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Ownership Structure and Economic Outcomes

The Case of Sugar Mills in India

In brief

- Agricultural productivity, which can be at the heart of many food crises, is a central concern to many developing countries. An important policy mechanism for improving productivity is in shaping the institutional structure of agricultural markets - i.e. who runs agirulcultural processing plants. These plants often require large investments, and the produce takes a long time to grow, giving rise to potential monopoly power.

- Sugarcane is a prime example of this as it must be crushed as soon as it is harvested by large-scale machinery and farmers cannot sale cane to mills that are far away. Thus, mills have local monopoly power and the opportunity to exploit farmers.

- This study examines whether governments should nationalize or convert sugar mills into cooperatives to combat the threat of local monopoly in the Indian state of Tamil Nadu.

- The sides of the borders of catchment areas of a private-owned mill are planted with a greater proportion of sugarcane than cooperative or government mills (21.6% vs. 20.2%). A survey of farmers shows that they are more likely to cultivate sugarcane if they are in private mill command areas. This effect is concentrated on farmers who own less land.

- Private mills also appear to provide loans for poorer farmers, thus encouraging the cultivation of sugarcane. Consumption is also relatively higher for poorer farmers in the private mill command area. Therefore, it does not seem as though monopoly power weilded by private mills hurts poor farmers or leads to the under-provision of sugarcane.

- Given various state governments' policies to run publicly owned mills or subsidize cooperative mills, it would appear that this is an unnecessary cost to state government. State governments should re-evaluate current policies regarding subsidized credit.

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

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.

"Contrary to popular perception, it does not seem as though the monopoly power wielded by private mills hurts poor farmers"

Secondly, 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.
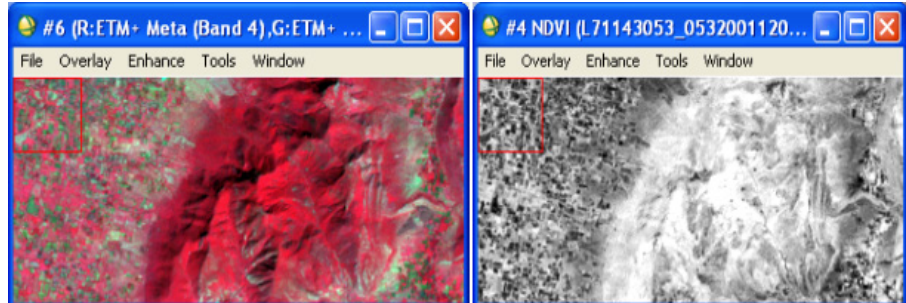
Implementation

• 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.
• 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.

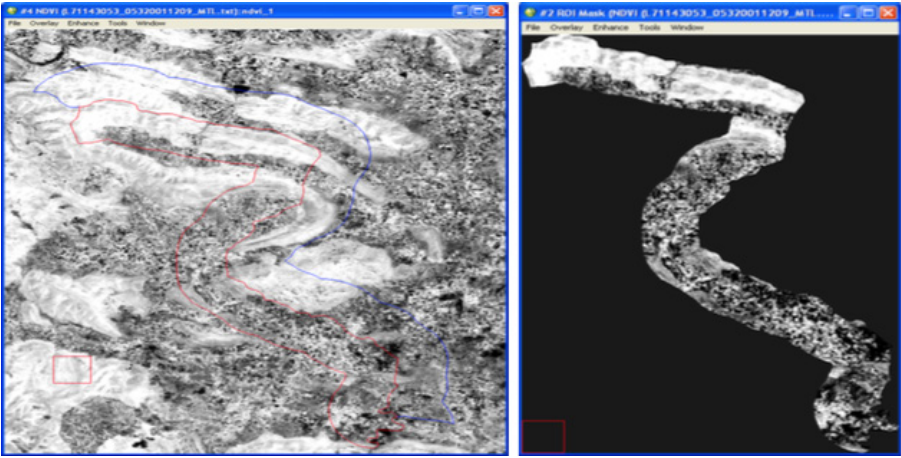Step 1: Convert Infrared Band 4, 3, 2 satellite image into vegetation Index (NDVI)

Step 2: Calibrate NDVI values of sugarcane using GPS coordinates of actual fields (Sugarcane 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	
	(1)	(2)	(3)	(4)	(5)	(6)
Private	0.385* (0.217)	0.124 (0.120)	9185 (9136)	5486 (12365)	3364 (7793)	13507 (12035)
Acreage	0.0271** (0.0109)	0.0168 (0.0114)	16491*** (2450)	4554* (2238)	4678*** (1072)	2649* (1529)
Interaction	-0.007 (0.021)	-0.0110 (0.0120)	-3328 (8912)	-4108* (2206)	2663 (1567)	-2436 (1536)
Observations	699	1106	920	1313	683	1313
Dummies	Vill Pair	Vill Pair	Vill Pair	Vill Pair	Vill Pair	Vill Pair
Survey	1	2	1	2	1	2

	Mill Loans		Soil Texture	Nitrogen
	(7)	(8)	(9)	(10)
Private	6282 (9609)	5110* (2838)	0.00575 (0.172)	19.79 (25.69)
Acreage	1537 (1044)	1138** (457.2)		
Interaction	70.37 (1243)	-908.8* (478.0)		
Observations	683	1313	148	148
Dummies	Vill Pair	Vill Pair	Vill Pair	Vill Pair
Survey	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. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

About the authors

Sendhil Mullainathan is a Professor of Economics at Harvard University. His real passion is behavioral economics. His work runs a wide gamut: the impact of poverty on mental bandwidth; whether CEO pay is excessive; using fictitious resumes to measure discrimination; showing that higher cigarette taxes makes smokers happier; modeling how competition affects media bias; and a model of coarse thinking. His latest research focuses on using machine learning and data mining techniques to better understand human behavior. He enjoys writing, having recently co-authored Scarcity: Why Having too Little Means so Much and writes regularly for the New York Times. He helped co-found a non-profit to apply behavioral science (ideas42), co-founded a center to promote the use of randomized control trials in development (the Abdul Latif Jameel Poverty Action Lab), serves on the board of the MacArthur Foundation, and has worked in government in various roles, including most recently as Assistant Director of Research at the Consumer Financial Protection Bureau. He is a recipient of the MacArthur "genius" Award, has been designated a "Young Global Leader" by the World Economic Forum, labeled a "Top 100 Thinker" by Foreign Policy Magazine, and named to the "Smart List: 50 people who will change the world" by Wired Magazine (UK).

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