. If all states implement it together then there will be no such cross-border incentive to sell and no distortion in prices. However, we can rule out this mechanism due to the cap on total quantity that a farmer is eligible to sell under BBY scheme. Based on the discussion in Section 2, we know that the maximum quantity that a farmer can sell under BBY is equal to the registered area times the average yield in his district. This directly rules out the problem of over supply from neighboring states flooding Madhya Pradesh and depressing the prices. So, the estimated price and quantity impact is only through the action of BBY eligible farmers.

Also, price deficiency schemes can alter cropping pattern if announced before the sowing season. If only certain crops are eligible for price deficiency payments like under BBY, it can incentivize farmers to shift towards such crops which can potentially lead to excess production induced supply glut. However under BBY, the scheme was announced post sowing period and so there was no change in cropping pattern. Thus the impact on prices can be only interpreted through the decision on when to sell the harvest on the market. And the results here show that PDP can reduce prices even in the absence of any kind of over production.

5 Model

We present a simple workhorse model to understand the impact of PDP by drawing upon the search and matching literature. We model the optimal decision making in two steps. First, we posit the farmer problem as an optimal waiting time problem. The farmer has to decide whether to hold or sell off his produce at any given time t. This problem can be solved both in the presence or absence of PDP scheme. In the second stage, if the farmer decides to sell on the market he has to match with a trader in order to complete the sale. The bargaining power of the two agents, farmers and traders, and the market tightness (in terms of quantity demanded and supplied) then determines the final price. This second step of matching between farmers and traders is posited as a search problem.[6]

5.1 Optimal Waiting Time

A farmer at time t decides to sell or hold back one unit of his produce to sell later. Let S denote the state when the farmer decides to sell and NS the state where the farmer decides not to sell. The value function of the farmer at any t is given by $V(S, NS)$. If the farmer decides to sell his produce, he receives a price p for the produce. Let p^*be the reservation price below which the farmer decides not to sell his produce. However, holding back the produce involves a cost b every period (can be though of as storage cost). Let $V(S) = V_s(p)$ be the value function of the farmer if he decides to sell, while V_{ns} be the value function of the farmer if he decides not to sell his produce. The farmer receives price offers from traders which has a support $F(p)$ (at this stage we can assume that an individual farmer takes the distribution $F(p)$ as given) over $[0, \bar{p}]$. Since $p^*$is the reservation price, we should have: $V_s(p^*) = V_{ns}$. The value function of the farmer who decides to sell his produce is given by:

[6] This section draws heavily from the search literature. See works of Burdett and Mortensen [1998], Christensen et al. [2005], Mortensen and Pissarides [1994], Pissarides [1985], Rogerson et al. [2005]

$$V_s(p) = p \tag{2}$$

The above equation tells us that the farmer, if he decides to sell in this period, receives a price p. Similarly, the value function of a farmer deciding to not sell his produce in this period is given by:

$$V_{ns} = -b + \beta \int_{0}^{\bar{p}} max\{V_s(p),\, V_{ns}\}.f(p).dp \tag{3}$$

The value function in case of not selling is equal to the holding cost plus expected gains from the next period. Here, β is the discount factor and the next period gains are maximum of $\{V_s(p),\, V_{ns}\}$ over various price realizations. Using the definition of reservation price i.e. $V_s(p^*) = V_{ns}$, we can solve for the reservation wage:

$$p^* = -b + \frac{\beta}{1-\beta} \int_{p*}^{\bar{p}} [1 - F(p)].dp \tag{4}$$

Equation 4 is a usual representation of reservation price in this simple scenario. We can show that as the holding cost, b, goes up the reservation price comes down. Now we can introduce PDP in this simple model and see how it changes the reservation price and waiting period of the farmer.

Introducing PDP: Suppose now that the government introduces a scheme wherein the farmer may sell his produce at a market determined price. However if the price is below a certain threshold, set exogenously by the government, the government will pay the difference between the threshold and the market price received by the farmer. If the price is above this threshold, there is no reimbursement from the government. We will call this threshold price as MSP, Minimum Support Price, sticking to the terminology used during the BBY scheme.

Since the threshold is exogenously set by the government, there could be two scenarios: either the price is below or above the threshold. Let δ be the probability of the price being below the threshold and $(1-\delta)$ be the probability of the price being above the threshold (since an individual farmer takes $F(p)$ as exogeneously given, δ can be directly calculated from $F(p)$). The value functions of the farmer in the presence of PDP turns out to to be:

$$V_s(p) = [\delta.ASP + (1-\delta).p] \tag{5}$$

$$V_{ns} = -b + \beta\lambda \int_0^{\bar{p}} max\{V_s(p),\, V_{ns}\}.f(p).dp + \beta(1-\lambda)V_{ns} \tag{6}$$

Equation 5 spells out the value function for a farmer who decides to sell under PDP. If the is below MSP, he receives a difference between the price and the MSP. So, overall, his revenue from selling when the price is below MSP is MSP and this happens with a probabilityδ. We can endogenize δ, but for the time being we take it as exogenously given (in general equilibrium sense, farmer decision to arrive on the market will determine $F(p)$, however individual farmer will still take it as given). On the other hand, if the price is above MSP, the farmer doesn't receive any benefits from the government but gets p. In the case when farmer decides to not sell, his value function is given by equation 6. He recieves a negative b due to holding costs plus some benefit from next period. In equation 6, we have introduced an extra parameter, λ, which captures the probability of matching between farmer and trader (in this simple setting one can think that matching offers arrive at a Poisson rate λ). With a probability λ, farmer matches and recieves $\int_0^{\bar{p}} max\{V_s(p),\, V_{ns}\}.f(p).dp$ or does not match and recieves V_{ns} with probability $(1-\lambda)$.

Once again using the fact that $V_s(p^*) = V_{ns}$ we can solve for the reservation wage:

$$p* = -\frac{b}{(1-\delta)} - \frac{\delta}{1-\delta}.MSP + \frac{\beta\phi}{\lambda(1-\beta)} \int_{p*}^{\bar{p}} [1-F(p)].dp \tag{7}$$

In equation 7, the reservation price now depends on cost b as well as threshold priceMSP and ofcourse the price support $F(p)$. Given the reservation price $p*$, the rate at which the farmer find price offers that are acceptable is given by:

$$h = \lambda[1 - F(p*)] \tag{8}$$

So the probability that a farmer has not found a price offer after time t is given bye^{-ht}, which can be used to calculate average wait time before a farmer sells his produce:

$$W = \int_0^\infty t.e^{-ht}.dt = \frac{1}{h} \tag{9}$$

Proposition 1:

The reservation price is lower in the presence of MSP and it decreases with an increase in the MSP, keeping all else constant. The elasticity of reservation price with respect to MSP is a function of the probability of the price being lower than the MSP. So, higher the probability of price being lower than MSP, more will be the effect of an increase of MSP on prices. Since average wait time, W is inversely dependent on $p*$, a rise in MSP also pushes down the average wait time.

5.2 Obtaining the equilibrium price

Having solved for optimal waiting time, the next stage involves matching between farmers and traders. In the first stage, we assumed that offers arrive at Poisson rate λ, but we can endogenize that as well as price discovery through a matching stage. In the second stage of the problem, we obtain a relationship between market tightness, farmer arrivals and equilibrium price.

Let's assume that traders and farmers are independently searching for the best price for one given commodity. Both the parties undertake this search activity which is costly. Traders create the demand for the commodity, while farmers supply it. Matching between the farmers and traders takes time and is not coordinated. Probability that a trader or a farmer find the best price depends on the relative demand and supply of the commodity.

The supply and demand are given by:

Supply: $Q = Q_{ns} + Q_s$, where Q_{ns} and $Q_s$are quantities held by the farmers who are not in the market and those who are in the market respectively. Similarly, demand: $D = D_{nb} + D_b$,where D_{nb} and D_b are quantities already bought by the traders and not bought by the traders respectively.

Let u be the fraction of quantity not brought in the market by the farmer. Total quantity not there in the market is uQ. Let v be the fraction of quantity demanded. Total quantity demanded is vQ. Let m be the matching function, which is the fraction of quantity transacted. $mQ = m(uQ, vQ)$. Let the m function be CRS, $m = m(u, v)$. Farmer finds a match with probability $p = \frac{m(.)}{u} = p(\theta)$, where $\theta = \frac{v}{u}$ represents the market tightness. If traders demand more, v increases which increases the market tightness. If more farmers come to the market, u decreases which also pushes up market tightness. Average length of wait time for a farmer $= 1/p(\theta)$. A demand is matched to trader with a probability$=\frac{m(.)}{u} = \frac{p(\theta)}{\theta} = q(\theta)$. Average wait time for the trader is given by $q(\theta)$.

Let Q or the production be fixed - there is a fixed amount available in the market. The flow quantity not available in the market is given by:$\frac{\partial(uQ)}{\partial t} = \dot{u}Q$, where,

$$\dot{u}Q = -p(\theta).uQ + s(1-u)Q \tag{10}$$

The first term in equation 10 is the fraction of quantity finding a match and arriving at the market. The second term is the number of farmers going back and holding their produce due to some exogenous separation from the trader or the market. Here s is the exogenous separation rate which can be though of as the efficiency of a particular mandi. Since the separation rate, s, is a parameter, it can be interpreted it in many ways (efficiency of the Mandi depending on its infrastructure. If the infrastructure/ transparency is less in a particular Mandi, the chances of separation are more). When θ is high (high demand), more farmers come to the market, $\dot{u}$ goes down. At the steady state:

$$\dot{u} = 0 : \; u* = \frac{s}{s + p(\theta)}$$

Demand creation by traders: The traders decides to post offers in the mandi that creates the demand. This decision of the trader depends on the expected future pay off. Each individual trader takes the aggregate market tightnessθ as given and can post at most one offer. If the transaction occurs, he gets a pay off equal to y while he pays the farmer a price p. Let c be the cost of posting an offer (cost of coming to the mandi etc). Let O be the value, the trader attaches to posting an offer and staying away from the market and M be the value the trader attaches to match and entering in to the transaction. The problem of the trader can thus be formulated by the following two equations governing offer posting and matching:

$$rO(t) = -c + q(\theta)[M(t) - O(t)] + \dot{O} \tag{11}$$

$$rM(t) = [y - p(t)] + s[O(t) - M(t)] + \dot{M} \tag{12}$$

The equation 11 is the flow return of staying out of the market (return from posting offer is equal to the cost of posting offer plus the gains from matching which happens at probability $q(\theta)$ and change in value of offer $\dot{O}$) while equation 12 is the flow return of entering the transaction (return from a match is equal to the net value from the offer $[y - p(t)]$ plus gains from posting offer in case match gets destroyed at rate s and change in value of match $\dot{M}$). We focus on steady state equilibrium given by $\dot{O} = \dot{M} = 0$. Let $V = 0$ in equilibrium which means the value of staying out of the market is brought down to zero at the steady state. Thus, we can write:

$$\begin{cases} M = c/q(\theta) \\ M = \frac{y-p}{r+s} \end{cases} \tag{13}$$

$$y - p = (r + s)c/q(\theta) \tag{14}$$

Price determination: The process of price determination is based on the fact that successful matching between traders and farmers creates a surplus i.e value of match> value of surplus. This surplus is shared between traders and farmers based on the bargaining power. Let S and NS denote the values of selling and not selling for the farmer.

$$\text{Joint value=} \begin{cases} M + S & , if\, matched \\ O + NS & , if\, not\, matched \end{cases}$$

Surplus value=$[M+S]-[O+NS] = [M-O]+[S-NS]$. The surplus is divided between the trader and the farmer. We adopt a Nash bargaining solution wherein the bargained price maximizes a geometric average of the surplus weighted by the relative bargaining strengthβ of the farmers:

$$max_p = [M - O]^{1-\beta}[S - NS]^{\beta} \tag{15}$$

The farmer problem can also be stated by the following two flow equations:

$$r.S = p(t) + s[NS(t) - S(t)] + \dot{S}(t) \tag{16}$$

$$r.NS = z + p(\theta)[S(t) - NS(t)] + N\dot{S}(t) \tag{17}$$

where z is the cost to farmer for holding the produce ($z < 0$). The first equation 16 gives the return value of match for the farmer and is equal to the price, $p(t)$ he gets plus the expected change in value in case match gets destroyed by exogeneous probability s and the change in value of match $\dot{S}(t)$. Similarly equation 17 gives value of match in case of no match. At the steady state: $\dot{S}(t) = \dot{NS}(t) = 0$, which gives us:

$$S - NS = \frac{p - z}{r + s + p(\theta)} \tag{18}$$

Since 15 is a Cobb-Douglas functional form, we have:

$$S - NS = \beta[M - O) + (S - NS)] \tag{19}$$

Using (14), (18), and (19) we have:

$$p = z + \beta[y + c\theta - z] \tag{20}$$

$$u* = \frac{s}{s + p(\theta)} \tag{21}$$

$$p = y - (r + s).\frac{c}{q(\theta)} \tag{22}$$

Equations 20, 21 and 22 together characterizes the equilibrium with endogenous variables: u, θ, and p.

Equilibrium in the presence of PDP: What happens to market clearing price under the presence of a scheme like PDP? We will discuss how the equilibrium conditions change under the presence of this scheme. Let the $\bar{p}$ and $\underline{p}$ denote the case when prices are above and below MSP. In this section we are going to assume that the market is operating below MSP so that the prevailing price is $\underline{p}$. Now, since $\underline{p}$ is below MSP, the farmers get the deficiency payment x, such that:

$$MSP = \underline{p} + x \tag{23}$$

The traders however pay the market clearing price. This creates a wedge between the farmer and trader optimal choices compared to the case without PDP. The demand equations by the trader remains the same as before:

$$rO(t) = -c + q(\theta)[M(t) - O(t)] + \dot{O} \tag{24}$$

$$rM(t) = [y - \underline{p}] + s[O(t) - M(t)] + M \tag{25}$$

However the flow equation for the farmer in this case is different and is given by:

$$r.S = MSP + s[NS(t) - S(t)] + \dot{S}(t) \tag{26}$$

$$r.NS = z + p(\theta)[S(t) - NS(t)] + N\dot{S}(t) \tag{27}$$

Solving for 20, 24, 25, 26 and 27, we have:

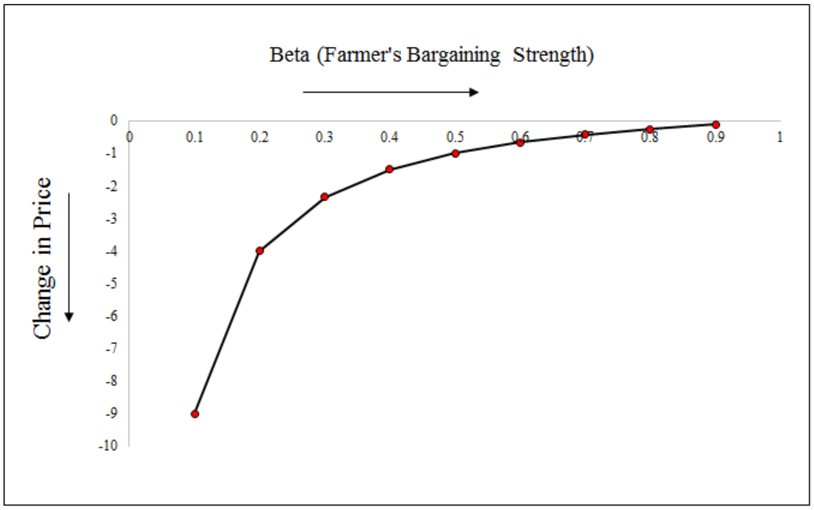
$$\underline{p} = [y + c\theta] + [1 - \frac{1}{\beta}][MSP - z] \tag{28}$$

$$\underline{p} = y - (r + s).\frac{c}{q(\theta)} \tag{29}$$

Proposition 2:

In the presence of a PDP scheme, the equilibrium price will go down regardless of the bargaining strength of the farmer. However, the magnitude of the decrease in prices would depend on the bargaining strength of the farmer. The change in prices with respect to a change in bargaining strength is shown in Figure 8 below. Higher the bargaining strength of the farmer, lower will be the decrease in equilibrium prices.

Figure 8: Bargaining Strength and Equilibrium Price



6 Conclusion

In this paper we look at a specific farmer support policy experiment carried out in Madhya Pradesh in 2017: the Bhavantar Bhugtan Yojana. Under this scheme, farmers were eligible to receive deficiency payments from the government if the actual sale price fell below a certain threshold. We use this exogenous policy experiment to understand the effect of such a policy on market distortions. We use a difference-in-difference approach to quantify the effect of this policy on prices and quantities for the crops covered under this scheme. We find that this policy has a general tendency to depress agricultural prices that may result into a temporary supply glut in the market. However, the heterogeneity in crops in terms of their storage costs, life span etc. play a role in the effectiveness of this kind of a policy in meeting the desired outcomes. In order to explain our empirical results, we build a micro-founded search theoretic model to derive some testable propositions. Our propositions from the theoretical model are an attempt toward understanding the outcomes of such farmer support schemes.

References

Julian M Alston and Jennifer S James. The incidence of agricultural policy. *Handbook of agricultural economics*, 2:1689–1749, 2002.

Kenneth Burdett and Dale T Mortensen. Wage differentials, employer size, and unemployment. *International Economic Review*, pages 257–273, 1998.

Tirtha Chatterjee, Ashok Gulati, and Siraj Hussain. Supporting indian farmers: Price support or direct income/investment support? *ICREAR Working Paper No. 357*, 2018.

Bent Jesper Christensen, Rasmus Lentz, Dale T Mortensen, George R Neumann, and Axel Werwatz. On-the-job search and the wage distribution. *Journal of Labor Economics*, 23 (1):31–58, 2005.

CSO. National accounts statistics. 2018.

Dale T Mortensen and Christopher A Pissarides. Job creation and job destruction in the theory of unemployment. *The review of economic studies*, 61(3):397–415, 1994.

NSSO. Employment-unemployment survey (68th round). 2011-12.

Christopher A Pissarides. Short-run equilibrium dynamics of unemployment, vacancies, and real wages. *The American Economic Review*, 75(4):676–690, 1985.

Richard Rogerson, Robert Shimer, and Randall Wright. Search-theoretic models of the labor market: A survey. *Journal of economic literature*, 43(4):959–988, 2005.

Carlo Russo et al. Deficiency payments and market power: effects of imperfect competition on welfare distribution and decoupling. In *American Agricultural Economics Association Annual Meeting, Portland, OR*, volume 29, 2007.

Paul C Westcott, J Michael Price, et al. Analysis of the us commodity loan program with marketing loan provisions. Technical report, United States Department of Agriculture, Economic Research Service, 2001.

Appendix

Table 6: DiD estimates for Price and Arrivals: MP and Chattisgarh

(a) Price

	(1) Urad	(2) Soyabean
Treatment:Urad	0.006	
	(0.019)	
Treatment:Soyabean		-0.012
		(0.006)
Time FE	Yes	Yes
Mandi FE	Yes	Yes
N	447	2891

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Arrivals

	(1) Urad	(2) Soyabean
Treatment:Urad	-0.200**	
	(0.054)	
Treatment:Soyabean		-0.364*
		(0.154)
Time FE	Yes	Yes
Mandi FE	Yes	Yes
N	446	2884

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: DiD estimates for Price and Arrivals: MP and Maharashtra

(a) Price

	(1) Urad	(2) Soyabean
Treatment:Urad	-0.089**	
	(0.031)	
Treatment:Soyabean		-0.012*
		(0.005)
Time FE	Yes	Yes
Mandi FE	Yes	Yes
N	6713	15428

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Arrivals

	(1) Urad	(2) Soyabean
Treatment:Urad	0.022	
	(0.164)	
Treatment:Soyabean		-0.351*
		(0.164)
Time FE	Yes	Yes
Mandi FE	Yes	Yes
N	2018	13051

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: DiD estimates for Price and Arrivals: MP and Rajasthan

(a) Price

	(1) Urad	(2) Soyabean
Treatment:Urad	-0.030**	
	(0.009)	
Treatment:Soyabean		0.014
		(0.015)
Time FE	Yes	Yes
Mandi FE	Yes	Yes
N	13079	30648

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Arrivals

	(1) Urad	(2) Soyabean
Treatment:Urad	0.444***	
	(0.075)	
Treatment:Soyabean		0.236***
		(0.060)
Time FE	Yes	Yes
Mandi FE	Yes	Yes
N	12954	29813

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: DiD estimates for Price and Arrivals: MP and Uttar Pradesh

(a) Price

	(1) Urad	(2) Soyabean
Treatment:Urad	-0.018	
	(0.010)	
Treatment:Soyabean		0.000
		(0.004)
Time FE	Yes	Yes
Mandi FE	Yes	Yes
N	7841	4985

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(b) Arrivals

	(1) Urad	(2) Soyabean
Treatment:Urad	0.033	
	(0.137)	
Treatment:Soyabean		-0.170
		(0.089)
Time FE	Yes	Yes
Mandi FE	Yes	Yes
N	7553	4945

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Farmer Registration Form (Next page)

मुख्यमंत्री भावांतर भुगतान योजनांतर्गत सम्मिलित फसलों [redacted] हेतु किसान पंजीयन फार्म वर्ष 2017-18

आवेदन क्रमांक ....

दिनांक 21.12.2018

1. पंजीयन केन्द्र का नाम/ग्राम सभा का नाम .... पंजीयन केन्द्र क्रमांक ....
2. किसान का नाम .... पिता/पति का नाम ....
3. निवासी ग्राम/वार्ड का नाम .... ग्राम पंचायत/वार्ड ....
4. तहसील .... जिला ....
5. वर्ग (अनुसूचित जाति/अनुसूचित जनजाति/अन्य पिछड़ा वर्ग/सामान्य) ....
6. किसान का मोबाईल नं. | | | | | | | | | | |
7. किसान की समग्र सदस्य आई.डी. क्रमांक | | | | | | | | | |
8. किसान का आधार नं. | | | | | | | | | | | | |

(यदि आधार नं. न होने पर E.I.D. नम्बर की जानकारी दें.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |

9. बैंक का नाम .... शाखा का नाम ....

बैंक खाता संख्या | | | | | | | | | | | | | | | | | | |

आई.एफ.एस.सी.कोड क्र. | | | | | | | | | | | |

10. किसान की स्वयं की भूमि का विवरण

(रकबा हेक्टेयर/मात्रा क्विंटल में)

ग्राम का नाम	फसल का नाम	मूल भूमि स्वामी की ऋण पुस्तिका	खसरा क्र.	रकबा	बोई गई फसल का रकबा		कुल संभावित उपज		मंडी/उपार्जन केन्द्र में विक्रय की जाने वाली	
					सिंचित	असिंचित	सिंचित	असिंचित	संभावित मात्रा	संभावित दिनांक