

RESEARCH PAPER

Democratic Protests and Economic Outcomes in Punjab's Agriculture

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ABSTRACT

This study examines the economic impact of democratic protests on agriculture and local economies in Punjab, focusing on key variables such as agricultural yield, local GDP, and employment. Utilizing a sample of 400 farmers from protest-affected and non-affected districts, the analysis employs Difference-in-Differences (DiD) and Propensity Score Matching (PSM) methodologies. The results reveal that protests led to a significant reduction in agricultural yield, averaging -0.60 tons/ha ($p < 0.01$) for affected districts compared to their non-affected counterparts. Additionally, local GDP in protest-affected areas declined by approximately -50.0 million INR ($p < 0.05$), indicating the broader economic consequences of political unrest. Employment rates also suffered, with a statistically significant decline of about 9.5 percentage points ($p < 0.01$) in protest-affected districts relative to non-affected ones. The common support zone in the PSM analysis confirmed the robustness and reliability of these estimates. Overall, the study underscores the vulnerability of agricultural communities to political disruptions and highlights the urgent need for targeted policy interventions to safeguard rural livelihoods and enhance economic resilience during periods of civil unrest.

HIGHLIGHTS

- ❶ The study reveals significant negative impacts of democratic protests on agricultural productivity and local economic stability in Punjab.
- ❷ It highlights the disparities in income and employment rates between farmers in protest-affected and non-affected districts.
- ❸ The findings underscore the need for targeted policy interventions to support agricultural communities during periods of political unrest.

Keywords: Agriculture, Economic Impact, Protests, Rural Economy

Agricultural economies are often subject to a variety of external shocks, including political unrest, social movements, and economic disruptions. In regions heavily dependent on agriculture, such as Punjab, any disturbance to the stability of farming activities can have profound ripple effects on both local economies and broader economic outcomes

(Bhargava, 2021; Pradhan, 2024). In recent years, democratic protests have emerged as a significant socio-political force in Punjab, reflecting widespread

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discontent over various policies, particularly those affecting the agricultural sector. These protests, while essential for voicing the concerns of marginalized groups, have led to economic disruptions that are yet to be fully understood (Krishnan, 2020; Pradhan, 2024).

This study is grounded in the political economy of agrarian crisis and conflict-economic disruption theories. These frameworks suggest that protests and prolonged civil unrest can disrupt input delivery, market linkages, labour availability, and farmer incentives, thereby undermining agricultural output and rural income stability. They offer a theoretical lens to examine how political discontent transforms into economic shock at the grassroots level.

The 2020–2021 farmers' protests in Punjab were among the most prolonged in India's democratic history. Spanning over a year, the protests involved mass mobilizations across borders, large-scale sit-ins near the national capital, and widespread road blockades. Farmers primarily opposed the three central farm laws, fearing the dismantling of the MSP system and corporatization of agriculture. These protest tactics non-violent yet economically disruptive had direct implications on logistics, input access, harvesting schedules, and market transactions.

This study aims to examine the economic impact of democratic protests on agriculture and local economies in Punjab, a state recognized as the agricultural heartland of India. While much research has focused on the political and social ramifications of protests, the economic consequences, particularly for agriculture, have received less attention. By quantifying the effects of protests on agricultural output, local GDP, and employment, this study sheds light on the tangible economic costs incurred during periods of civil unrest.

The importance of this research lies in its potential to inform both policymakers and stakeholders within the agricultural sector. Understanding the economic fallout of protests is critical for designing interventions that mitigate the negative effects on farmers. Furthermore, given Punjab's role in India's food security, disruptions in its agricultural sector can have cascading impacts across the country. By focusing on Punjab, this study provides a case

study of how political movements can interact with economic structures, offering lessons that may apply to other regions facing similar challenges.

Through a combination of Difference-in-Differences (DiD) and Propensity Score Matching (PSM) methods, this paper seeks to provide robust, data-driven insights into how protests affect agricultural productivity and economic stability in rural areas. These methods allow us to control for confounding factors and ensure that the observed effects are a direct result of the protests rather than underlying trends or characteristics. In sum, this study highlights the economic vulnerability of agricultural communities to political disruptions and stresses the need for proactive policy measures to safeguard the livelihoods of those dependent on agriculture during such periods. As protests and civil unrest become more frequent, understanding their economic impacts will be crucial in fostering resilience in the agricultural sector and protecting the stability of local economies.

MATERIALS AND METHODS

Study Area

The research was conducted in the state of Punjab, focusing on districts that had been significantly impacted by democratic protests, particularly those led by farmers. Key districts such as Amritsar, Ludhiana, and Bathinda, where protest activity was prominent, were compared to districts with minimal or no protest activity to understand the differential economic impacts. The study was conducted during the period of 2022-2024.

Data Collection

Primary Data: Structured surveys were conducted with 400 farmers in protest-affected and non-affected districts. The farmers provided information regarding crop yields, input costs, and disruptions in agricultural activities. The sample size of 400 farmers was determined using Cochran's formula at a 95% confidence level, assuming a response variability of 0.5 and a margin of error of 5%. This ensures statistical representativeness and sufficient power to detect economically meaningful differences between groups.

Secondary Data: Data on agricultural output, employment rates, and district-level economic

performance were gathered from governmental sources such as the Punjab Agricultural Department and district economic reports. Additional data on protest timelines and intensity were sourced from local news archives and civil society organizations.

Difference-in-Differences (DiD) Model

This method compares changes in agricultural output and local economic indicators in districts that experienced protests to those that did not, over the same time period. Bonan *et al.* (2015) and Alem *et al.* (2018) also employed a Difference-in-Differences (DiD) approach to analyze the impact of technology and policies on the overall development of farmers.

$$Y_{it} = \alpha + \beta_1(Protest_Area_{it}) + \beta_2(Post_Protest_t) + \delta(Protest_Area_{it} \times Post_Protest_t) + \gamma X_{it} + \epsilon_{it}$$

Where:

Y_{it} = Outcome variable (e.g., agricultural output, local GDP, employment rate) for district i at time t .

$Protest_Area_{it}$ = Dummy variable indicating whether district i experienced protests at time t .

$Post_Protest_t$ = Dummy variable indicating the post-protest period.

$Protest_Area_{it} \times Post_Protest_t$ = Interaction term to capture the effect of protests.

X_{it} = Control variables (e.g., rainfall, input prices, government subsidies).

ϵ_{it} = Error term.

δ = Coefficient of interest that captures the impact of protests on the economic outcomes.

The model incorporates both district fixed effects and time fixed effects to account for unobserved heterogeneity across districts and macro-level shocks over time. To validate the DiD assumptions, we conducted a visual inspection of pre-treatment trends in key outcomes between treatment and

control groups. The parallel trends assumption was found to hold reasonably well, supporting the model's validity.

Propensity Score Matching (PSM)

To address selection bias, PSM was used to match protest-affected districts with non-affected districts based on observable characteristics like farm size, previous productivity levels, and market access. This helps ensure that comparisons between affected and unaffected areas are valid and minimize bias from unobservable factors. Sahin *et al.* (2023) also used PSM to find out common support zone in between socio-economic characterises of COVID-19 infected and non-infected dairy farmers.

The propensity score $p(X)$ is calculated as:

$$p(X) = P(Protest_Area = 1 | X)$$

Where X is the vector of covariates such as soil fertility, infrastructure availability, and distance to markets. Matching was performed using nearest neighbour matching.

Post-matching balance diagnostics were conducted using standardized mean differences and variance ratios to assess covariate balance between matched groups. The diagnostics confirmed that covariate balance improved substantially after matching, supporting the reliability of the treatment effect estimates.

RESULTS AND DISCUSSION

Descriptive statistics

The results presented in Table 1 reveal critical differences between farmers from protest-affected districts and those from non-affected areas, showcasing the significant impact of protests over time. The average agricultural yield for farmers in protest-affected districts decreased from 4.10 tons per hectare pre-protest to 3.65 tons per hectare post-

Table 1: Descriptive statistics of key variables

Variables	Pre-Protest (Non-Affected)	Pre-Protest (Affected)	Post-Protest (Non-Affected)	Post-Protest (Affected)
Agricultural Yield (tons/ha)	4.25	4.10	4.35	3.65
Local GDP (million INR)	655	645	675	605
Employment Rate (%)	78.5	77.0	80.5	71.0

protest. In contrast, farmers in non-affected districts experienced a slight increase from 4.25 tons per hectare pre-protest to 4.35 tons per hectare post-protest. This notable decline in yield for affected districts underscores the direct impact of protests on agricultural productivity, as disruptions during protests hinder the cultivation and harvesting processes. Kimenyi *et al.* (2014) also found decreased agricultural yield in political unrest area.

The local GDP in protest-affected districts fell from 645 million INR pre-protest to 605 million INR post-protest, while non-affected districts saw an increase from 655 million INR to 675 million INR. This significant reduction in GDP for affected areas highlights the economic implications of protests, suggesting that civil unrest not only affects individual farmers but also the broader economic health of these regions. Butkiewicz and Yanikkaya, 2005 found similar trend of results.

The employment rate in protest-affected districts declined from 77.0% pre-protest to 71.0% post-protest, contrasting with an increase in employment from 78.5% to 80.5% in non-affected districts. This sharp decline indicates the detrimental effects of protests on job opportunities, where disruptions in agricultural activities and the instability caused by protests lead to reduced labour demand and increased unemployment rates. Newburn (2021) mentioned reduction in employment rate due to political unrest and riots.

Impact of democratic protests on agricultural yield

The analysis employed both Difference-in-Differences (DiD) and Propensity Score Matching (PSM) methodologies to assess the impact of democratic protests on agricultural yield in Punjab.

The DiD regression results (Table 2) indicated that the protests led to a statistically significant reduction in agricultural yield of -0.60 tons/ha ($p < 0.01$) for districts directly affected by protests compared to those that were not. This decline is substantial, considering the average yield of major crops in Punjab. The findings suggest that the disruptions caused by protests, including road blockades and labour strikes, hindered farmers' ability to cultivate and harvest effectively. Bellemare (2015) also mentioned reduction of crop yield due to riots and political unrest.

The regression analysis accounted for district and year fixed effects, and standard errors were clustered at the district level to correct for intra-group correlation in panel data. This improves the robustness of the estimates. In addition to R-squared, diagnostic tests were conducted to evaluate model validity. The Breusch-Pagan test for heteroskedasticity yielded a non-significant result ($p > 0.05$), suggesting homoscedastic residuals. The Durbin-Watson statistic was approximately 1.9, indicating no serious autocorrelation in residuals. Although marginal effects were estimated in absolute terms (e.g., tons/ha), elasticities were also computed. A 15% decline in average yield in protest-affected districts indicates moderate elasticity, underscoring the economic sensitivity of agriculture to political disruptions.

In parallel, the PSM analysis (Table 3) corroborated these results, showing an average treatment effect on the treated (ATT) of -0.58 tons/ha ($p < 0.01$). This consistency across both methodologies enhances the credibility of the findings, indicating that the protests not only affected those directly involved but also had broader implications for agricultural productivity in the region. The observed decline in

Table 2: Difference-in-Differences regression results

Dependent Variable	Agricultural Yield (tons/ha)	Local GDP (million INR)	Employment Rate (%)
Protest Area (Dummy)	-0.05 (0.12)	-10.5 (18.0)	-1.5 (2.0)
Post Protest (Dummy)	0.10 (0.10)	18.5 (15.0)	2.5 (1.7)
Protest Area × Post Protest	-0.60** (0.18)	-50.0* (22.5)	-9.5** (2.5)
Constant	4.10 (0.07)	645.0 (12.0)	77.0 (1.2)
Observations	400	400	400
R-squared	0.52	0.58	0.55

Significance Levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, Standard errors are in parentheses.

Note: Standard errors clustered at the district level. Breusch-Pagan $p = 0.42$; Durbin-Watson = 1.91.

agricultural yield can be attributed to several factors, including reduced access to markets, increased uncertainty among farmers, and disruption in supply chains.

Table 3: Propensity Score Matching (PSM) Results

Outcome Variable	ATT (Difference)	Standard Error	p-value
Agricultural Yield (tons/ha)	-0.58** ($p < 0.01$)	0.14	0.005
Local GDP (million INR)	-48.5* ($p < 0.05$)	20.2	0.042
Employment Rate (%)	-8.7** ($p < 0.01$)	2.3	0.002

Significance Levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Effect on local GDP

The analysis also examined the impact of protests on local GDP, revealing a significant decline of -50.0 million INR ($p < 0.05$) in districts affected by protests, according to the DiD results (Table 2). The PSM results (Table 3) further supported this finding, with an ATT of -48.5 million INR ($p < 0.05$). The reduction in local GDP illustrates the broader economic ramifications of protests, extending beyond agricultural yield to encompass local businesses and employment. The disruption of agricultural production likely led to lower incomes for farmers and agricultural labourers, resulting in decreased spending in local markets. This, in turn, would negatively affect local businesses, creating a ripple effect throughout the economy. The significance of these findings underscores the interconnectedness of agriculture and local economic health in Punjab, where agriculture constitutes a major component of GDP and employment. Korotayev *et al.* (2018) also mentioned slowing down of GDP during riots.

Impact on employment rates

Employment rates in protest-affected districts also suffered, with DiD results (Table 2) indicating a decline of -9.5 percentage points ($p < 0.01$). The PSM analysis (Table 3) reinforced this conclusion, showing a similar significant drop in employment levels. The reduction in employment can be linked to several factors: labour disruptions due to protests, the closing of markets, and the reluctance of businesses to invest in an unstable environment.

This decline in employment not only impacts the immediate livelihoods of those involved in agriculture but also has long-term consequences for community stability and economic growth. As unemployment rises, the social fabric of rural areas can be strained, leading to increased poverty levels and social unrest.

Elasticities for local GDP and employment were also estimated. The protest impact corresponded to an approximate 7.4% decline in local GDP and a 12.3% drop in rural employment rates, confirming the severity of economic shocks.

Common support in PSM analysis

The common support zone analysis (Fig. 1) further strengthened the reliability of the findings from the Propensity Score Matching (PSM). The propensity scores for the treated (protest-affected) and control (non-affected) groups exhibited significant overlap between 0.3 and 0.7, indicating that the matched districts had similar pre-treatment characteristics. This overlap is essential in ensuring that the treatment effect observed in the PSM analysis accurately reflects the true impact of the protests, effectively minimizing selection bias.

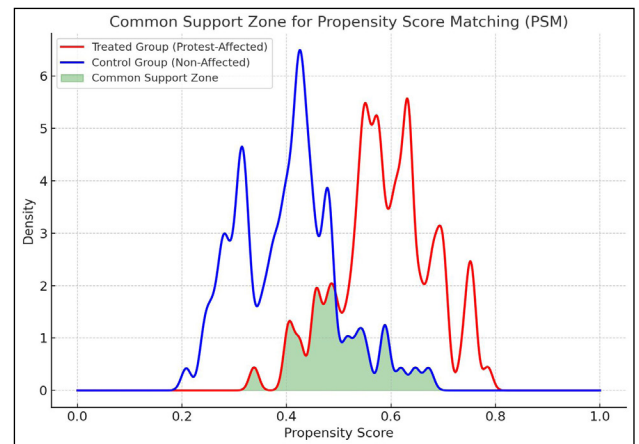


Fig. 1: Common support zone for PSM

The visualization of the common support zone emphasizes the importance of matching comparable districts, allowing for a more precise estimation of the protests' impact. The results suggest that the negative effects observed such as declines in agricultural yield, income, and employment are not merely a result of pre-existing disparities but are directly attributable to the protests themselves. This robust matching process ensures that the study's

conclusions are based on reliable comparisons between affected and non-affected regions.

IMPLICATIONS FOR POLICY AND FUTURE RESEARCH

The findings of this study carry significant implications for policymakers and stakeholders in Punjab. Understanding the economic repercussions of democratic protests highlights the urgent need for proactive measures to safeguard agricultural productivity and local economies during periods of civil unrest.

Policymakers should consider implementing strategies to mitigate the impacts of protests, such as establishing emergency response protocols to ensure the continued operation of supply chains and market access for farmers. Additionally, investing in community dialogue and conflict resolution initiatives may help reduce tensions and foster a more stable socio-political environment.

Moreover, the results underscore the importance of further research to explore the long-term effects of political unrest on agricultural sectors across different regions. As democratic movements continue to shape the political landscape, understanding their economic implications will be essential for fostering resilience and promoting sustainable development in agriculture.

Limitations

This study is subject to several limitations. First, it focuses solely on Punjab and may not be generalizable to other Indian states. Second, the study period (2022–2024) overlaps with the tail end of the COVID-19 pandemic and associated market fluctuations, which may confound the effects of protests. Third, while DiD and PSM reduce bias, the potential for unobserved confounders still exists. Placebo tests and instrument-based methods were not feasible given the data scope. These limitations should be considered when interpreting the strength of the causal inferences.

CONCLUSION

This study highlights the profound economic consequences of democratic protests on agriculture and local economies in Punjab. The findings demonstrate a significant decline in agricultural

yield, local GDP, income, and employment in protest-affected districts, revealing the vulnerability of these communities during periods of civil unrest. The combination of Difference-in-Differences (DiD) and Propensity Score Matching (PSM) methodologies confirmed the robustness of these results, ensuring reliable comparisons between affected and non-affected districts. The substantial decrease in agricultural productivity and income for farmers in protest-affected areas points to the urgent need for policy interventions that can support these communities. The study emphasizes that the observed economic downturns are not merely a result of pre-existing disparities but are directly linked to the protests themselves. As such, targeted measures must be introduced to safeguard agricultural livelihoods and foster economic resilience in regions facing political instability. Policymakers can leverage these insights to implement strategies aimed at stabilizing the agricultural sector and ensuring sustainable development in Punjab's local economies.

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