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Effects of credit and market access on farm gate prices in India

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Abstract

Farm gate prices for crops in many developing countries vary widely within a cropping season, by village, and by farmer. One hypothesis for this heterogeneity is that farmers are prevented from arbitraging prices due to lack of credit, forcing them to sell right at harvest, or in response to an immediate need for cash, such as illness. Even with credit, farmers need to have access to agricultural markets to take advantage of price arbitrage opportunities. In this paper, using longitudinal data on 1,348 households in India, we ask whether farmers are able to obtain higher farm gate prices when they have improved access to credit. We use the increase in agricultural loans associated with state elections as our exogenous shock to credit supply among public banks. Second, we ask how access to open markets associates with farm gate prices, and whether those with greater access to markets are better able to take advantage of the credit increase. We find that increased credit amount affects farm gate prices, but largely for crops other than paddy and wheat, which are highly regulated. Third, greater access to markets improves farm gate prices, and enhances the benefits of the increased credit. We rule out price effects of elections through other agricultural assistance programs, and credit from other sources. Thus, we find evidence that improving farmers' ability to access arbitrage opportunities can improve their crop revenue.

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1 Introduction and Motivation

Many farmers in the developing world face high market frictions and variable prices when selling their crops. One indicator of incomplete markets is the large variation in prices faced by farmers between regions and over the cultivation season. Regular seasonal price variation is a common feature of staple grain markets in many parts of the world (Sahn et al., 1989). For instance, Burke (2014) reports that maize prices in Kenya can vary up to 100% in the same market location within the same year. In a household survey conducted in India, farmers in the same village who sell the same crop receive prices that vary up to as much as 100% within the same month. In our setting, crop prices fluctuate significantly over time, with the greatest level of dispersion observed right at harvest, when almost 70% of all transactions occur. Farmers are highly dependent on their crop revenue, and even a small fluctuation in received crop prices can greatly affect their household income.

While some of the variation in prices farmers receive at the time of sale within the same village for the same crop may be attributed to spurious price fluctuations throughout the year, it might also be explained by the variation in outside options for farmers, and thus substantial variation in bargaining power.[1] Farmers often face high transportation costs, lack insufficient price information, and cannot verify the quality of their produce accurately when trying to sell their crops (Goyal, 2010). All of these obstacles may make them more dependent of village traders and the prices they offer. As a result, farmers who have no outside options have little bargaining power, often resulting in low returns on their crops (Bardhan, 1991; Clay, 2004).

In India, most farmers sell their crops to traders at their farm, who then sell the crops to the government regulated markets or *mandis*. Nearby markets, where they exist, often close not long after harvest, reducing price information and increasing potential transactions costs, which may exacerbate the farmers' dependence on traders

[1] Our summary statistics indicate that there is no significant change over time after harvest in the average prices received by farmers across all the crops in our sample.

(Mallory and Baylis, 2013).[2] While the Indian government annually sets minimum support prices (MSP) for farmers, which are meant to be the minimum prices paid for 'fair quality' crops, in our data, approximately half of the transactions report sale prices below the MSP levels. A substantial share of the transactions where prices are below the MSP levels occur for paddy and wheat sales (76% and 47% of all transactions are below the MSP levels), which are subject to heavy regulation by the government throughout the growing season.[3] Thus, even in these regulated markets, prices are highly variable, and farmers may require bargaining power to receive better prices.

Lack of credit also constrains a farmer's ability to take advantage of price arbitrage opportunities. While credit may help farmers in Kenya arbitrage prices over time (Burke, 2014), in India, farmers often obtain credit from traders, and are expected to pay the trader back right at harvest, necessitating a prompt sale (Mitra et al., 1986). This problem is compounded by the fact that before borrowing for inputs for the next cropping season, farmers have to pay off their past loan, again, necessitating sales at harvest. Among the households who use credit in our sample, approximately 75% receive credit from informal sources. Thus, farmers are constrained by their inability to arbitrage over time, over space or over buyers. In this study, we analyze the extent to which increased access to credit and agricultural markets allows farmers to receive higher crop prices.

To investigate how credit and market access affect farm gate prices, we use data on monthly crop transactions reported in the longitudinal household survey from the International Crops Research Institute for the Semi-Arid-Tropics (ICRISAT). We geocode these data, and combine them with market price information reported by the Indian Ministry of Agriculture, AgMarkNet.[4] We test two main hypotheses in this study. First, we explore the extent to which access to agricultural credit helps farmers receive higher prices for their crops. We limit our analysis to only major grains and oilseeds

[2]The Indian government issues license for agricultural traders to operate in mandis to buy crops from farmers. Since there are only a small number of traders who are allowed to operate in each market, traders tend to collude and offer low prices to farmers at the time of sales.

[3]Of all 4,845 crop transactions in our data, 43 % are paddy and wheat transactions.

[4]AgMarkNet is the website of the Indian Ministry of Agriculture http://agmarknet.nic.in/.

cultivated in the villages in our sample. It is possible that the amount of loans and crop prices farmers receive are correlated with common unobserved characteristics. For example, farmers who are better negotiators may be able to obtain credit more cheaply, and also receive better prices for their crops. To account for this endogeneity problem, we exploit the plausibly exogenous variation in state elections across India as a potential shock to the provision of public agricultural credit. We observe an increase in public loans, and a decrease in interest rates in the six months prior to a state election, which allows us to compare states with and without elections as a shock to credit from public sources.[5] Second, to control for a farmer's market access, we consider the number of markets open for sales of any crop within a 50 kilometer radius of each village in a given week using the geocoded market data from AgMarkNet.

Our results show that the increase in credit provision by public banks and the reduction in interest rates increase the crop prices received by farmers. Further, we find that greater access to nearby, open agricultural markets after harvest also increases prices received by farmers, and increase the price effects of improved credit access. We find that the increase in prices due to the credit shock is specific to crops other than paddy and wheat. We note that paddy and wheat prices and sales are highly regulated which may reduce potential for arbitrage, even with credit. The magnitude of the effect of credit on prices is highest among small farmers, who may have more limited outside options to access credit compared to larger farmers. We show that our results are only driven by the increase in public loans, not credit from other sources that is less likely to be directly influenced by state elections. Further, we rule out that our results are driven by other effects of elections, such as on agricultural assistance programs or prices directly.

We make several contributions to the literature. First, this study complements the broad literature on the effects of credit on farm management and agricultural marketing (De Janvry et al., 1991; Goetz, 1992; Key et al., 2000; Bellemare and Barrett, 2006; Barrett, 2007; Stephens and Barrett, 2011). Existing evidence of the returns to credit

[5]In our study, public banks include the State Bank of India and its associates, and nationalized banks.

provision are not conclusive. While a number of studies find substantial returns to credit provision (de Mel et al., 2008; McKenzie and Woodruff, 2008; Blattman et al., 2013; Fafchamps et al., 2014), other studies have found the magnitude of returns to credit to be much more limited (Karlan et al., 2012; Berge et al., 2014; Karlan et al., 2014). In addition, most studies have considered the effects of credit on agricultural investments, farm management, and technological adoption, but only one to our knowledge has studied the direct effects of credit on crop prices (Burke, 2014). Burke (2014) uses a randomized controlled trial to explore the effects of credit on prices Kenyan farmers receive for their maize, and finds that access to credit can help increase prices at farm gate. In our study, we extend his work by using observational data along with the plausibly exogenous variation in credit access to ask not only whether farmers receive higher prices, but which farmers are able to benefit, in conjunction with the role of market access. While Burke (2014) uses a randomized experiment to study the effect of credit on crop prices, our work uses observational data from eight states India, which allows our work to capture a larger geographic variation in our analysis.

Second, while existing studies have noted the effect of state elections on credit provision from public sources, to our knowledge, ours is the first to use elections as an instrument for access to credit using a household survey containing detailed credit information. Third, we find that state elections do not only affect the amount of public credit provided by public banks, but also the interest rates offered by non-institutional financial sources.

Last, most prior literature emphasizes the role of geography and transportation costs on market participation (Fafchamps and Gabre-Madhin, 2001; Muto and Yamano, 2009; Aggarwal, 2015). Commonly, market access measures only focus on the role of geographical distance on market participation (Rahman, 2003; Dewi et al., 2005; Minten and Barrett, 2008). While a number of studies identify improvements in efficiency from farmers having direct access to agricultural supply chains (Siamwalla, 1993; Besley and Burgess, 2000; Chamberlin and Jayne, 2013), very few explore the effect of the temporal variation in that access. We find that many *mandis* report no

transactions for many months of the year, implying these markets may not be a true option for periods outside harvest in India. This study complements the existing literature on market access measures by accounting for the opening times of local mandis that vary across both space (distance) and time (opening times) as a determinant of household welfare.

2 Setting and Data

In India, the markets for food and grain crops are highly regulated. The federal government sets floor prices (MSP), procures crops through the Food Corporation of India, and provides food to poor households at a subsidized price (Mallory and Baylis, 2013). Based on an extensive review of the expected production and consumption processes of a particular crop or commodity, the Commission for Agricultural Costs and Prices determines the MSP levels at the beginning of each cropping season. The federal government sets common national MSP levels, but each state in India may add ad-hoc additional bonuses for a specific period. While the federal government procures crops from these regulated agricultural markets (mostly paddy and wheat), it sets MSP prices for most other crops (as well as a number of household commodities including sugar and kerosene). The public administration of the Indian agricultural market creates a large degree of inefficiency due to dated market infrastructure, over-regulation, inadequate introduction of technology, and poor allocation of resources (Mahadevan, 2003).

Prior to the liberalization of the Indian agricultural markets in the early 2000s, agricultural products were restricted from freely moving across states and even districts. However, these restrictions have been relaxed since 2003, and the Model Market Act now allows private buyers to trade cash crops more freely across India (Jayasuriya et al., 2007). Despite the reforms, these regulatory constraints, along with the need to sell to only a small number of local, registered traders, result in there being few options for farmers outside of their local traders, and thus low farmer bargaining power when

negotiating the price of their crops.

The data in this study come from two main sources. The first is the Village Level Studies (VLS) program, which is part of the Village Dynamics in South Asia (VDSA) project conducted by ICRISAT.[6] The data are part of the Second Generation VLS, which began collecting household data in July 2001 from approximately 40 households per village in six villages across four states. In 2009, the project was expanded to cover a total of 30 villages in eight states (Andhra Pradesh, Bihar, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Maharastra and Orissa).[7] Figure 1 illustrates the location of the villages in our sample. The household survey contains information about household characteristics, demographic information, livelihood strategies, household production and consumption decisions, cash crop transactions, and monthly prices received from cash crop sales.[8] The summary statistics of the credit and price information are reported in levels, but in our analysis we convert them to the logarithmic scale.

The second source of data contains price information collected by the Indian Ministry of Agriculture. Each local government regulated market (*mandi*) records daily maximum, minimum, modal prices, and the quantities of each crop delivered every day at least one transaction took place. The Ministry of Agriculture publishes detailed price information on its website, AgMarkNet, and makes the data publicly available (AgMarkNet, 2015).

Our unit of observation is the monthly sale of each crop by each household. After removing missing data, the total sample size in our analysis is 4,845 observations. For each transaction, we have information about crop type, quantities sold (in quintals), and prices received (in Rupees).

In Table 1, we report the descriptive statistics of economic and demographic characteristics of the sample households. Households in each village are stratified based on

[6]See the VDSA project website for more information at http://www.icrisat.org/vdsa/vdsa-microdoc.htm

[7]The initial four states in which the survey was conducted are Andhra Pradesh, Maharashtra, Gujarat and Madhya Pradesh. Currently, the data collection has also expanded to a number of villages in Bangladesh, but they are not part of our analysis.

[8]The ICRISAT data also contain information about regional market prices, the prices actually received by farmers and the timings of both harvest and sales

their land ownership; landless, small, medium, and large. According to the definition provided by ICRISAT in the data, landless farmers own 0.00-0.20 hectares, small farmers own 0.21-2.50 hectares, medium farmers own 2.51-5.25 hectares, and large farmers own greater than 5.25 hectares. Of the 1,348 households in our sample, 312 are landless, 403 are in the small category, 332 are in the medium category, and are 301 in the large category. Panel A presents the summary statistics of the demographic characteristics of the households in our sample. Panel B presents the asset information divided into three categories: land assets, non-land assets, and livestock assets. We measure non-land assets and livestock assets by using principle component factor analysis to construct asset indices for these two asset categories. In Panel C, we report the access to storage facilities in our sample. A very small portion of farmers in our sample have storage facilities, ranging from only 0.03% among landless farmers up to 0.08% among large farmers. We also report the market-equivalent value of their storage facilities for those who own them. In Table 2, we report some of the characteristics of the villages in our sample. Substantial variation exists among the villages in terms of population size, access to the nearest town, and access to nearby agricultural markets.

In Table 3, we present the summary statistics of crop sale information by farmers. In our dataset, we observe production, consumption, and transaction data from each household by month. To mitigate the potential issue of farmers' selecting into growing a particular cash crop, we restrict our analysis to the marketing of the crops grown by most farmers in each of the villages in our data.[9] Our analysis covers ten crops: black gram, chickpea, finger millet, groundnut, maize, paddy, pigeonpea, sorghum, soybean, and wheat. Even for the same crop, we observe considerable variation in prices both across space and time. We also observe substantial variation in prices received by farmers across different levels of land ownership. For example, Figure 2 presents the variation in prices of paddy over time by months after harvest. In Figure 3, we present the variation in the median paddy prices received by farmers within each village over

[9]We restrict our analysis to the crops grown in each village by more than half of the non-landless farmers in our sample.

time, which exhibit variation in crop prices across villages in our sample. Overall, prices of maize, paddy, and wheat are less dispersed than other pulse and oilseed crops.

Panel A presents the average prices of crops sold by each transaction separated by farmer category. Column (1) reports the average prices that farmers received for each crop, pooling across all villages and all years within our sample. We observe substantial variation in prices received by farmers selling the same crop in the same village, even within the same time period. Columns (2) and (3) report the average of monthly prices offered by the village trader, and by the trader from the nearest market. In Panel B we present the average amount of transactions sold for each crop by growing season with which we observe substantial difference in the average amount sold per transaction across crops.

In Table 4, we report information about the amount of agricultural credit obtained by farmers in our sample contingent on land ownership. In our sample, loans from financial institutions are usually larger than loans from non-institutions, and come with lower interest rates on average. In India, farmers who use agricultural credit from financial institutions are required to register their assets, usually their land, as collateral in case of default. Land assets need to be re-registered every six months, to ensure the land title is up to date.[10] Further, even those with land may find it difficult to access credit from the financial institutions without connections. As a result, landless farmers often have to borrow from non-institutional financial providers and face high interest rates. We compare the amount of loans received by farmers and their interest rates up to six months before a state election versus not, which should create an appropriate counterfactual for our setting. We find that the amount of credit provided by public banks increases right before an election, as presented in Figure 4 for the state of Karnataka. We see lower interest rates offered right before an election, with the most significant decrease among loans offered by non-institutional financial sources, as illustrated in Figure 5 for the state of Maharashtra. While interest rates for agricultural loans from public banks are determined by each state's banking committee,

[10] Anecdotally, in some contexts, re-registering land titles may require paying a bribe.

other types of lenders may response to the increased credit provision by public banks by lowering their interest rates associated with the loans they offer.

Finally, in Table 5, we report our measure of market access. Our measure is the number of weeks markets in the 50 km surrounding a village are open each month. We downloaded the maximum, minimum, and modal price data from AgMarkNet (from prices reported on every Monday of each week). Our field tests indicated that 50 kilometers is the maximum distance that farmers can physically and reasonably travel to the agricultural markets themselves. Our results show that the number of weeks the markets are open decreases after harvest. The quantity of crops supplied to the market decreases after harvest, and increases just before the start of the next growing season. We do not observe a clear trend in farm gate prices after harvest, implying that there may not always be the potential to gain a higher price by waiting to sell after harvest.

3 Identification Strategy

This study asks whether access to agricultural credit and nearby markets may allow farmers to receive higher crop prices. Specifically, we test whether these factors may help explain the heterogeneity the prices of cash crops farmers report to have received at the time of sale. We estimate a reduced-form equation as follows:

$$p_{ijkt} = \alpha + \beta y_{it} + \gamma A_{kt} + \omega X_{it} + \epsilon, \tag{1}$$

where p_{ijkt} is the log price of crop j farmer i living in village k receives at time t, y_{it} is the log level of agricultural credit received by farmer i in time t, A_{kt} is the market access measure faced by farmers in village k receives at time t and X_{it} is the set of household characteristics.

A number of factors could drive farmer access to credit, some of which likely also affect the price received for a crop. To overcome the endogeneity of the access to credit, we exploit the plausibly exogenous variation in state-level election schedules across

India to explain a boost in agricultural lending in India during an election year.[11] The rationale for this identification strategy is based on the observation by Cole (2009) that state governments increased agricultural credit leading in the months leading up to a state election. Several papers document an increase in the amount of agricultural lending in an election year relative to lending in off-election years using district-level credit provision data and document a positive and significant relationship between state elections and credit supply (Cole, 2009; De and Vij, 2012; Kumar, 2014). Specifically, we use the following relationship to represent the exogenous change in access to credit of farmers in our sample.

$$y_{it} = \alpha + \beta Election_{rt} + \gamma_r + \omega_t + \delta_i + \epsilon, \tag{2}$$

where y_{it} is the log level of agricultural credit received by farmer i in time t , $Election_{rt}$ represents an indicator variable equal to 1 if state r holds a state election in the following six months, γ_r is the village fixed effects, ω_t is the year fixed effects, and δ_i is a dummy variable for farmer category as classified by ICRISAT.

Within the context of India, this identification strategy is reasonable due to the nature of the relationship between state governments and the legal and financial institutions of each state (Cole, 2009). Each state government appoints members of its legislative assembly to serve in the "State Level Bankers Committee." This committee regulates financial policies and practices in each state, and is dissolved at the end of each legislative term. Although the committee does not have formal authority over the operations of banks and other financial institutions within the state, it holds quarterly meetings to determine levels of financial credit to be offered by public banks and other financial institutions within a state. These committees may influence public banks to offer greater amount of credit for political purposes. The Constitution of India

[11] While the Constitution of India requires that state-level elections must take place every five years, the actual timing of the elections may not perfectly correspond to this timeline. State-level elections may take place before they are scheduled due to any change in the government leadership (Cole, 2009). In our sample, all state elections map perfectly to their scheduled timeline. Therefore, we argue that there is no spurious occurrence of any state elections before the scheduled time in our sample.

mandates each state to hold elections to elect members of the *Vidhan Sabha*, or the Legislative Assembly of each state every five years. This election schedule mandated by the Constitution varies from state to state.

There are two advantages to the unsynchronized nature of this election schedule (Cole, 2009). First, national economic conditions will affect all states simultaneously, and will therefore not be correlated with state elections. Further, we rule out potential reverse causality in that interest rates are not likely to affect timing of state elections.

Since increasing agricultural credit supply can be costly to the state governments, each state might only choose to intervene the credit market only in the months leading up to an election in areas that would require greater political support. A sizable amount of literature including Snyder (1989), Dixit and Londregan (1996), Dahlberg and Johansson (2002) and Cole (2009) observe larger increases in government grants in areas where political competition is particularly strong to capture the swing votes. However, we do not observe enough variation in the political competition data within the districts in our sample.

To qualify as a valid instrument for agricultural credit offered by public banks, state-level elections should not affect prices in any other way except through loans. We verify this claim by considering alternative mechanisms through which elections may directly affect crop prices. In all scenarios, we find that our results are driven by the effect of elections on the provision of agricultural credit, and not through these other mechanisms.

4 Empirical Results

4.1 Main Results

We begin our analysis by examining the direct effect of state-level elections on farm gate prices, and present our results in Table 6. Panel A reports the direct of effect of elections on prices. Our results indicate that crop prices received by farmers are

positively and significantly higher in the six months leading up to a state election, controlling for household, village-level, and crop-specific characteristics. We include a linear time trend for the number of months after harvest. The results are positive and significant when we both control for crop year fixed effects and not.[12] Specifically, in the six months prior to a state election, crop prices are 0.165 and 0.094 times higher than they are outside this time window, without and with crop year fixed effects (Columns (1) and (2)). We also use calendar year fixed effects in place of cropping rotation fixed effects and the results remain qualitatively unchanged.

In Panel B, we add an additional control to both specifications. The number of weeks nearby markets are open is a sum of the number of weeks nearby markets are open for sales of any crop. Nearby is defined as being within a 50 km radius of the village. If more than one market is open in the vicinity, we add up the total number of weeks each market is open in a month. This variable accounts for the level of market accessibility farmers have to sell their crops after harvest, which should capture the level of a farmer's dependence on village agricultural traders. The market accessibility variable is positive and significant, suggesting that farmers in areas with one unit of greater access to markets nearby and open agricultural markets tend to receive higher prices for their crops by approximately 1.2

Next, in Table 7, we explore the channel through which state elections affect crop prices. In this study, our identification relies on the plausibly exogenous variation in the state-level election schedule as a potential shock to agricultural credit offered by public banks. For Panel A, our results in Column (1) shows that farmers who receive a 1% larger agricultural loan from public banks up to six months before elections report 1.12% higher prices for their crops compared to those who receive credit outside this time window. The point estimate of the effect of credit is no longer significant when we include the crop year but the magnitude is still similar, as shown in Column (2).

[12] We define a crop year in India to cover an annual crop year, which include two to three seasons. This cropping rotation varies by state and depends heavily on agro-climatic factors of each state. For example, in Andhra Pradesh, the *kharif* or summer season starts in June and ends in November while the *rabi* or winter season starts in December and ends in May.

A possible explanation for the change in statistical significance is that the crop year fixed effects may remove a lot of the variation in our instrument, the state election timeline.[13] In Panel B, we control for market access, and our results remain qualitatively unchanged. We still find positive and significant effects of credit on crop prices. Specifically, if the number of weeks nearby markets opened increases by one week on average, prices farmers receive for their crops increase by approximately 4%. We control for the seasonality of credit by including the dummy variable for the number of months after harvest in all our regression specifications.

In another set of specifications reported in Table 8, we test whether farmers who benefit from greater access to credit up to six months before elections receive prices for their crops significantly different from the median prices of the transactions for that crop occurred right at harvest within the same village. We also test for if there is any significant difference between prices received by farmers and the MSP levels. Either when do not include the market access control (Panel A), and when we do (Panel B), we do not observe a significant difference between prices received by farmers and the median prices received within the same village right at harvest, and between the prices received and the MSP levels. In another set of unreported specifications, we find no significant effect of credit on prices received by farmers and the median prices received within the same village right at harvest when we split our sample to paddy and wheat, and all other crops. However, we observe a significant effect of credit on prices received by farmers and the MSP levels for all other crops, but no significant effect for paddy and wheat.

We are interested in finding out if the positive and significant effects of credit on crop prices received by farmers may be specific to certain crops. In Table 9, we split our sample to two categories: paddy and wheat (Column (1)), and all other crops (Column (2)). In Panel A we do not control for market access and we do so in Panel B. Our results indicate that there is no significant effect of credit on prices of paddy

[13] One argument that may help reconcile the need to include the crop year fixed effects is that we test for the trend of crop prices after harvest by season. We do not find any distinct upward or downward trend of crop prices after harvest for all of the seasons in our sample.

or wheat received by farmers in the six months prior to state elections. This finding is not surprising due to the heavy intervention of the government in the paddy and wheat markets in India. Prices of paddy and wheat are subject to heavy regulation throughout the year, and thus increased access to credit due to elections may not help farmers store their crop to receive better prices. However, we find strong and positive significant effects of credit on prices of other crops in our sample. Specifically, we find that a one percentage increase in credit supply from public banks ahead of state elections is associated with approximately a 0.82% increase in prices of crops other than paddy without market controls (Column (2), Panel A), and a 0.92% increase in prices when including market control variables (Column (2), Panel B).

We expect that the effect of the increase in credit provision by public banks ahead of state elections may vary depending on farm size. One might hypothesize that if large farmers already have ready access to credit, increased credit provision may not facilitate waiting or bargaining for higher prices.[14] In Table 10, we test whether the effects of credit based on farmer category by interacting the credit variable with the dummy variable for each farmer category. We find that relative to other farmer categories in the dataset, small farmers benefit from increased access to credit due to state elections more than medium and large farmers (Table 10, Column (1)). Specifically, a 1% increase in the amount of public loans to small farmers from public banks up to six months before elections lead to approximately 0.278% higher crop prices they receive relative to those of farmers in other categories. An interesting implication both in terms of welfare outcomes and rural credit policy may be drawn from this finding. Smaller farmers often have very limited access to credit from public sources, but the credit shock ahead of elections opens up opportunities for them to use credit, which as a result allow them to earn higher prices for their crops. Medium and larger farmers, on the other hand, may be more able to access agricultural credit from public banks

[14]We check if there is a direct effect of elections on the level of interest rates among larger farmers. Our results (unreported, but available by request) show that larger farmers also benefit from borrowing ahead of state elections because they could borrow with lower interest rates. However, the reduction in interest rates does not appear to translate to higher prices for them.

regardless whether it is ahead of an election or not, so the credit shock due to state elections may not benefit their received crop prices as much as it does crop prices of smaller farmers. It may, however, have subsidized their borrowing costs directly by way of lower interest rates.

In Table 11, we explore the extent to which greater accessibility to nearby, open agricultural markets within a 50 kilometer radius of each village may allow farmers to use credit to improve crop prices they receive. To test this hypothesis, we add an interaction term between credit and the number of weeks agricultural markets around each village is opened. In Column (1) using the full sample, we find that farmers who are in areas with one week of additional access to agricultural markets nearby receive approximately 0.024 higher unit prices for their crops at the time of sale. Our results suggest evidence that if access to nearby, open agricultural markets help farmers improve the crop prices they receive for a number of reasons. First, access to markets facilitates greater price information, which may allow farmers to strategically plan their timing of sales to obtain higher prices. Second, by reducing transactions costs, it reduces farmers' dependence on traders, and therefore improving farmers' bargaining positions (Upton and Fuller, 2004). This finding provides evidence that increased market access may help farmers help farmers better benefit from the increase in agricultural loans increase in agricultural loans in the months leading up to a state election. Additionally, we split the sample to explore the effects of this interaction separately by crop (paddy and wheat versus others) in Columns (2) and (3). However, we do not find a significant effect of this interaction term in either specifications.

Earlier, we showed that increased credit provision ahead of state elections increases farm gate prices. In Table 12, we investigate how interest rates may affect prices received by farmers. It may be possible that as public banks increase their credit supply to farmers ahead of state elections, other credit sources may try to compete with public banks by offering loans with lower interest rates.[15] Thus, lower interest rates may affect

[15]We think this is a reasonable justification to use average interest rates because most loans taken up by farmers in our sample are from non-institutional financial sources.

farmers who not only take out loans from public banks, but by improving their outside options and increasing their bargaining power. For this regression specification, we take the average of the interest rates across all types of loans taken up farmers in the same village in a particular cultivation season. In Columns (1) and (2) of Table 12, we find that a 1% reduction in interest rates ahead of elections lead to 0.048% and 0.05% increases in crop prices received by farmers at the time of sale. These results show us that higher crop prices received by farmers ahead of elections not only operate through increased credit provision by public banks, but also lower interest rates offered.

4.2 Robustness Checks

4.2.1 Other Types of Loans

If our hypothesis is accurate that the effect of elections largely occurs through the increase in provision of agricultural loans by public banks, we would expect to observe the largest effect of elections through credit from public sources, and not though other sources of credit. To verify our hypothesis, we test if state elections affect a change in the amount of agricultural loans taken up by farmers in our sample from sources other than public banks: private banks, non-institutional sources, and agriculture-related non-institutional sources.

The results in Table 13 illustrate that there is no significant effect of state elections on agricultural loans from sources other than public banks. Thus, we verify that the relationship between increased credit uptake among farmers ahead of state elections and higher prices received for their crops are not driven by loans from other sources than mainly from public banks.

4.2.2 Minimum Support Prices (MSP)

Second, one might be concerned that state elections might be associated with other government programs or policies related to agriculture. The first concern is that, during election years, the local government might implement policies that would affect local

prices of agricultural commodities in each state. Such policy is likely to influence the reference market prices, and the prices received by farmers.

We check if there is any significant increase in the MSP levels or the minimum prices of crops delivered to the nearby mandis around each village in the months leading up to state elections. We do not find any significant increase in the MSP levels or the minimum prices of crops at the *mandis*. Additionally, since MSP are common for all markets in India, it is unlikely that state-level electoral cycles may associate with any price differentials received by farmers in the months leading up to state elections. We report the list of MSP prices for all crops in Table 14.

4.2.3 Government-sponsored Agricultural Assistance Programs

One might be worried that state elections may generate increases in funding for other government-sponsored agricultural assistance programs. Crop insurance and input subsidy programs offered by public sources may help reduce farmers' cultivation costs, and thus reduce the amount they need to borrow at the beginning of the cropping season. Farmers in India spend the majority of their agricultural credit to purchase inputs or to borrow against crop losses, such as those caused by weather, and thus input prices and crop insurance may substantially affect demand for credit. To test for this concern, we drop farmers who receive at least some form of crop insurance or input subsidy from our sample, and run our main specification again.[16]

Our results indicate that receiving credit from public banks ahead of state elections still result in farmers receiving higher crop prices, even among those farmers who do not receive crop insurance or input subsidy programs (Table 15, Columns (1) and (2)). Therefore, we may rule out the possibility that our results are largely driven by government-sponsored crop insurance or input subsidy programs.

[16]Since we only do not have information about crop insurance and input subsidy for households in three states: Bihar, Jharkhand and Orissa. We also drop households in these three states from this robustness check.

4.2.4 Household Heterogeneity

It is likely that very poor farmers without sufficient landholding or assets to use as collateral for credit may not be able to obtain credit when they need to. On the other hand, relatively wealthy farmers may not require increased access to credit in order to receive better prices for their crops due to their greater outside options. To deal with this concern, we drop landless farmers (who may have very limited other forms of assets to use as collaterals) and farmers whose landholding belong to the top decile within each village, and run our main specification in Table 7.

In Table 16, we present results when we drop landless farmers (Column (1)), we drop the largest 10% of land owners (Column (2)), and both groups of farmers (Column (3)) from our analysis. After controlling for a number of factors, we still find positive and significant effects of credit from public banks on prices received by farmers for their crops. We find that the largest effects of credit on prices when we drop the landless farmers from our specification, and that magnitude of the effect of credit become smaller when we exclude the largest 10% of land owners in each village from our specifications. These two findings suggest that the landless farmers and the largest land owners in our sample drive the effects of credit on prices farmers receive at farm gate to a certain extent.

To provide a qualification that elections should not affect credit for landless farmers, who do not usually have access to formal credit due to the lack of collaterals, we test for the effect of credit on prices only among landless farmers in our sample. In another unreported specification, we test for the effects of agricultural loans from public banks on farm gate prices just among landless farmers, but we do not find significant effect of credit (Column (4)). We also run another specification to test for the direct effects of elections on prices among the landless farmers, and we observe no significant effect of elections on prices received by farmers (Column (5)). These two results indicate that the landless farmers do not drive our results.

5 Conclusions

In this study, we provide empirical evidence that increased agricultural credit provision by public banks, and greater access to nearby, open agricultural markets may help farmers improve farm gate prices for their crops. To account for the potential endogeneity of credit provision, we exploit the plausibly exogenous variation in state-level elections which take place at different times across states in India. We find that the credit shock from public banks and lower interest rates for agricultural loans ahead of state-level elections increase farm gate prices at the time of sale. We find that the effects of credit are only specific to crops other than paddy and wheat, whose trade is under heavy government control throughout the year. We note that the effects of increased credit are most significant among small farmers, who often have few options of obtaining credit from financial institutions. We also show that factors including government assistance programs related to agriculture and agricultural credit from sources other than public banks do not drive our findings.

Our results are important for policies related to financial systems and market infrastructures in rural areas of developing countries. We argue that while expanding credit provision to small-scale farmers may be beneficial for farmers in terms of both agricultural production and marketing purposes, it is not sufficient for farmers to improve their farm revenue, and thus household welfare. The absence of sufficient access to nearby, open agricultural markets may open up opportunities for agricultural traders to take advantage of the limited bargaining powers farmers have to extract profits away from them. The expansion of functioning agricultural market infrastructures in the rural areas of India may be necessary to help farmers improve their bargaining power against agricultural traders, guarantee more stable crop prices, and subsequently improve their farm revenues.

We note at least three limitations in our study. First, our data run from July 2009 to June 2014, covering only twelve state-level elections. We recognize that the relatively short time span of our data may not be sufficient to fully capture the relationship

between state-level election cycles and credit provision in India. However, this limitation may be accounted for to a certain extent since the election schedule of each state does not occur simultaneously. Second, state elections may also affect other aspects of agricultural marketing. Therefore, the concern is that receiving agricultural assistance programs from the government may reduce the need to acquire loans for agricultural production, which may help farmers improve their bargaining power against traders through other channels than agricultural credit from public banks. In our data, we observe whether households receive subsidized input and crop insurance programs from the government. We test whether state elections affect public agricultural assistance programs which may help farmers improve their crop prices. However, other types of agricultural assistance programs may associate with higher crop prices, but are not documented in our dataset. Third, a considerable amount of the variation in prices farmers received for their crops may be attributed to differential quality. We reconcile this concern by arguing that the AgMarkNet offers different levels of prices for each crop based on observed quality. It provides a guideline for traders operating in the regulated markets to follow in order to assign prices to crops delivered to the markets. Therefore, in this study, we assume that differential quality of crops should already be manifested in differential prices received by farmers. However, there could still be other quality-related issues that may associate with differential prices farmers received, which is a limitation in our study.

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Figure 1: Location of the villages in our sample

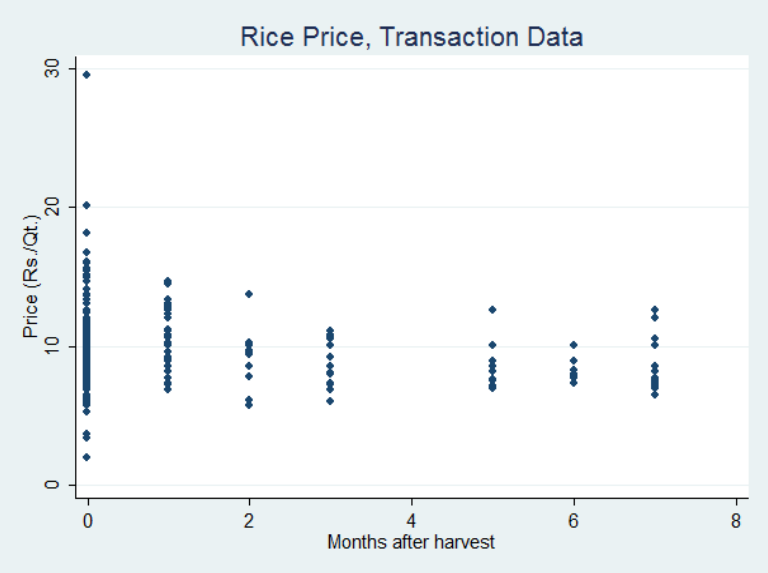

Figure 2: Paddy price variation over time

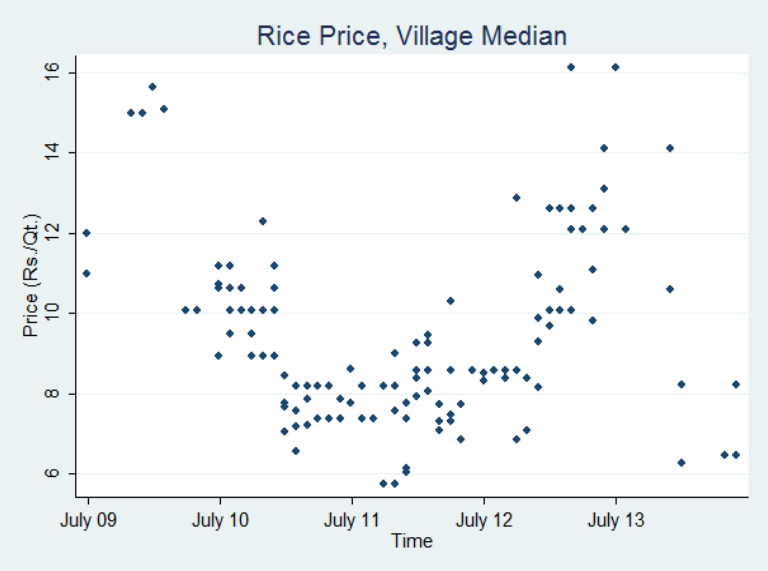

Figure 3: Paddy price variation over space

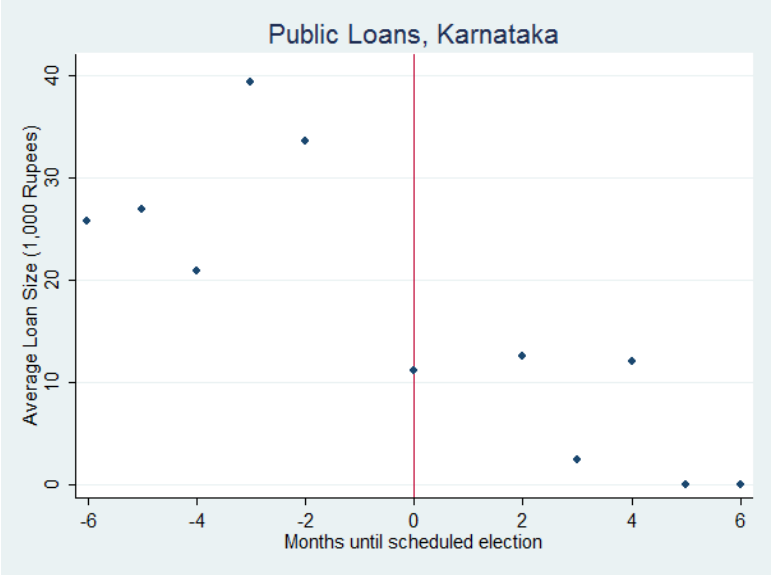

Figure 4: Average public loan size by month, Karnataka

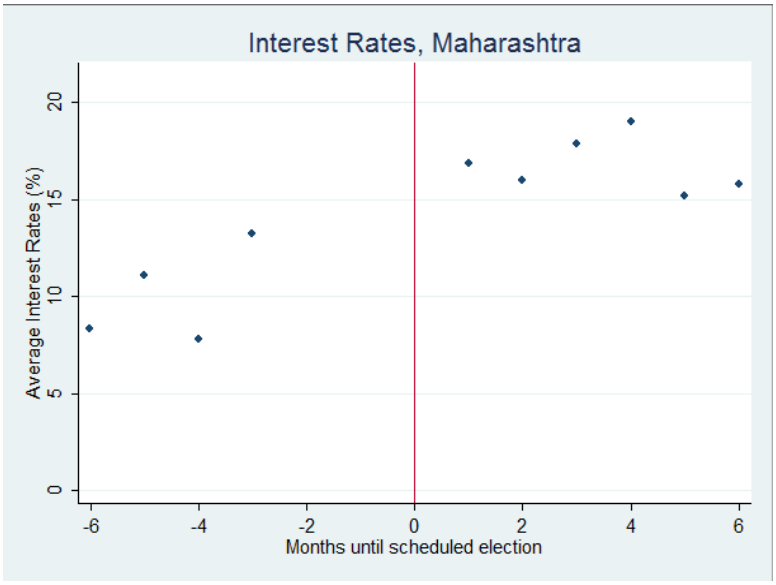

Figure 5: Average interest rates for all loans by month, Maharashtra

Table 1: Household and Demographic Characteristics by Farmer Category

	(1) Landless		(2) Small		(3) Medium		(4) Large	
Variable	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
A. Demographic information								
Age of head	45.95	12.58	49.64	12.15	49.80	12.27	53.59	13.34
Gender of head (=1 if male)	0.88	0.32	0.91	0.29	0.95	0.21	0.97	1.17
Number of male adults	1.95	1.09	2.39	1.33	2.39	1.33	2.72	1.77
Number of female adults	1.92	1.01	2.10	1.64	2.10	1.16	2.43	1.45
Number of children	1.09	1.14	1.14	1.22	1.14	1.22	1.01	1.25
Household size	4.98	2.23	5.64	2.65	5.64	2.65	6.18	3.28
B. Asset information								
Landholding (acre)	0.55	1.69	2.12	1.71	3.88	3.50	8.54	9.17
Non-land asset (index)	-0.30	0.82	0.02	0.81	0.10	0.92	0.45	0.95
Livestock asset (index)	-0.42	0.71	-0.12	0.81	0.16	1.04	0.51	1.20
C. Storage facilities								
Storage (=1 if yes)	0.03	0.17	0.04	0.20	0.06	0.23	0.08	0.27
Facility value (1,000 Rs.)	0.67	1.07	9.58	18.02	28.08	90.72	69.24	166.61
Observations	312		403		332		301	

Note 1: We follow the farmer classification system employed by ICRISAT and define as follows: landless farms: 0.00-0.20 hectares; small farms: 0.21-2.50 hectares; medium farms: 2.51-5.25 hectares; large farms: $>$ 5.25 hectares.
Note 2: We calculate asset indices for non-land assets and livestock assets using the principle component analysis method.
Note 3: Landholding includes both owned and leased-out land areas.
Note 4: Non-land asset includes the following asset categories: house ownership, courtyard, bathroom, cable TV, cooking gas, electricity, tap water, toilet, strong walls.
Note 5: Livestock asset includes the following asset categories: cattle, goat, horse, milk (cow and she buffalo), pig, poultry (including duck and pigeon), sheep, young stock.
Note 6: The survey specifically asked farmers about proper storage structures available on-farm and their values if they were to sell them.

Table 2: Village Characteristics

	All Villages	
Variable	Mean	S.D.
Village characteristics		
Population (headcount)	2,367.20	1,620.89
Distance to nearest town (km.)	12.18	7.62
Number of mandis (within 50 km. boundary)	1.73	1.31
Observations	30	

Note 1: Village population information comes from the Census of India 2011, http://www.censusindia.gov.in (Accessed May 3, 2015)
Note 2: Distance to the nearest town information comes from ICRISAT's VDSA dataset.
Note 3: The information about the mandi locations comes from AgMarkNet, http://agmarknet.nic.in/ (Accessed May 3, 2015).

Table 3: Crop Price and Number of Sale Information

	(1) Landless		(2) Small		(3) Medium		(4) Large	
Variable	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
A. Sold prices (100 Rs./Qt.)								
Black Gram	34.13	1.25	43.65	8.56	36.88	2.94	39.72	9.41
Chickpea	25.03	7.53	24.50	8.49	24.03	7.12	24.34	7.73
Finger Millet	16.89	0.50	12.87	4.55	15.45	4.21	15.38	6.77
Groundnut	32.16	15.33	31.37	10.35	30.97	10.10	30.20	9.22
Maize	8.73	2.52	8.98	2.74	8.91	2.10	9.30	1.73
Paddy	9.14	2.05	9.64	2.22	9.48	2.09	9.67	2.68
Pigeonpea	32.58	8.90	33.51	8.93	33.65	8.25	35.17	8.76
Sorghum	19.46	3.97	19.63	6.35	14.40	6.70	19.41	5.47
Soybean	21.69	5.43	21.97	5.09	22.23	5.33	21.95	5.47
Wheat	9.39	2.19	11.22	3.01	11.43	2.67	11.36	2.58
B. Number of sales (by season)								
Black Gram	1.00	0.00	1.17	0.41	1.17	0.41	1.11	0.33
Chickpea	1.22	0.44	1.26	0.55	1.31	0.60	1.60	0.91
Finger Millet	1.00	0.00	1.00	0.00	1.13	0.35	1.00	0.00
Groundnut	1.33	7.80	1.21	0.42	1.41	0.67	1.41	0.74
Maize	1.38	0.62	1.17	0.44	1.23	0.51	1.30	0.59
Paddy	1.45	0.92	1.69	1.21	1.49	0.90	1.48	0.75
Pigeonpea	1.04	0.21	1.09	0.29	1.10	0.33	1.23	0.54
Sorghum	1.00	0.00	1.21	0.54	2.85	2.54	1.90	1.15
Soybean	1.32	0.62	1.24	0.51	1.49	0.76	1.81	0.98
Wheat	1.61	1.34	1.32	0.73	1.65	1.01	1.68	1.01
Observations	222		1,161		1,369		2,093	

Note 1: We follow the farmer classification system employed by ICRISAT and define as follows: landless farms: 0.00-0.20 hectares; small farms: 0.21-2.50 hectares; medium farms: 2.51-5.25 hectares; large farms: > 5.25 hectares.
Note 2: 1 quintal (Qt.) = 100 kilograms (Kg.)
Note 3: Transaction-level price data come from farmers' individual recorded responses.
Note 4: Prices are adjusted for inflation using 2009 constant consumer prices.

Table 4: Agricultural Credit Information by Farmer Category

	(1) Full Sample			(2) Small Farmers			(3) Medium Farmers			(4) Large Farmers		
Variable	Elect.	No	Diff.	Elect.	No	Diff.	Elect.	No	Diff.	Elect.	No	Diff.
A. Total credit												
Loan amount (1,000 Rs.)	42.64	31.90	0.03***	13.50	15.05	0.61	23.20	21.64	0.75	84.33	49.02	0.00***
Interest rate (%)	10.30	15.69	0.00***	11.51	14.53	0.23	11.48	17.34	0.10*	8.38	14.41	0.00***
B. From public inst.												
Loan amount (1,000 Rs.)	34.22	20.46	0.00***	7.12	7.16	0.98	14.85	12.60	0.60	73.79	33.78	0.00***
Interest rate (%)	2.79	2.76	0.94	2.33	2.09	0.65	3.41	3.05	0.72	2.96	3.13	0.77
C. From non-public inst.												
Loan amount (1,000 Rs.)	-	0.30	0.56	-	0.24	0.56	-	0.11	0.47	-	0.48	0.71
Interest rate (%)	-	0.36	0.11	-	0.38	0.37	-	0.48	0.34	-	0.14	0.52
D. From agri. non-inst.												
Loan amount (1,000 Rs.)	7.89	9.93	0.26	5.98	6.97	0.55	7.72	7.04	0.68	9.93	13.65	0.36
Interest rate (%)	9.53	14.25	0.01***	10.54	14.16	0.19	10.85	16.17	0.18	7.44	12.32	0.04***
E. From other non-inst.												
Loan amount (1,000 Rs.)	0.52	1.20	0.17	0.93	0.68	0.48	0.62	1.89	0.39	0.61	1.12	0.04***
Interest rate (%)	0.06	1.34	0.02***	0.00	0.69	0.30	0.23	1.53	0.23	0.00	1.62	0.08**
Observations	197			1,125			1,195			1,257		

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note 1: We present the amount of loans (in actual levels) received by farmers near state-elections (up to six months) prior versus not. The difference columns represent the p-values of the t-tests comparing the sample means of two samples. In this table, we compare the sample means of the loans received near (up to six months prior) and those received not near state-elections. In our analysis, we convert the credit amount into the logarithmic scale.

Note 2: We follow the farmer classification system employed by ICRISAT and define as follows: landless farms: 0.00-0.20 hectares; small farms: 0.21-2.50 hectares; medium farms: 2.51-5.25 hectares; large farms: $>$ 5.25 hectares.

Note 3: Agricultural credit information comes from a summary of transaction-level data reported by farmers in our sample. Each loan transaction is reported by amount and its interest rate.

Note 4: Public institutions includes government-regulated commercial banks. Private financial institutions include privately-owned commercial banks, chit funds and microfinance agencies.

Note 5: Non-institution financial agencies include money lenders, friends/relatives, outsiders, input dealers, Self Help Groups (SHG) and commission agent/middlemen.

Note 6: The amount of credit is adjusted for inflation using 2009 prices. Agricultural non-institution financial sources include any source from non-institutions explicitly labeled to be related to agriculture including input dealers, middlemen or commission agents.

Table 5: Market Access Measures

	(1) Weeks Opened		(2) Quantity		(3) Max. Prices		(4) Modal Prices		(5) Min. Prices	
Variable	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
A. Months after harvest										
At harvest	2.75	0.99	0.83	1.45	22.52	10.94	20.32	10.18	17.72	9.41
1 month after	2.93	0.80	0.53	0.67	22.70	8.28	20.49	7.21	18.04	6.00
2 months after	3.44	0.79	0.14	0.11	24.93	10.31	22.57	9.50	20.22	8.84
3 months after	2.00	1.12	0.33	0.46	16.52	8.54	15.72	8.16	14.81	7.62
4 months after	2.49	1.18	0.98	0.93	20.46	9.09	19.33	8.33	17.38	8.32
5 months after	2.18	0.87	0.23	0.13	24.60	8.78	23.51	8.46	21.76	7.88
B. Crop										
Black Gram	-	-	-	-	-	-	-	-	-	-
Chickpea	-	-	-	-	-	-	-	-	-	-
Finger Millet	-	-	-	-	-	-	-	-	-	-
Groundnut	2.87	0.87	0.56	1.83	33.26	9.65	29.81	9.02	25.79	8.05
Maize	-	-	-	-	-	-	-	-	-	-
Paddy	3.26	0.92	0.11	0.25	10.99	3.57	10.57	3.36	10.06	2.96
Pigeonpea	2.21	1.22	0.38	0.31	34.46	6.29	32.63	6.09	29.91	5.64
Sorghum	2.84	0.77	0.01	0.01	21.01	3.78	19.60	3.88	17.70	4.27
Soybean	2.29	0.95	0.74	0.63	24.02	7.01	23.23	6.65	21.84	6.74
Wheat	2.61	1.11	1.16	1.39	15.65	5.37	13.15	3.73	10.47	2.55
Observations	4,847									

Note 1: Our market access measures include: the number of weeks the markets are opened in a month, the total amount of arrivals (tonnes), maximum, modal and minimum prices reported at the nearby mandis.

Note 2: Prices (in actual levels) are adjusted for inflation using 2009 constant consumer prices and are reported in 100 Rs./Qt. However, in our analysis, we convert prices into the logarithmic scale.

Table 6: Direct Effects of Elections on Price

	(1) Full Sample	(2) Full Sample
Variable	Price	Price
A. Direct effect of elections on prices		
Election	0.165***	0.094***
	(0.016)	(0.015)
B. Direct effect of elections on prices		
Election	0.170***	0.092***
	(0.016)	(0.015)
No. of weeks nearby markets open per month	0.012***	-0.003
	(0.003)	(0.003)
HH Controls	Yes	Yes
Village FE	Yes	Yes
Crop FE	Yes	Yes
Year FE	No	Yes
Farmer category FE	Yes	Yes
Months after harvest	Yes	Yes
Observations	4,845	4,845

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note 1: This table reports the direct effects of state-level elections on crop prices received by farmers. All specifications are estimated with household control variables: land ownership, livestock index and asset index. Credit and price variables are in the logarithmic scale.

Note 2: The election variable serves as a 'treatment' variable in our study. It is an indicator variable if a transaction takes place up to at least six months prior to a state election.

Note 3: The number of weeks markets opened captures the total number of weeks markets within a 50 kilometer of a village report price and quantities, pooling all markets together.

Note 4: Year FE represents a cropping calendar year. We also try replacing year FE with calendar year FE and find similar estimates.

Note 5: The months after harvest variable captures the linear trend by month after harvest following crop-specific cultivation pattern.

Table 7: Effects of Agricultural Credit from Public Banks on Price

	(1) Full Sample	(2) Full Sample
Variable	Price	Price
A. Effects of credit on prices		
Public loan size	1.120*	1.052
	(0.591)	(0.926)
B. Effects of credit on prices		
Public loan size	1.229*	0.925
	(0.684)	(0.729)
No. of weeks nearby markets opened	0.040**	-0.020
	(0.021)	(0.018)
HH Controls	Yes	Yes
Village FE	Yes	Yes
Crop FE	Yes	Yes
Year FE	No	Yes
Farmer category FE	Yes	Yes
Months after harvest	Yes	Yes
Observations	4,845	4,845

Robust standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Note 1: This table reports the effects of agricultural credit from public banks on crop prices received. We instrument for the amount of credit from public banks provided with the 'treatment' state-elections. All specifications are estimated with household control variables: land ownership, livestock index and asset index. Credit and price variables are in the logarithmic scale.
Note 2: In Panel B, we add two additional variables. The number of weeks markets opened captures the total number of weeks agricultural markets within a 50 kilometer of a village report price and quantities, pooling all markets together.
Note 3: Year FE represents a cropping calendar year. We also try replacing year FE with calendar year FE and find similar estimates.
Note 4: The months after harvest variable captures the linear trend by month after harvest following crop-specific cultivation pattern.

Table 8: Effects of Agricultural Credit from Public Banks on Price

	(1) Full Sample	(2) Full Sample
Variable	Price - Median at harvest	Price - MSP
A. Effects of credit on prices		
Public loan size	0.235	0.217
	(0.170)	(0.170)
B. Effects of credit on prices		
Public loan size	0.120	0.111
	(0.091)	(0.094)
No. of weeks nearby markets opened	-0.006	-0.003
	(0.005)	(0.003)
HH Controls	Yes	Yes
Village FE	Yes	Yes
Crop FE	Yes	Yes
Year FE	No	Yes
Farmer category FE	Yes	Yes
Months after harvest	Yes	Yes
Observations	4,845	4,845

Robust standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Note 1: This table reports the effects of agricultural credit from public banks on crop prices received. We instrument for the amount of credit from public banks provided with the 'treatment' state-elections. All specifications are estimated with household control variables: land ownership, livestock index and asset index. Credit and price variables are in the logarithmic scale.
Note 2: In Panel B, we add two additional variables. The number of weeks markets opened captures the total number of weeks agricultural markets within a 50 kilometer of a village report price and quantities, pooling all markets together.
Note 3: Year FE represents a cropping calendar year. We also try replacing year FE with calendar year FE and find similar estimates.
Note 4: The months after harvest variable captures the linear trend by month after harvest following crop-specific cultivation pattern.

Table 9: Effects of Agricultural Credit from Public Banks on Price

	(1) Paddy & Wheat	(2) Other Crops
Variable	Price	Price
A. Effects of credit on prices		
Public loan size	-1.137	0.816***
	(3.007)	(0.300)
B. Effects of credit on prices		
Public loan size	-0.924	0.922**
	(2.056)	(0.355)
No. of weeks nearby markets opened	-0.025	0.061***
	(0.052)	(0.021)
HH Controls	Yes	Yes
Village FE	Yes	Yes
Crop FE	Yes	Yes
Farmer category FE	Yes	Yes
Months after harvest	Yes	Yes
Observations	2,091	2,755

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note 1: This table reports the direct effects of state-level elections on crop prices received by farmers. We instrument for the amount of credit from public banks provided with the 'treatment' state-elections. All specifications are estimated with household control variables: land ownership, livestock index and asset index. Credit and price variables are in the logarithmic scale.

Note 2: In Panel B, we add two additional control variables. The number of weeks markets opened captures the total number of weeks agricultural markets within a 50 kilometer of a village report price and quantities, pooling all markets together. The share of average delivery variable captures any agricultural production shock within each village. If this information is missing, we instead use the share of average delivery to the markets within the same state. For the rest of our paper, we refer to these two variables as market controls.

Table 10: Effects of Agricultural Credit from Public Banks on Price

	(1) Small Farmer	(2) Medium Farmer	(3) Large Farmer
Variable	Price	Price	Price
Effects of credit on prices			
Public loan size	0.144***	0.198***	0.204***
	(0.018)	(0.024)	(0.026)
Public loan size × Farm category	0.134***	-0.053**	-0.0626***
	(0.038)	(0.023)	(0.022)
HH Controls	Yes	Yes	Yes
Market Control	Yes	Yes	Yes
Production Shock Control	Yes	Yes	Yes
Village FE	Yes	Yes	Yes
Crop FE	Yes	Yes	Yes
Farmer category FE	Yes	Yes	Yes
Months after harvest	Yes	Yes	Yes
Observations	4,845	4,845	4,845

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note 1: This table reports the effects of agricultural credit from public banks on crop prices received by farmer category. We instrument for the amount of credit from public banks provided with the 'treatment' state-elections. All specifications are estimated with household control variables: land ownership, livestock index and asset index. Credit and price variables are in the logarithmic scale.

Note 2: We follow the farmer classification system employed by ICRISAT and define as follows: landless farms: 0.00-0.20 hectares; small farms: 0.21-2.50 hectares; medium farms: 2.51-5.25 hectares; large farms: $>$ 5.25 hectares.

Table 11: Effect of Agricultural Credit from Public Banks on Price

	(1) Full Sample	(2) Paddy & Wheat	(3) Other Crops
Variable	Price	Price	Price
Effect of credit on prices			
Public loan size	0.166***	0.375	0.111***
	(0.022)	(0.438)	(0.024)
No. of weeks nearby markets opened	0.009**	-0.001	0.028***
	(0.004)	(0.008)	(0.005)
Public loan size × No. of weeks nearby markets opened	0.015*	0.012	0.001
	(0.008)	(0.043)	(0.008)
HH Controls	Yes	Yes	Yes
Production Shock Control	Yes	Yes	Yes
Village FE	Yes	Yes	Yes
Crop FE	Yes	Yes	Yes
Farmer category FE	Yes	Yes	Yes
Months after harvest	Yes	Yes	Yes
Observations	4,845	2,091	2,755

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note 1: This table reports the effects of agricultural credit from public banks on crop prices received interacted with market access. We instrument for the amount of credit from public banks provided with the 'treatment' state-elections. All specifications are estimated with household control variables: land ownership, livestock index and asset index. Credit and price variables are in the logarithmic scale.

Note 2: The number of weeks markets opened captures the total number of weeks agricultural markets within a 50 kilometer of a village report price and quantities, pooling all markets together.

Table 12: Effect of Interest Rate on Price

	(1) Full Sample	(2) Full Sample
Variable	Price	Price
Effect of interest rate on prices		
Interest rates (%)	-0.048***	-0.050***
	(0.017)	(0.019)
Interest rates (%) × Months after harvest	-	0.003
	-	(0.003)
HH Controls	Yes	Yes
Market Controls	No	Yes
Production Shock Controls	No	Yes
Village FE	Yes	Yes
Crop FE	Yes	Yes
Farmer category FE	Yes	Yes
Months after harvest	Yes	Yes
Observations	4,845	4,845

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note 1: This table reports the effects of interest rates on crop prices received. We instrument for the interest rate shock with the 'treatment' state-elections.All specifications are estimated with household control variables: land ownership, livestock index and asset index. Credit and price variables are in the logarithmic scale.

Note 2: We take the average interest rate associated with all loans taken up by farmers within a village. We also limit our sample to only loans taken up by farmers from non-institutional financial sources and we still find similar results.

Table 13: Effect of Agricultural Credit from Other Sources on Price

	(1)	(2)	(3)
	Other Types of Credit		
Variable	Private Credit	Non-inst. Credit	Ag. Non-inst. Credit
Direct effect of elections on prices			
Election	-0.005	0.020	-0.102
	(0.005)	(0.040)	(0.107)
HH Controls	Yes	Yes	Yes
Market Controls	Yes	Yes	Yes
Production Shock Controls	Yes	Yes	Yes
Village FE	Yes	Yes	Yes
Crop FE	Yes	Yes	Yes
Farmer category FE	Yes	Yes	Yes
Months after harvest	Yes	Yes	Yes
Observations	1,718	1,718	1,718

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note 1: This table explores the effects of state-level elections on other other types of credit: credit from private banks, non-institutional sources and agricultural non-institutional sources. All specifications are estimated with household control variables: land ownership, livestock index and asset index. The amount of credit is adjusted for inflation using 2009 prices. All outcome variables are in the logarithmic scale.

Note 2: Public institutions includes government-regulated commercial banks. Private financial institutions include privately-owned commercial banks, chit funds and microfinance agencies.

Note 3: Non-institution financial agencies include money lenders, friends/relatives, outsiders, input dealers, Self Help Groups (SHG), commission agents, traders, and middlemen.

Note 4: Agricultural non-institution financial sources include any source from non-institutions explicitly labeled to be related to agriculture including input dealers, middlemen or commission agents.

Table 14: Minimum Support Prices (MSP)

Commodity	Variety	2009-10	2010-11	2011-12	2012-13	2013-14
Crop						
Black Gram		2,520	2,900	3,300	4,300	4,300
Chickpea		1,730	1,760	2,100	2,800	3,000
Finger Millet		915	965	1,050	1,500	1,500
Groundnut		2,100	2,100	2,300	2,700	3,700
Maize		840	880	890	1,175	1,250
Paddy	Common	950	1,000	1,080	1,250	1,310
	Grade A	980	1,030	1,110	1,280	1,345
Pigeonpea		2,300	3,000	3,200	3,850	4,300
Sorghum	Hybrid	840	880	890	1,500	1,530
	Maldandi	860	900	1,000	1,520	1,530
Soybean	Black	1,350	1,400	1,650	2,200	2,500
	Yellow	1,390	1,440	1,690	2,240	2,560
Wheat		1,100	1,120	1,285	1,350	1,400

Source: Ministry of Agriculture, Government of India, http://eands.dacnet.nic.in/MSP.htm (Accessed March 30, 2015)
Note 1: Prices reported are in Rupees per quintal.
Note 2: All prices reported are according to crop year.

Table 15: Robustness Checks: Agricultural Assistance Programs

	(1) Drop Insurance	(2) Drop Subsidy
Variable	Price	Price
Direct effect of elections on prices		
Election	0.594	0.476
	(0.432)	(0.490)
HH Controls	Yes	Yes
Village FE	Yes	Yes
Crop FE	Yes	Yes
Year FE	No	Yes
Farmer category FE	Yes	Yes
Months after harvest	Yes	Yes
Observations	3,901	3,901

Robust standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Note 1: This table reports the direct effect of elections on crop prices received for farmers who do not receive government-funded crop insurance or input subsidy.
Note 2: The dataset reports whether a farmer receives crop insurance or input subsidy from the government and its amount (in Rupees). We restrict our sample in both specifications among those who do not receive either (1) crop insurance or (2) input subsidy from the government.

Table 16: Robustness Checks: Household Heterogeneity

	(1) Drop Landless	(2) Drop Top 10% Land	(3) Drop Both (1) and (2)	(4) Only Landless	(5) Only Landless
Variable	Price	Price	Price	Price	Price
A. Effect of credit on prices					
Public loan size	1.112*	0.883**	0.870**	-2.277	-
	(0.610)	(0.365)	(0.372)	(3.684)	-
B. Direct effect of elections on prices					
Election	-	-	-	-	0.183
	-	-	-	-	(0.136)
HH Controls	Yes	Yes	Yes	Yes	Yes
Village FE	Yes	Yes	Yes	Yes	Yes
Crop FE	Yes	Yes	Yes	Yes	Yes
Farmer category FE	Yes	Yes	Yes	Yes	Yes
Months after harvest	Yes	Yes	Yes	Yes	Yes
Observations	3,901	3,901	4,623	4,228	4,006

Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note 1: Results in this table show the effects of state elections on other outcomes related to agricultural production and marketing: input subsidies and crop insurance, and other control variables as listed in the specifications in Table 7. All specifications are estimated with household control variables: land ownership, livestock index and asset index. All outcome variables are in the logarithmic scale.

Note 2: Panel A.

Note 3: Panel B. presents the same model specification as in Table 6 but we restrict our sample to exclude (3) non-landless farmers, (4) those within the top 10% in terms of landholding within a village and (5) both.