Ownership Structure and Economic Outcomes: The Case of Sugar Mills in India

Sendhil Mullainathan, Harvard University
Sandip Sukhtankar, Dartmouth College

Motivation

In this era of food price inflation, developing country governments are increasingly concerned about agricultural productivity, lack of which is at the heart of many food crises. Shaping the institutional structure of agricultural markets – that is, deciding whether agricultural processing plants should be run by the government, producer cooperatives, or private individuals – represents an important potential policy lever for improving agricultural productivity. These plants often require large-scale investments, and the raw produce they use takes a long time to grow but must be processed immediately after harvest, which gives rise to potential monopoly power. Sugarcane is a prime example; since it must be crushed as soon as it is harvested using large-scale machinery, farmers cannot sell their cane to mills that are far away, and mills thus have local monopoly power and the opportunity to exploit farmers after their crop has grown. Farmers may anticipate these problems and undersupply cane, thereby directly affecting agricultural productivity and growth. Given that India is the world's second largest producer of sugarcane, and the sugar industry employs a substantial number of the rural population, these problems could have massive effects on rural welfare.

Should governments nationalize processing plants or convert them into cooperatives to combat the threat of local monopoly? On the one hand, we might expect that publicly- or cooperatively-owned plants will care more about the smallest farmers. In developing countries, there may also be reason to believe that these small farmers are the most productive. On the other hand, government or cooperative entities may be more liable to capture by political elements and therefore potentially less productive. Whether governments should manage publicly-owned sugar mills, subsidize and promote cooperatives, or leave the market to private mills, is therefore an empirical question.

Agricultural ministries at both the Central and State levels should be particularly interested in the answer to this question, as they are in charge of agricultural policy. In addition, the agencies that fund agricultural cooperatives and rural public entities – in particular NABARD, the National Bank for Agriculture and Rural Development – would be a key target audience.

Results from study

Our study on sugar mills in the Indian state of Tamil Nadu compares private to cooperative and government run sugar mills, focusing on the borders of catchment areas of each type of mill to hold constant other factors that may affect outcomes. Overlaying satellite images on maps of catchment areas, we determined that the sides of the borders owned by private mills are actually planted with a greater proportion of sugarcane than those owned by cooperative or government mills (21.6% vs. 20.2%; see Figure 1 for explanation of calculation).

This result is mirrored in a surveys of farmers with plots that are close to the borders. We find that more of them are likely to be cultivating sugarcane if they are in private mill command areas. Further, we find that the effect is concentrated on farmers that own less land. Delving deeper into the data, we find that private mills appear to provide more loans for poorer farmers, thereby encouraging them to cultivate cane. Consumption is also relatively higher for poorer farmers living on the private side of the border. Table 1 provides detailed results for the interested reader.

Policy Implications

1. Contrary to popular perception, it does not seem as though the monopoly power wielded by private mills hurts poor farmers, nor does it lead to under-provision of sugarcane. Given these facts, it appears as though various state governments' policies to run publicly owned mills and/or to massively subsidize cooperative mills are unnecessary. Given the high costs – one estimate puts the state government of Maharashtra's guarantees to be paid to mill at Rs. 4000 million – these policies seem particularly indefensible.

2. The main mechanism for encouraging sugarcane production appears to be loans. Sugarcane has a yearly harvest, hence the income stream of its farmers is lumpy, and providing loans can ameliorate cash flow constraints and encourage productive activities. However, private mills seem to be just as good at making these loans as cooperate and public mills, even without access to the massive agricultural credit flows that cooperative and public mills enjoy.

Implementation

1. Divest ownership in public sugar mills. There appears to be little justification for the government to take part in market activities already performed satisfactorily by private actors.

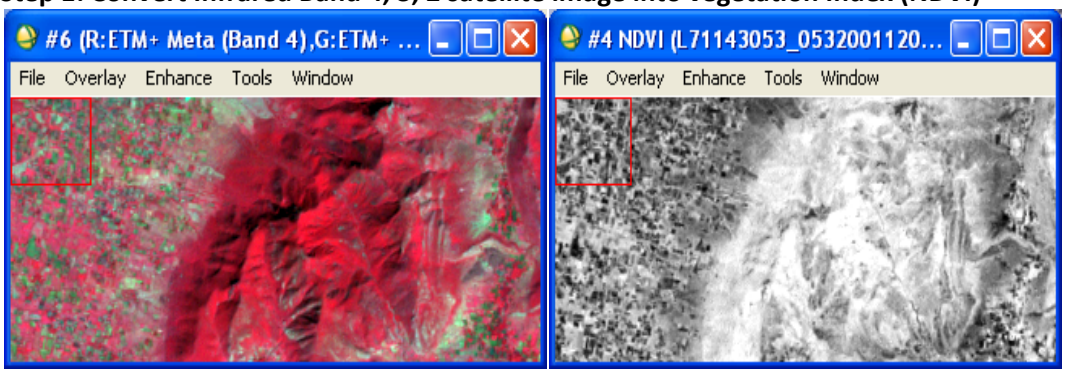
2. Reevaluate the provision of subsidized credit to cooperative and public sugar mills. Given that subsidized agricultural credit tends to be politically motivated and often wasted, these policies should be abandoned as well.

Concluding Remarks

The lessons from this study are applicable to various other realms where governments feel forced to intervene in agricultural markets in developing countries due to the threat of market failure. These interventions are costly, and the benefits of the intervention are likely to be captured by special interests. Therefore firm empirical evidence on the productivity or equity gains of these interventions is essential before they proceed. Two extremely important such realms are 1) producer price supports and the involvement of the Food Corporation of India in purchasing foodgrains and 2) the protection of the retail sector, which prevents the application of technological innovations in food transport.

Figure 1: Determining Proportion of Area Planted with Sugarcane

Step 1: Convert Infrared Band 4, 3, 2 satellite image into vegetation Index (NDVI)

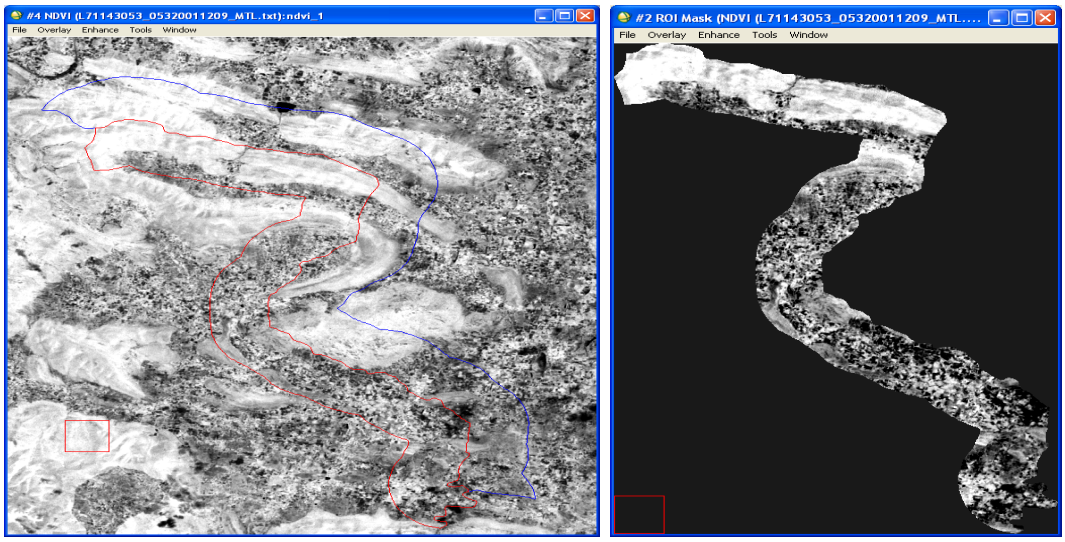


Step 2: Calibrate NDVI values of sugarcane using GPS coordinates of actual fields

Sugarcane field on left

Step 3: Use GIS shapefiles of border areas and create 2km buffer around border

Step 4: Overlay border buffer areas on NDVI image



Step 5: Divide pixel count of sugarcane NDVI range by pixel count of cultivable land NDVI range

Table 1

	Grows Cane		Farming Income		Consumption		Mill Loans		Soil texture	Nitrogen
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Private	0.385*	0.124	9185	5486	3364	13507	6282	5110*	0.00575	19.79
	(0.217)	(0.120)	(9136)	(12365)	(7793)	(12035)	(9609)	(2838)	(0.172)	(25.69)
Acreage	0.0271**	0.0168	16491***	4554*	4678***	2649*	1537	1138**		
	(0.0109)	(0.0114)	(2450)	(2238)	(1072)	(1529)	(1044)	(457.2)		
Interaction	-0.007	-0.0110	-3328	-4108*	2663	-2436	70.37	-908.8*		
	(0.021)	(0.0120)	(8912)	(2260)	(1567)	(1536)	(1243)	(478.0)		
Observations	699	1106	920	1313	683	1313	683	1313	148	148
Dummies	Vill pair	Vill pair	Vill pair	Vill pair	Vill pair	Vill pair	Vill pair	Vill pair	Vill pair	Vill pair
Survey	1	2	1	2	1	2	1	2	2	2

Columns 1-2 are probit estimations of whether the respondent has ever grown sugarcane in the last 5 years on an indicator for being on the private side of the border and other controls. "Interaction" is the interaction of private and acreage. "Vill Pair" dummies correspond to indicators for village pairs across from each other. Survey 1 refers to the survey at command area borders which overlapped taluk/district borders; Survey 2 was done at command area borders which did not overlap borders of these administrative divisions.
Columns 3-4 are estimations of income received from farming on the same set of right hand side variables; columns 5-6 of total household consumption; and columns 7-8 of the amount of loans received from sugarcane mills.
Columns 9-10 are estimations of measures of soil quality on the same right hand side variables; soil quality tests were conducted on a subset of Survey 2 respondents. Soil texture is a scale describing the size of particles; Nitrogen refers to the available nitrogen in the soil.
Standard errors clustered at the mill level in all regressions are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1