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Is Small Still Beautiful?
Revisiting the Farm-Size Productivity Debate

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Is Small Still Beautiful? Revisiting the Farm-Size Productivity Debate[1]

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Abstract

In this paper, we revisit the well-known debate on the inverse relationship between farm-size and agricultural productivity. Using unit level data from Situation Assessment Survey (SAS) of Agricultural Households in the 70th Round National Sample Survey (NSS), we test the relationship between yield (output per hectare) and land operated as well as the relationship between net returns per hectare and land operated for three major crops: paddy, wheat, and cotton. Conditional on several agricultural household characteristics as well as controls for NSS regions, we find a significant inverse relationship irrespective of whether we focus on crop yield or net returns per hectare for the crop. Furthermore, our analysis of farm-size wise patterns of cost of cultivation and net returns from cultivation brings out the issue of high external input intensive agriculture and low absolute net returns of smallholders: two important dimensions of agrarian crisis. As the Indian economy experiences a stunted structural transformation in which the dependence on agriculture for employment remains high and size of farm holdings decline continually, the existence of aninverse relationship between farm-size and agricultural productivity as well as rising cost of cultivation raise concerns about sustainability of smallholder agriculture.

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1. Introduction

The farm size-productivity relationship in Indian agriculture has been much debated over decades (Sen, 1962; Rao, 1967; Rudra, 1968; Sani, 1971; Bardhan, 1973; Rao, 1975; Deolalikar, 1981, Chand *et al*., 2011).[4] In 2015, we revisited the debate using unit level data from Situation Assessment Survey (SAS) of Farmers in the 59th Round National Sample Survey (NSS), January – December, 2003 (Gaurav and Mishra, 2015). We rejected the scale neutrality between productivity measured in terms of net returns per hectare and land cultivated for all India agriculture and observed the existence of an inverse relationship. However, an examination of the relationship between productivity measured in terms of crop yield (quantity of output per hectare) and land cultivated is conspicuous by its absence in recent literature. Moreover, there has been no examination of the farm size-productivity relationship using new data at the all India level.[5] In order to address this gap in the literature, we test the relationship between yield and land operated for three major crops: paddy, wheat, and cotton using unit level data from SAS of Agricultural Households in the 70th Round NSS, 2012-13.

The period between the two SAS surveys is crucial for analysis of the state of Indian agriculture for the following reasons. First,while the share of agriculture in GDP has fallen to about 14% (2012-13) and growth of farm income fallen to 1% (after 2011-12), the employment share of agriculture has not fallen proportionately. Between the 2001 and 2011 Censuses, there has also been an absolute decline in the farmer population; to the tune of about nine million (Census 2011).[6]This suggests that the structural transformation of the economy has been stunted as the productivity of agricultural worker has declined with economic growth (Binswanger-Mkhize 2013). Despite growing rural non-farm employment (Himanshu 2011) and phases of rising real wages in agriculture and non-farm work (Chand and Srivastava 2014), there is a protracted agrarian crisis (Government of India (GoI), 2007; Reddy and Mishra, 2009; Mishra and Reddy, 2011, Mishra 2015). Second, during this period, the average gross cropped area has fallen below one hectare, and the share of small and marginal holders is on the rise. Furthermore, while growing farm mechanization and changing technology in agriculture have contributed to higher crop productivity in the irrigated regions and crops such as wheat and paddy (Gaurav and Himanshu, 2018), productivity growth in rainfed regions have been relatively low.

Whether the inverse-relationship between farm productivity and farm size has weakened or strengthened over the decade has far reaching implications on the country's agricultural development and rural employment strategy. From a smallholder welfare perspective, examining the inverse relationship using aggregated data, Chand *et al*. (2011), raised concerns about the low per capita productivity of smallholders despite their productivity advantage over farmers with larger land holdings – an aspect that Gaurav and Mishra (2015) also emphasized while questioning the sustainability of the low absolute net returns from agriculture for the smallholders. On a related note, Chandrasekhar and Mehrotra (2016) also identified the need to increase investment in productive assets by marginal and small farmers. Furthermore, the riskiness of production in much of rainfed agriculture remains to be high, and the failures in the market for agricultural inputs and produce persist (Gaurav, 2014; 2015).

Our study provides new empirical evidence on the farm size-productivity relationship in Indian agriculture. This re-examination of the inverse farmsize-productivity relationship

[4]See Gaurav and Mishra (2015) for a detailed review of the past literature. Chand et al. (2011) provided evidence on the inverse relationship using aggregated data from the 59th Round NSS while Gaurav and Mishra (2015) was the first examination using unit level data from the NSSO. Recent studies such as Gautam and Ahmed (2018) examine the inverse relationship in the context of Bangladesh.

[5] While there have been a few studies on farm incomes and changes over the decade (e.g., Ranganathan, 2015; Chandrasekhar and Mehrotra. 2016), the farm-size productivity relationship has not been studied using new data.

[6]This is the first instance of an absolute decline in the number of cultivators since the 1971 Census.

using unit level data that is a decade apart from the earlier dataset (SAS from 59th Round NSS) also raises important questions in the context of rising cost of cultivation that is at the heart of a protracted agrarian crisis. Our findings have important policy implications at a juncture when the policy emphasis is on doubling farmers' income (Chandrasekhar and Mehrotra, 2016; Singh, 2018);tackling farmers' indebtedness (Reserve Bank of India (RBI), 2006; GoI, 2007, 2009); and addressing agrarian distress.

The rest of the paper is organized as follows. Without repeating the vast literature on the inverse farm-size productivity debate that has been extensively reviewed (e.g., Chand *et al.*, 2011; Gaurav and Mishra, 2015), we describe the data and methodology in section 2. Section 3 presents crop specific estimates of costs of cultivation, value of output, and net returns per hectare, followed by a presentation and discussion of regression results that test the inverse relationship. Section 4 concludes.

2. Data and Methodology

We used unit level data from the NSS 70thSituation Assessment Survey of Agricultural Households that was conducted to collect information on various aspects of farming. The survey was conducted during the calendar year 2013 (1st January, 2013 to 31st December, 2013), and provides a comprehensive assessment of the situation of agricultural households for the agricultural year 2012-13 (reference period: July 2012 – June 2013) in two visits. The same household was visited twice during the survey period. The period of first visit (visit 1) was from January to July 2013 and that of second visit (visit 2) was from August to December, 2013 (NSSO, 2014, p.6).Detailed information on expenses and receipts from cultivation were collected for the period July to December, 2012 in visit 1 and for January to June, 2013 in visit 2. It was ensured in the survey that all the crops, whether principal or not, harvested during the agricultural year 2012-13 were duly considered in either visit 1 or visit 2.

In the NSS 70th round SAS, there a few fundamental departures from the NSS 59th round SAS that limit one-to-one comparability between the two rounds. We summarise some key differences between the two rounds of surveys.

2.1 Comparability of SASin the 59th round and 70throundof NSS

The following differences between the two rounds of SAS are important.

(i) Apart from changes in the sampling design, there are important definitional differences.[7] In the 70th round SAS, the emphasis was on 'agricultural household' whereas in the 59th round, it was on 'farmer household'. An 'agricultural household' was defined as a household receiving at least Rs.3000 as value of produce from agricultural activities such as cultivation of field crops, horticultural crops, fodder crops, plantation, animal husbandry, poultry, fishery, piggery, bee-keeping, vermiculture, and sericulture; and having at least one member who is self-employed in agriculture: either in the principal status or in subsidiary status during last 365 days.[8] Possession of land was an essential condition for defining a person as farmer (farmer household) in 59th round, but an agricultural household as defined in NSS 70th round may or may not possess land; as discussed earlier.[9]In order to eliminate households pursuing agricultural activities of insignificant nature in 70th round, households with at least one member self-employed in agriculture either in principal status or subsidiary status and having

[7] In the 59th round, there were three strata for the first stage unit (FSU) – villages. In the 70th round, there were only two strata for the FSU.

[8]Entirely agricultural labour households and households receiving income entirely from coastal fishing, activity of rural artisans, and agricultural services were not considered as agricultural household.

[9] In 59th round, farmers having insignificant farming activities such as kitchen garden were excluded from the survey coverage.

total value of produce during last 365 days more than Rs. 3000 were only considered for inclusion in the survey coverage.[10]

(ii) The timing of the visits for data collection also differ. In 59th round SAS, data were collected for 'kharif' and 'rabi' seasons from each sample household, whereas in 70th round SAS, data were collected for two halves of the agriculture year 2012-13 as July to December, 2012 and January to June, 2013; from each sample household.

(iii) There are key differences in cost accounting.Crop specific input expenditure is not available in the 70th round SAS, unlike in the 59th round SAS.

Having discussed the differences in sampling methodology and definitions between the 59th round and 70th round SAS, a caveat regarding input expenditures in the 70th round is in place. Thesurvey did not collect input wise costs incurred for a specific crop except seed expenditure (reported for up to five crops grown). Instead, for the non-seed expenditure items, aggregate cost data are available.Since, we attempt to examine the relationship between farm size and agricultural productivity at the household level for paddy, wheat, and cotton, we do not disaggregate the reported input expenditures as there is no information on actual expenditure incurred under each of the non-seed input heads at crop level. However, in analyses not reported here, we approximated the item wise shares for the inputs for each crop separately by using the cost of cultivation data from the Commission for Agricultural Costs and Prices (CACP) for 2011.[11]The total cost was apportioned across various expense heads to arrive at an estimate of the expenditure under each non-seed item for the three crops. Using the data on the number of crops grown by a household, we equally distributed the input expenditures among the crops grown. However, this method may underestimate the expenditure on cash crops such as cotton that are often intercropped with crops that do not require equally large expenditures. In the absence of crop specific non-seed expenditures, this method may be used to offer credible approximations and to examine robustness of scale neutrality.[12]

2.2.*Empirical strategy*

For each of the three crops, we test the inverse relationship by using two main specifications. In the first set of specifications (equation 1), log of crop yield measured as quantity of output per hectare of land operatedis the dependent variable.

$$lnY_{ij} = \alpha_1 + \beta_1 lnL_{ij} + X_{ij} + u_{ij} \quad (1)$$

where *i* indexes household; $j = 1,2$ indexes agricultural season indicating *kharif*and*rabi*; Y is crop yield in Kg per hectare; L denotes land operated for all crops (in hectare); $u$is i.i.d. error term. In the second set of specifications (equation 2), the dependent variable is log of net returns per hectare of land operated that is measured in valueterms.

$$lnR_{ij} = \alpha_2 + \beta_2 lnL_{ij} + X_{ij} + v_{ij} \quad (2)$$

where *i* indexes household; $j = 1,2$ indexes agricultural season indicating *kharif*and *rabi* season. R is net returns per hectare (rupees per hectare); L denotes land operated for all crops

[10] Chandrasekhar and Mehrotra (2016) attempt to compare income of households from 2003 and 2013 SAS. They use a cut-off of annual household cultivation income of Rs.1345 in 2003 that corresponds to Rs.3000 at 2013 prices (CPI-AL) in order to arrive at agricultural households that are comparable to the 2013 definition. Furthermore, sine both surveys have information on four sources of household income namely net receipt from cultivation, wages, net receipt from farming of animal, and net receipt from farm business, they restricted the sample in both surveys to households whose primary source of income was cultivation, livestock, other agricultural activity, non-agricultural enterprises, and wage/salaried employment (p.10).

[11]Using data on cost of cultivation for the three crops being analysed by major crop growing states for respective crops.

[12] In the 70th round SAS, irrigation expenditure is separately reported along with diesel and electricity expenditure whereas in the CACP cost of cultivation data, irrigation expenditure is reported as a single item. For comparability of the cost estimates from the two sources of data, the irrigation expenditure reported in SAS may be added to diesel and electricity expenditure to arrive an upper bound of irrigation expenditure per hectare.

(in hectare); v is i.i.d. error term. α parameters are intercept terms in each specification. In order to test the inverse farm-size productivity relationship, the sign and significance of the β parameters are of interest whilst. In the double-log specifications, β_1 and β_2 can be interpreted as the elasticity of productivity with respect to land operated; for yield and net returns per hectare, respectively.[13]

We estimate the models using OLS wherein weaccount for heterogeneity in agricultural household characteristics and agro-ecological conditions by controlling for farmer characteristics such as sex, age, and educational attainment of household head along with social group and religion. These controls comprise the X variables in equations 1 and 2.[14]In our econometric analysis, for each specification, we add controls for diverse economic activities of the household in the second model. In the third model, we add state and region fixed effects to control for heterogeneity of agro-ecological zones.[15]

2.3 Sample description

Table 1 presents the summary statistics for variables used in the regression analysis for paddy, wheat, and cotton. An average head of the agricultural household is a 51 year old male.[16]Average land operated is higher for cotton than wheat and paddy. However, variation in land operated and yield is high for all the crops. Nevertheless, the crop yields are comparable with national average for 2011-12.[17]In terms of educational attainment of household heads, paddy and wheat growing households are comparable, and they have higheraverage educational attainment than households associated with cotton production. The extent of formal agricultural training is low, with less than 4% having received formal agricultural training.

In terms of variations by social group, Other Backward Classes (OBCs) are the dominant caste group across the crop specific samples. There are more Scheduled Tribe (ST) paddy growers relative to their share among wheat and cotton growers. Scheduled Castes (SCs) are comparatively lower among cotton growers. There is considerable religion based heterogeneity as well. Considering variations in economic activities, wheat growing households are associated with higher livestock activity than cotton and paddy growing households.The paddy sample has more non-farm work than wheat and cotton whilst the wheat sample is associated with the lowest non-agricultural wage activity.

Next, we present farm-size wise variation in average yield, value of output per hectare and net returns per hectare for the crops. We also presented a detailed farm-size wise analysis of the input expenditure patterns for the crops. Then we present the regression results of our test of inverse relationship, separately for each crop.

[13]Since the log-log specification includes only non-zero observations of yield and net returns per hectare, there is considerable loss of information in estimation in comparison to a level specification. However, the elasticity interpretation of the coefficient of land operated as well as comparability with earlier studies encourages us to follow the log-log specification.

[14] Net returns is defined as the difference between value of output (sum of value of main product and by-products) and total cost which is the sum of all paid out costs reported in the survey.

[15]For robustness checks, all the specifications have also been tested using land possessed and area cultivated for the specific crop. However, these results have not been reported as our focus is on the relationship between yield and land operated by the household in each season, and that between net returns per hectare and land operated in each season. These results can be provided upon request.

[16]It is 50 year old in the case of cotton.

[17] We have controlled for outliers in land operated. Yield variations are particularly high owing to extremely high per hectare output attributed to very marginal/near landless households whose denominator is much lower compared to farmers having at least one hectare of land. Our main results remain qualitatively unchanged when we drop these observations but researchers can employ their discretion in treating the outliers in the raw unit level data.

3. Results and Discussion

3.1 Farm-size wise yield, value of output per hectare, and net returns per hectare

Table 2 reports the farm-size wise weighted yield, value of output per hectare and net returns per hectare for paddy, wheat, and cotton. We constructed farm-size of land operated based on size of total land operated by a household as follows: near landless (<0.01 hectare, ha), marginal (0.01-1 ha), small (1-2 ha), semi-medium (2-4 ha), medium (4-10 ha), and large (>10 ha).

Paddy and wheat have similar patterns of average cost of cultivation per hectare, value of output per hectare, and net returns per hectare whereas cotton offers a considerable contrast. In terms of farm-size wise variation for the two crops, the input costs per hectare fall as we move from near landless to small farm-size. There is a general rise in cost per hectare for farm-sizes above small farm-size; for paddy in particular. In terms of value of output per hectare, paddy demonstrates a decreasing trend as we move up the farm-size distribution while wheat demonstrates such a pattern till the small farm-size; and rising beyond that. The weighted value of output per hectare for wheat is particularly high in comparison to paddy. Net returns per hectare also demonstrates a general decreasing trend for wheat and paddy as we move from near-landless to large farm-size.

In the case of cotton, there is a clear decreasing trend of value of output per hectare as we move up the farm-size distribution. Unlike in the case of paddy and wheat, the cost per hectare is more or less same across the farm-sizes in the case of cotton. Furthermore, despite higher value of output per hectare in the case of cotton, the average cost of production is considerably higher than that of paddy and wheat. As a result, the average net returns per hectare in cotton is lower. In terms of farm-size wise variation of net returns per hectare, there is a trend of decreasing net returns per hectare as we move from marginal to semi-medium farm-size but the medium farm-size has higher net returns in comparison to semi-medium farm-size. Households belonging to large farm-size in cotton, however have net returns that are around one-third of that of those in the small farm-size. This is due to the considerably high cost of cultivation per hectare relative to the value of output per hectare. Note that the average for all farm-sizes in the case of cotton is negative. This is due to extremely high losses for the weighted values of 28 near landless households in the sample for cotton.Removing the near-landless households, however, does not alter the farm-size based patterns qualitatively.[18]

Tables 3a, 3b, 3c present farm-size wise weightedper hectare input costs for paddy, wheat, and cotton, respectively. From Table 3a, it is clear that large farm-size in paddy uses higher fertilisers and insecticides more intensively than small and marginal counterparts but weighted fertiliser for near-landless farm-size is considerably higher in comparison to other farm-sizes. Similarly, hired labour expenditure, insecticides, and diesel expenditure per hectare for large farm-size is considerably higher than that ofsmaller farm-sizes. For the large farm-size, diesel expenditure is around five times higher than that of smallholders. However, machine hiring costs per hectare are higher for small farm-size compared to large farmers; suggesting capital disadvantage of the smallholders vis-à-vis the labour disadvantage of the large holders. Among other expenditure items, lease rent expenses per hectare of large farmers are considerably higher, suggesting prevalence of more own-farm cultivation in the case of smallholders compared to the large farm-size cultivation.

In the wheat sample (Table 3b), small and marginal wheat farmers spend the most (per hectare) on fertilisers, followed by machine hiring. Seed, fertiliser, and human labour costs per hectare are higher than that in the case of paddy but insecticides expenditure per hectare are lower than paddy. Diesel expenditure per hectare is also considerably high suggesting greater need for intensive irrigation in wheat than in paddy. However, per hectare

[18] Alternative farm-size distribution excluding the near-landless sub-group can be constructed to address this concern. However, the weights used in finding the weighted average cost per hectare, value of output per hectare, and net returns per hectare would also be revised accordingly, and the revised values should be generated cautiously.

human labour expenditure in wheat is much lower than that in paddy whilst machine hiring cost per hectare is much higher than paddy. This is indicative of labour intensive production of paddy and more mechanised production of wheat. In terms of farm-size wise differences, the per hectare expenditure on machine hiring is much lower than small holders, implying greater reliance on owned farm machinery for larger holders vis-a-vis small holders.From the point of view of debt servicing, interest expenditures of large farm-size growers are substantially higher than that of smallholders, suggesting better access to formal agricultural credit compared to smallholders on the one hand and higher average institutional loan sizes on the other. As in the case of paddy, per hectare expenditure on human labour and lease rent is considerably higher for large farm-size growers than small farm-size growers.

In the case of cotton (Table 3c), per hectare spending on fertiliser, hired human labourand seed is particularly high. Insecticide expenditures per hectare are alsohigh relative to wheat and paddy.However, the cost of machine hiring per hectare in cotton is lower than that in wheat but higher than that of paddy. In terms of farm-size wise variation, large cotton growers have similar pattern of input expenditures per hectare albeit with considerably higher magnitudes. For instance, hired labour expenditure per hectare for the large farm-sizein the case of cotton is nearly double that of smallholders. Similarly, seed and insecticide expenditures per hectare are also much higher than that of smallholder growers of cotton. These are in line with the trends ofseed (Gaurav and Mishra 2016) andpesticide usage patterns in cotton (Ranganathan *et al*. 2018).

The utilisation of hired machinery in the case of cotton is more or less similar for small and large farm-size growers. This is on account of limited use of machines in cotton harvesting (picking) unlike in wheat and paddy.The particularly low expenditure on diesel and irrigation in the case of small farm-size growers stands in stark contrast to high expenditure on diesel and irrigation by large farm-size growers. This is primarily on account of the predominantly rainfed nature of smallholder cotton in tracts such as Vidarbha region of Maharashtra and parts of Telangana in comparison to the irrigated cotton tracts in Punjab and Gujarat. Along with more intensive cultivation of cotton in the irrigated tracts, large holders are more likely to have profits from cotton production when the weather and pest pressure is conducive but they are also more likely to lose vis-à-vis smallholders as evident from the 2013 SAS survey.

3.2 Farm-size productivity relationship

Tables 4, 5, and 6 report the regression results for paddy, wheat, and cotton, respectively. Models 1, 2, and 3 pertain to the specifications with log of yield as dependent variable and Models 4, 5, 6 are specifications with log of net returns per hectare as the dependent variable, as discussed earlier.

It is evident that conditional on agricultural household characteristics and controls forNSS state-region, we reject the null hypothesis of no relationship between land operated and crop yields as well as net returns per hectare for all the three crops.[19][20]Furthermore, the coefficient of land operated has a negative sign in all the specifications we tested.

In the case of paddy (see Table 4), age of household head is significantly associated with both yield and net returns per hectare while gender is not. Although higher education is associated with higher yields and net returns per hectare, formal agricultural training does not have a statistical significant relationship with either.In terms of variation between social groups, OBCs and 'Other' social groups have significantly higher yield and net returns per hectare than ST households. In terms of religious affiliation, Muslim households are associated with significantly higher yields but not net returns than Hindu households whereas

[19]There were 78 regions in the survey. Regions are representative of agro-ecological variation as they are hierarchical domains below the level of state/ Union Territory in the NSS. State-region controls for states and regions within a state taken together. Controlling for state-region also partially absorbs state wide policy variations that may influence farm productivity. In panel data contexts, state-region fixed effects offer an effective control for time invariant factors relevant to state-region level attributes.

[20] We confine our discussion of results to the full-models (Models 3 and 6) for each of the crops.

Sikh households are associated with both higher yield and net returns per hectare than Hindu households. Taking into account economic activities of the household, households having other agricultural activities and non-farm wage activities are associated with significantly lower paddy yields as well as net returns per hectare in paddy. This may be attributed to the labour intensive nature of paddy production.

In the case of wheat (see Table 6), male headed households are associated with significantly higher yield but not returns per hectare than female headed households. Households having a head who has completed higher secondary schooling or has studied beyond high school, are significantly associated with higher yields in comparison to households with an illiterate household head. Furthermore, formal agricultural training fails to have significance with yield or net returns per hectare. In terms of caste based variation, unlike in the case of paddy, all social groups are associated with significantly higher yield and net returns per hectare than ST households whilst in terms of religion based variations, Muslim and Sikh households have significantly higher yield and net returns than Hindu households.

We also find evidence of a significant negative relationship between livestock activity and wheat yield. This relationship may be driven by the greater farm mechanization in wheat production where draft labour has been substituted by tractors and other farm equipments. Among other economic activities, non-agricultural activity and wage activity outside agriculture are associated with significantly lower yields and net returns per hectare in the case of wheat. Interestingly, households with other agricultural activities have significantly higher net returns per hectare but not crop yields. The positive association of net returns per hectare with other agricultural activities suggest complementarities that may lower cost of cultivation or increase value of output due to better market linkages that may.

Results for cotton (see Table 5) offer interesting contrasts with the results of paddy and wheat. Although the inverse relationship is established for both yield and net returns per hectare, coefficients of higher education categories have no significance. Formal agricultural training is associated with negative but insignificant association with net returns per hectare. These findings are relevant in the context of deskilling of farmers (Stone 2007; Gaurav 2014). Among cotton producers, 'Other' category households are associated with significantly higher yields than ST households. Interestingly, although SC households have significantly lower yields than ST households, the significance disappears in the case of net returns per hectare. Muslim and Sikh agricultural households have significantly lower cotton yields than Hindu agricultural households growing cotton whilst Jain households are associated with significantly positive net returns in cotton relative to Hindu households. In terms of diversification of economic activity, livestock activity is associated with significantly higher cotton yields than households that do not have livestock activity. On the contrary, other agricultural activity is associated with significantly lower net returns per hectare, and wage activity is associated with significantly lower yield vis-à-vis households that do not have these activities.

4. Conclusion

In this paper, we revisited the much debated relationship between farm size and productivity using data from SAS of Farm Households in the 70th Round NSS, 2011-12. We find significant negative relationship between crop yield for each specific crop and land operated for all crops for the three crops (both in logs). When we consider the relationship between net returns per hectare for specific crop and size of land operated for all crops (both in logs), we reject scale neutrality and observe an inverse relationship. We examine weighted average yields, value of output per hectare, and net returns per hectare by farm-size of land cultivated. We also delve into farm-size wise variations in input expenditures for the three crops. The set of findings indicate that small holders continue to have a productivity advantage over larger holders when we consider yield as well as net returns per hectare. However, high cost of cultivation owing to reliance on external purchased inputs warrants attention.

Farm-size wise analysis of input expenditure, value of output, and net returnssuggests that households operating more land have a general disadvantage in terms of labour used per

unit of land. Our set of findings at a crop levelsuggest that for the three major crops under consideration, 'small is still beautiful' in terms of productivity advantage as well as net returns from hectare. However, in light of the persistent agrarian distress and attempts of public policy to 'double farm incomes', the low absolute net returns from farming for smallholders relative to larger land operating groups is a matter of concern. This policy relevant issue has alsobeen highlighted in recent studies (Dev *et al.,* 2018; Mishra, 2018).

From an agricultural policy perspective, our findings corroborate the evidence on rising cost of cultivation, and suggest the need to pay considerable attention to policy measures for enhancing crop productivity without disproportionately raising cost of cultivation. Of particular concern is the lack of significance of formal agricultural training. However, education being associated with higher yield and return suggests that in the absence of agricultural extension or presence of weak agricultural extension (Gaurav, 2018), formal education may offer informational substitution. Agricultural training not only has an insignificant relationship with yield or net returns in paddy and wheat but also a significant negative relationship with net returns per hectare in cotton. Along with the fact that very low fraction of farmers have attained formal agricultural training, this raises concerns about the weakness of the agricultural extension system (Gaurav, 2018), de-skilling among the farming community (Stone, 2007; Gaurav, 2014) and risk in agriculture (Mishra, 2006, 2008).Furthermore, the weakness of educational system in rural India to accommodate agricultural information demands is evident in light of our evidence that formal education beyond higher secondary schooling is positively associated with both yield and net returns in the paddy and wheat but has no significance in the case of cotton. This suggests that while formal education beyond a certain threshold might substitute for lack of agricultural training in paddy and wheat, it fails to offer any informational advantage in the case of cotton.

The finding that Sikh agricultural householdsare associated with significantly higher yield and net returns per hectare than Hindu agricultural household in the case of wheat and paddy is suggestive of differential returns to agricultural development and farm technology. Muslim farmers (who have lower average land possessed and operated than their Hindu counterparts) having higher crop level productivity in the case of wheatand paddy than Hindu farmers suggests the possibility of differences in productivity and farm mechanization owing to different tenancy arrangements.In this context, questions of incentives and moral hazard associated with specific tenancy arrangements (Cheung 1968; Shaban, 1987) can be taken up in future research. Although we do not have information on whether the leased-in land is taken up under sharecropping, fixed rent contract, or other form of contract with varying degrees of cost and output sharing, there is a need to examine using microdata whether inefficiency of sharecropping versus cultivation on own land. This is particularly relevant in the context of growing marketization of agricultural inputs and greater non-farm opportunities (Gaurav and Himanshu, 2018). There has been also been renewed policy interest in reforming land leasing and land titling laws which could potentially raise farm productivity and efficiency(GoI, 2016).

Our findings also indicate how non-farm diversification associated with structural transformation of the economy is associated with crop yields and net returns per hectare. Non-agricultural work is not associated with positive net returns per hectare whilst non-farm wage activity and other agricultural activity is generally associated with lower net returns per hectare. In addition, the positive association between livestock activity and cotton yields is encouraging given evidence on fodder crisis and poor organic quality of soil under cotton production (Reddy and Mishra, 2009; Gaurav, 2015). If cotton production systems are able to sustain livestock, there is a possibility of potential benefits from moving away from cotton monoculture. Livestock may also complement yields owing to ready availability of farm yield manure which in turn improves soil fertility and offers ecological benefits. Policies aimed at fostering income from livestock may also boost agricultural investment, thereby enabling farmers to raise farm productivity.

A limitation of our study is that we have not addressed selection bias that may be present due to unobserved heterogeneity, thereby potentially biasing the sign and significance

of the coefficient of interest (Gaurav and Mishra, 2015).[21]Since a primary objective of the study was to examine if the inverse relationship holds at the yield level from a correlational perspective in the classical OLS specification, we consider the findings as a baseline for subsequent analyses that address the identification problem. Alternative econometric methodologies as followed in Gautam and Ahmed (2018) can also be taken up by those interested in a more rigorous evaluation of the evidence. Furthermore, due to lack of data on crop level input expenditures we assumed that the cost incurred is equally allocated among crops in the case of inter-cropping or mixed-cropping. In a work in progress, we are examining whether the inverse relationship remains significant when we analyse monocropping separately.

[21] The selectivity bias may arise due to unobserved heterogeneity on account of who grows paddy, wheat, or cotton among the full sample of farmer households.

Table 1. Summary statistics for regression analysis

	Paddy farmers			Wheat farmers			Cotton farmers		
Variable	**Mean**	**SD**	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	**N**
Yield (Kg per hectare)	2969.92	8659.40	17,991	2223.13	3615.3	10,875	815.58	1143.75	2,303
Land operated (hectare)	1.23	1.52	18,156	1.36	1.66	10,903	2.38	2.46	2,334
Age of household head (years)	51.21	13.27	18,156	51.16	13.89	10,903	49.82	12.94	2,334
Male household head	92.56%		18,156	92.96%		10,903	95.32%		2,334
Illiterate*	31.67%		18,156	35.22%		10,903	41.22%		2,334
Literate without formal schooling	1.13%		18,156	0.85%		10,903	1.11%		2,334
Schooling up to higher secondary	60.83%		18,156	56.92%		10,903	54.11%		2,334
Education beyond higher secondary	6.37%		18,156	7.01%		10,903	3.56%		2,334
Received formal agricultural training	3.57%		18,156	2.59%		10,903	3.47%		2,334
Scheduled tribe (ST)	24.32%		18,156	8.73%		10,903	15.34%		2,334
Scheduled caste (SC)	11.37%		18,156	12.26%		10,903	8.65%		2,334
Other backward classes (OBC)	35.72%		18,156	46.50%		10,903	44.82%		2,334
Other social group	28.58%		18,156	32.51%		10,903	31.19%		2,334
Hindu	77.33%		18,156	86.48%		10,903	90.75%		2,334
Muslim	9.68%		18,156	7.67%		10,903	3.13%		2,334
Christian	8.23%		18,156	0.11%		10,903	0.47%		2,334
Sikh	2.84%		18,156	5.35%		10,903	4.41%		2,334
Jain	0.03%		18,156	0.18%		10,903	0.04%		2,334
Buddhist	0.62%		18,156	0.00%		10,903	1.16%		2,334
Other religious group	1.28%		18,156	0.22%		10,903	0.04%		2,334
Livestock activity	70.16%		18,156	82.48%		10,903	71.68%		2,334
Other agricultural activity	14.06%		18,156	5.93%		10,903	5.22%		2,334
Non-agricultural activity	14.63%		18,156	12.11%		10,903	9.98%		2,334
Non-agricultural wage activity	45.91%		18,156	33.40%		10,903	41.60%		2,334

Note: N denotes number of observations. SD denotes standard deviation.
*Educational categories and agricultural training of head of household.

Table 2. Farm-size wise weighted cost, value of output, and net returns per hectare by crop

	Paddy			Wheat			Cotton		
Farm-size	**TC**	**VO**	**NR**	**TC**	**VO**	**NR**	**TC**	**VO**	**NR**
NL	54877	53646	11081	31500	44176	14227			
Mean	(727)	(727)	(727)	(434)	(434)	(434)			
MA	16999	34703	17717	17344	34345	17003	23325	39096	16055
Mean	(9096)	(9096)	(9096)	(5362)	(5362)	(5362)	(548)	(548)	(548)
SL	17073	32758	15699	16555	27714	11169	20830	30767	9938
Mean	(5093)	(5093)	(5093)	(2941)	(2941)	(2941)	(741)	(741)	(741)
SM	19120	33573	14458	16630	27563	10945	21280	26326	5045
Mean	(2641)	(2641)	(2641)	(1594)	(1594)	(1594)	(681)	(681)	(681)
ME	26669	42018	15349	18955	33328	14373	21042	27421	6380
Mean	(540)	(540)	(540)	(512)	(512)	(512)	(297)	(297)	(297)
LA	32588	42748	10160	23156	37047	13891	21981	25509	3528
Mean	(59)	(59)	(59)	(60)	(60)	(60)	(39)	(39)	(39)
All	19183	34995	16316	17698	31923	14292	67613	38440	-21093
Mean	(18156)	(18156)	(18156)	(10903)	(10903)	(10903)	(2334)	(2334)	(2334)

Note: N denotes number of observations.NL is near landless, MA is marginal, SL is small, SM is semi-medium, ME is medium, LA is large farm-size of land operated. TC, VO, NR denote total cost per hectare, value of output per hectare, and net returns per hectare, respectively. Values are in rupees. Figures in parentheses are number of observations.

Weighted values are computed using multipliers available in the raw data.

Table 3a. Farm-size wise weighted average input expenditure per hectare: Paddy

Farm-size	Seed	Fertiliser	Manure	Insecticide	Human Labour	Animal Labour	Diesel	Electricity	Irrigation	Minor repair	Interest	Machine hiring	Lease rent	Other
NL														
Mean	6417	11520	1705	2931	8979	829	4482	137	4856	615	257	9110	970	2069
N	727	727	727	727	727	727	727	727	727	727	727	727	727	727
MA														
Mean	1387	3944	418	973	4244	317	671	138	854	279	165	1943	965	701
N	9096	9096	9096	9096	9096	9096	9096	9096	9096	9096	9096	9096	9096	9096
SL														
Mean	1570	3629	455	1101	4580	194	834	186	312	327	316	1659	1245	667
N	5093	5093	5093	5093	5093	5093	5093	5093	5093	5093	5093	5093	5093	5093
SM														
Mean	1581	3897	424	1683	5158	231	1116	192	270	434	423	1633	1520	558
N	2641	2641	2641	2641	2641	2641	2641	2641	2641	2641	2641	2641	2641	2641
ME														
Mean	1497	4827	295	2598	5624	96	2568	237	160	669	473	1674	5520	432
N	540	540	540	540	540	540	540	540	540	540	540	540	540	540
LA														
Mean	2026	4953	546	3697	5471	69	4133	218	226	536	632	1692	8075	313
N	59	59	59	59	59	59	59	59	59	59	59	59	59	59
All														
Mean	1673	4182	477	1248	4706	283	1002	162	754	341	259	2097	1283	716
N	18156	18156	18156	18156	18156	18156	18156	18156	18156	18156	18156	18156	18156	18156

Note: N denotes number of observations. NL is near landless, MA is marginal, SL is small, SM is semi-medium, ME is medium, LA is large farm-size of land operated. Expenditures are in rupees per hectare. Weighted values are computing using multipliers available in the raw data.

Average losses in the case of cotton are due to considerably high negative net returns of 28 near landless cultivators in the sample.

Table 3b. Farm-size wise weighted average input expenditure per hectare: Wheat

Farm-size	Seed	Fertiliser	Manure	Insecticide	Human Labour	Animal Labour	Diesel	Electricity	Irrigation	Minor repair	Interest	Machine hiring	Lease rent	Other
NL														
Mean	4324	5696	3259	636	2267	946	728	136	4816	356	101	5646	517	2070
N	434	434	434	434	434	434	434	434	434	434	434	434	434	434
MA														
Mean	1946	4315	298	638	1938	93	1109	495	1644	349	69	3157	656	636
N	5362	5362	5362	5362	5362	5362	5362	5362	5362	5362	5362	5362	5362	5362
SL														
Mean	1995	3797	318	840	2448	51	1335	661	789	416	158	2393	853	502
N	2941	2941	2941	2941	2941	2941	2941	2941	2941	2941	2941	2941	2941	2941
SM														
Mean	1846	3639	272	1099	2720	31	1764	609	430	552	307	2130	885	348
N	1594	1594	1594	1594	1594	1594	1594	1594	1594	1594	1594	1594	1594	1594
ME														
Mean	1585	3425	307	1559	2623	25	2268	424	207	573	410	1775	3431	344
N	512	512	512	512	512	512	512	512	512	512	512	512	512	512
LA														
Mean	1927	3869	178	1752	3612	59	2841	358	267	617	757	2039	4588	293
N	60	60	60	60	60	60	60	60	60	60	60	60	60	60
All														
Mean	2022	4087	417	809	2244	103	1314	538	1287	409	149	2829	889	599
N	10903	10903	10903	10903	10903	10903	10903	10903	10903	10903	10903	10903	10903	10903

Note: N denotes number of observations. NL is near landless, MA is marginal, SL is small, SM is semi-medium, ME is medium, LA is large farm-size of land operated. Expenditures are in rupees per hectare. Weighted values are computed using multipliers available in the raw data.

Table 3c. Farm-size wise weighted average input expenditure per hectare: Cotton

Farm-size	Seed	Fertiliser	Manure	Insecticides	Human Labour	Animal Labour	Diesel	Electricity	Irrigation	Minor repair	Interest	Machine hiring	Lease rent	Other
MA														
Mean	3652	5764	573	2798	3678	976	349	622	398	216	377	2486	734	702
N	548	548	548	548	548	548	548	548	548	548	548	548	548	548
SL														
Mean	4045	4940	473	2270	3731	607	442	343	175	283	235	1776	925	584
N	741	741	741	741	741	741	741	741	741	741	741	741	741	741
SM														
Mean	3578	4849	363	2607	4275	511	490	299	182	256	321	1955	1086	509
N	681	681	681	681	681	681	681	681	681	681	681	681	681	681
ME														
Mean	3478	4746	285	2569	4372	262	991	348	164	424	359	1049	1626	370
N	297	297	297	297	297	297	297	297	297	297	297	297	297	297
LA														
Mean	2791	4544	375	2394	3970	134	1759	315	46	465	211	1420	3276	278
N	39	39	39	39	39	39	39	39	39	39	39	39	39	39
All														
Mean	16702	15225	1045	4959	6090	1826	3191	392	272	1507	2544	11525	1071	1265
N	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334

Note: N denotes number of observations. NL is near landless, MA is marginal, SL is small, SM is semi-medium, ME is medium, LA is large farm-size of land operated. Expenditures are in rupees per hectare. Weighted values are computed using multipliers available in the raw data.

Table 4. Relationship between productivity and land operated: Paddy

	Dependent variable: Ln Yield			*Dependent variable*: Ln NR ha		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Ln Land	-0.188***	-0.184***	-0.208***	-0.232***	-0.242***	-0.293***
	(0.006)	(0.007)	(0.006)	(0.010)	(0.010)	(0.010)
Male	0.056**	0.071***	0.002	0.031	0.040	0.010
	(0.024)	(0.024)	(0.021)	(0.036)	(0.036)	(0.033)
Age	0.002***	0.002***	0.002***	0.002***	0.002***	0.003***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Education (Ref.=Illiterate)						
Literate without formal schooling	0.119**	0.117*	0.05	0.058	0.055	0.029
	(0.060)	(0.060)	(0.052)	(0.086)	(0.086)	(0.080)
Schooling up to higher secondary	0.118***	0.107***	0.091***	0.138***	0.134***	0.083***
	(0.015)	(0.015)	(0.013)	(0.021)	(0.021)	(0.021)
Education beyond higher secondary	0.24***	0.213***	0.202***	0.138***	0.144***	0.117***
	(0.028)	(0.028)	(0.025)	(0.042)	(0.042)	(0.039)
Formal training in agriculture	0.026	0.036	0.018	-0.056	-0.050	-0.027
	(0.034)	(0.034)	(0.030)	(0.051)	(0.050)	(0.047)
Social group (Ref.=ST)						
SC	0.28***	0.265***	0.114***	0.013	-0.008	0.029
	(0.025)	(0.025)	(0.023)	(0.036)	(0.036)	(0.036)
OBC	0.271***	0.259***	0.184***	0.100***	0.068**	0.084***
	(0.019)	(0.019)	(0.019)	(0.027)	(0.028)	(0.029)
Other social group	0.216***	0.2***	0.148***	0.030	-0.004	0.061*
	(0.021)	(0.021)	(0.021)	(0.030)	(0.031)	(0.032)
Religion (Ref.=Hindu)						
Muslim	0.162***	0.16***	0.07***	0.145***	0.147***	0.035
	(0.022)	(0.022)	(0.022)	(0.033)	(0.033)	(0.034)
Christian	-0.069***	-0.081***	-0.032	0.346***	0.348***	-0.046
	(0.027)	(0.027)	(0.037)	(0.037)	(0.037)	(0.055)
Sikh	0.818***	0.828***	0.546***	1.095***	1.079***	0.368***
	(0.039)	(0.039)	(0.074)	(0.056)	(0.056)	(0.114)
Jain	-0.283	-0.301	-0.023	-0.596	-0.628	-0.528
	(0.376)	(0.374)	(0.330)	(0.564)	(0.563)	(0.525)
Buddhist	-0.371***	-0.414***	-0.026	0.119	0.115	-0.067
	(0.080)	(0.080)	(0.075)	(0.110)	(0.110)	(0.111)
Others	-0.247***	-0.255***	-0.201***	-0.061	-0.071	-0.278***
	(0.057)	(0.057)	(0.059)	(0.079)	(0.079)	(0.087)
Livestock activity	No	-0.161***	-0.008	No	-0.136***	0.014
		(0.014)	(0.013)		(0.019)	(0.019)
Other agricultural activity	No	-0.038**	-0.066***	No	0.034	-0.075***
		(0.018)	(0.017)		(0.025)	(0.025)
Non-agricultural activity	No	0.025	0.013	No	-0.025	-0.002
		(0.018)	(0.016)		(0.025)	(0.023)
Wage activity	No	-0.066***	-0.079***	No	-0.096***	-0.1***
		(0.013)	(0.012)		(0.018)	(0.018)
State-Region	No	No	Yes	No	No	Yes
Constant	7.123***	7.266***	6.828***	9.255***	9.396***	9.584***
	(0.038)	(0.039)	(0.092)	(0.052)	(0.054)	(0.131)
Observations	17970	17970	17970	15201	15201	15201
R-squared	0.098	0.106	0.331	0.045	0.05	0.187
F	121.3	106.21	88.358	44.854	39.807	35.548
P-value	0.000	0.000	0.000	0.000	0.000	0.000

Note: *p<0.1,**p<0.05,***p<0.01

Table 5. Relationship between productivity and land operated: Wheat

	Dependent variable: Ln Yield			*Dependent variable*: Ln NR ha		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Ln Land	-0.125***	-0.142***	-0.168***	-0.153***	-0.175***	-0.201***
	(0.011)	(0.011)	(0.012)	(0.007)	(0.007)	(0.007)
Male	0.157***	0.190***	0.125***	0.086***	0.123***	0.040
	(0.043)	(0.043)	(0.042)	(0.029)	(0.029)	(0.026)
Age	-0.002**	-0.002**	0.000	-0.001	-0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Education (Ref.=Illiterate)						
Literate without formal schooling	0.045	0.067	0.184	-0.239***	-0.210***	-0.065
	(0.125)	(0.125)	(0.120)	(0.078)	(0.077)	(0.069)
Schooling up to higher secondary	-0.035	-0.036	-0.004	-0.023	-0.026	0.026*
	(0.025)	(0.025)	(0.024)	(0.016)	(0.016)	(0.015)
Beyond higher secondary	-0.010	-0.001	0.019	0.124***	0.135***	0.121***
	(0.047)	(0.047)	(0.046)	(0.031)	(0.031)	(0.027)
Training in agriculture	0.085	0.083	0.047	0.062	0.062	0.039
	(0.069)	(0.069)	(0.066)	(0.045)	(0.045)	(0.040)
Social group (Ref.=ST)						
SC	0.261***	0.239***	0.121**	0.343***	0.315***	0.121***
	(0.048)	(0.048)	(0.051)	(0.032)	(0.032)	(0.031)
OBC	0.275***	0.234***	0.138***	0.417***	0.362***	0.168***
	(0.040)	(0.041)	(0.044)	(0.027)	(0.027)	(0.027)
General	0.313***	0.271***	0.169***	0.364***	0.307***	0.193***
	(0.043)	(0.043)	(0.046)	(0.029)	(0.029)	(0.028)
Religion (Ref.=Hindu)						
Muslim	0.050	0.070*	0.159***	0.047*	0.066**	0.128***
	(0.042)	(0.042)	(0.043)	(0.027)	(0.027)	(0.026)
Christian	-0.028	-0.052	0.008	0.213	0.194	0.330
	(0.326)	(0.325)	(0.340)	(0.216)	(0.214)	(0.203)
Sikh	0.811***	0.814***	0.385***	0.870***	0.869***	0.449***
	(0.048)	(0.048)	(0.082)	(0.034)	(0.033)	(0.053)
Buddhist	0.041	-0.001	0.205	-0.476***	-0.493***	0.203
	(0.276)	(0.275)	(0.351)	(0.168)	(0.166)	(0.176)
Others	0.145	0.174	0.287	-0.812***	-0.776***	-0.249*
	(0.389)	(0.388)	(0.375)	(0.153)	(0.152)	(0.143)
Livestock activity	No	-0.060**	-0.108***	No	-0.048**	-0.049***
		(0.029)	(0.028)		(0.019)	(0.017)
Other agricultural activity	No	-0.085*	0.011	No	-0.083***	0.050*
		(0.047)	(0.046)		(0.030)	(0.027)
Non-agricultural activity	No	-0.161***	-0.100***	No	-0.124***	-0.047**
		(0.034)	(0.033)		(0.022)	(0.020)
Wage activity	No	-0.159***	-0.073***	No	-0.208***	-0.091***
		(0.024)	(0.024)		(0.016)	(0.014)
State-Region	No	No	Yes	No	No	Yes
Constant	9.137***	9.256***	9.538***	6.957***	7.091***	7.127***
	(0.067)	(0.071)	(0.123)	(0.045)	(0.047)	(0.079)
Observations	8880	8880	8880	10869	10869	10869
R-squared	0.051	0.059	0.143	0.112	0.13	0.323
F	31.89	29.38	21.066	91.178	85.252	71.666
P-value	0.000	0.000	0.000	0.000	0.000	0.000

Note: *p<0.1,**p<0.05,***p<0.01

Table 6. Relationship between productivity and land operated: Cotton

	Dependent variable: Ln Yield			*Dependent variable*: Ln NR ha		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Ln Land	-0.261***	-0.283***	-0.339***	-0.221***	-0.255***	-0.255***
	(0.025)	(0.027)	(0.025)	(0.043)	(0.046)	(0.046)
Male	0.005	0.000	0.025	-0.012	-0.021	0.035
	(0.096)	(0.096)	(0.087)	(0.164)	(0.164)	(0.159)
Age	-0.001	-0.002	0.000	0.000	0.000	-0.001
	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)
Education (Ref.=Illiterate)						
Literate without formal schooling	-0.159	-0.17	-0.271	-0.392	-0.424	-0.495*
	(0.193)	(0.193)	(0.176)	(0.304)	(0.303)	(0.295)
Schooling up to higher secondary	0.013	-0.004	0.109**	-0.023	-0.06	-0.023
	(0.044)	(0.044)	(0.042)	(0.074)	(0.074)	(0.077)
Beyond higher secondary	0.042	0.026	0.113	0.137	0.113	-0.015
	(0.112)	(0.112)	(0.103)	(0.196)	(0.195)	(0.192)
Training in agriculture	0.067	0.047	-0.02	-0.187	-0.203	-0.282
	(0.112)	(0.111)	(0.102)	(0.193)	(0.193)	(0.187)
Social group (Ref.=ST)						
SC	0.081	0.081	-0.169**	0.006	0.011	-0.218
	(0.089)	(0.088)	(0.086)	(0.150)	(0.150)	(0.151)
OBC	0.083	0.073	0.025	0.028	0.021	-0.02
	(0.059)	(0.059)	(0.060)	(0.097)	(0.096)	(0.101)
General	0.172***	0.141**	0.158**	0.195*	0.163	0.123
	(0.065)	(0.065)	(0.070)	(0.106)	(0.106)	(0.120)
Religion (Ref.=Hindu)	0	0	0			
Muslim	-0.427***	-0.445***	-0.384***	-0.06	-0.117	-0.099
	(0.119)	(0.119)	(0.109)	(0.208)	(0.209)	(0.203)
Christian	0.335	0.277	-0.04	0.422	0.344	0.223
	(0.303)	(0.302)	(0.276)	(0.484)	(0.483)	(0.465)
Sikh	0.194*	0.177*	-0.61***	0.14	0.102	-0.594
	(0.099)	(0.099)	(0.225)	(0.186)	(0.186)	(0.350)
Jain	0.48	0.345	0.092	0.301	0.146	0.187*
	(0.960)	(0.957)	(0.875)	(1.284)	(1.279)	(1.253)
Buddhist	-0.161	-0.163	0.085	-0.455	-0.426	-0.042
	(0.197)	(0.196)	(0.184)	(0.323)	(0.322)	(0.328)
Others	-1.346	-1.401	-0.875			
	(0.953)	(0.950)	(0.856)			
Livestock activity	No	-0.046	0.078*	No	-0.046	-0.072
		(0.046)	(0.043)		(0.076)	(0.076)
Other agricultural activity	No	-0.145	-0.089	No	-0.388**	-0.324**
		(0.090)	(0.084)		(0.157)	(0.155)
Non-agricultural activity	No	0.067	0.097	No	0.148	0.182
		(0.066)	(0.061)		(0.115)	(0.112)
Wage activity	No	-0.173***	-0.192***	No	-0.212***	-0.113
		(0.043)	(0.040)		(0.074)	(0.073)
State-Region	No	No	Yes	No	No	Yes
Constant	6.367***	6.536***	7.194***	9.401***	9.617***	10.477***
	(0.130)	(0.137)	(0.265)	(0.218)	(0.229)	(0.431)
Observations	2300	2300	2300	1433	1433	1433
R-squared	0.056	0.065	0.254	0.026	0.037	0.149
F	8.443	7.881	14.397	2.473	2.895	4.566
P-value	0.000	0.000	0.000	0.001	0.000	0.000

Note: *p<0.1,**p<0.05,***p<0.01

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