The Effect of the Collective Forest Tenure Reform in China on Forestation

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- Collective Forest Tenure Reform
  - Individualize collective-owned forests
  - Resolution on the Development of Forestry 2003
  - Policy delivery process: State, Province, County, Township and Village
  - Village representative committees or village assemblies vote for or against the reform
  - Redistribution of plots, legal contract and forest certificate, and expanded rights.

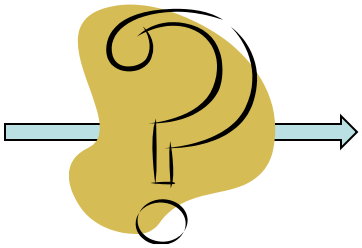
- Goals of the reform
  - Stimulate investment in forests
  - Improve forest conservation
  - Increase forest income

Forest Certificate

- Forestation

  - Afforestation and Reforestation
    - Afforestation is to establish a forest on land that is not forest by planning trees or seeds
    - Reforestation is to reestablish a forest after its removal such as harvest
  - Newly planted forest land in a year, in unit of mu (1 mu = 1/15 hectare)
  - Forest offers important environment services
    - Flood protection, carbon sequestration, recreation and so on.

- What is the effect of the reform on forestation?
  - Whether forestation is increased by the reform significantly?
  - If so, what is the magnitude of the effect?



Forestation under Collective and Private Ownership

- Village leaders or local forestry agencies may or may not behave like social planners.
  - Environmental services of forests
  - Forestation cost (different cost than individual owners)
  - Profit incentive
  - Political business cycle
  - Personal gain

- Individual owners maximize profit
  - Constrained by required forest practices to protect environment
  - Ecological forests reserve most sensitive land from harvest

Literature Review

- Previous research produced mixed findings
  - RRI's findings in favor of strengthened forest tenure (Sunderlin, Hatcher and Liddle, 2008)
  - Arguments in favor of maintaining collective management (Harkness, forthcoming)
- For the particular case of China, previous empirical papers studied the reform of the 1980s
  - Official government statistics show an 8.2% increase in national forest cover between 1980 and 1988
  - Rozelle et al. (2003) showed a 15% increase in forest cover and a sharp recovery of forest volume.
- Due to data constraints, studies on the renewed reform are limited.
  - Some researchers relied on single region case studies (Sheng 2007, Zhao and Liu 2007) or fragmentary data on forest resources changes (ZGNLSLGH, 2005) to argue the effect of the reform.
  - Surveys conducted by Xu (2008) suggest that the reform has documented increases in timber harvest, forest shares in farmer household income and forestation.

Data

- The data is from the surveys done by the Environmental Economics Program in China (EEPC), Beijing University.
- They surveyed 49 counties in 8 provinces. In each county, they conducted interviews randomly in 6 villages, and 10-20 households in each village.

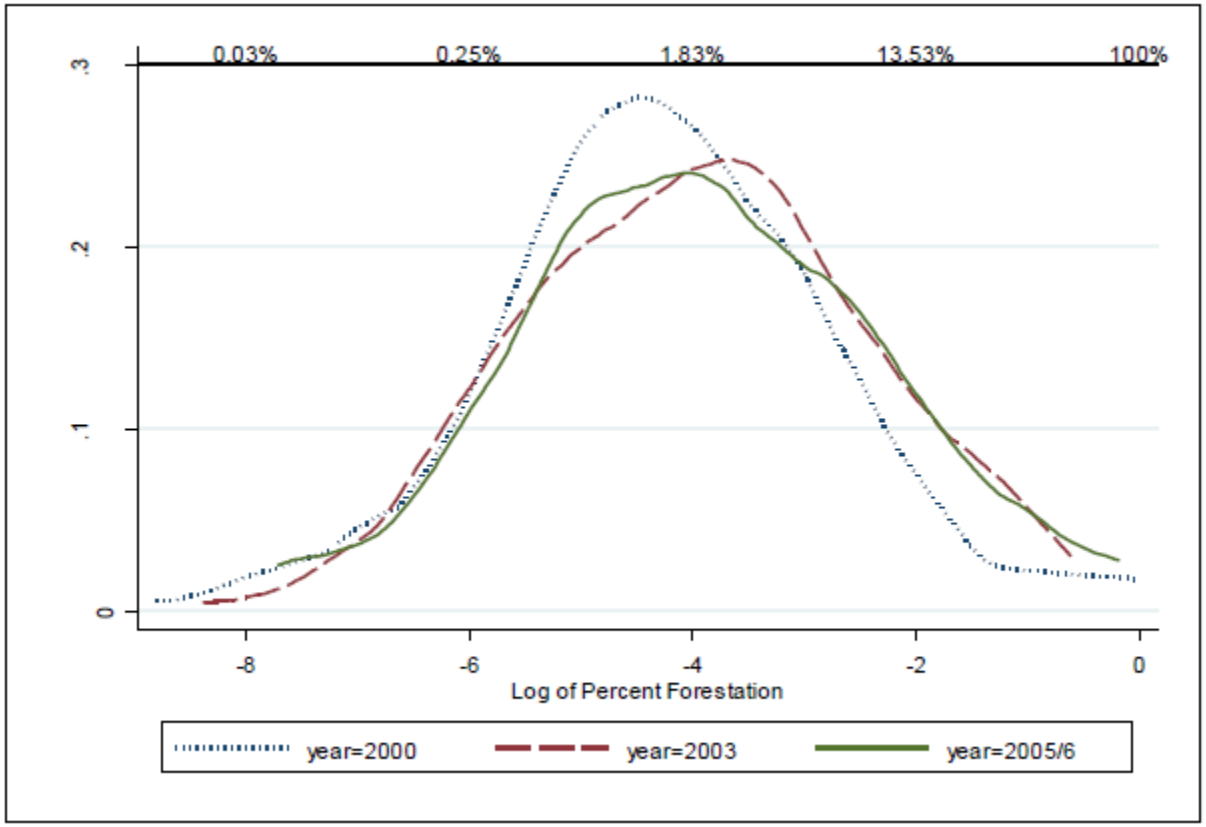
- Three questionnaires were used to gather information on:
  - 1) Reform process, forest activities, village characteristics, etc.
    - personal interviews with village leaders
    - each village gave information from three years between 2000 to 2006
  - 2) Changes in forest resource and the history of forest production
    - provided by local forestry agencies
    - On 1985,1990,1995,2000-2006
  - 3) village collective revenue and expenditure from 1985 to 2006
    - provided by township governments
    - On 1985,1990,1995,2000-2006

Table 2: Sample of Villages by Reform Status

	Villages offered the policy /total villages observed			Villages that have taken the reform /villages offered		
	Year00	Year03	Year05/6	Year00	Year03	Year05/6
Total	42/288	120/288	222/288	16/42	52/120	183/222
Fujian	12/72	72/72	72/72	6/12	34/72	70/72
Jiangxi	0/30	0/30	30/30	0/0	0/0	30/30
Zhejiang	0/36	0/36	6/36	0/0	0/0	1/6
Anhui	0/30	0/30	6/30	0/0	0/0	6/6
Hunan	6/30	18/30	24/30	3/6	7/18	16/24
Liaoning	6/30	6/30	30/30	3/6	3/6	28/30
Shandong	18/30	24/30	24/30	4/18	8/24	8/24
Yuanna	0/30	0/30	30/30	0/0	0/0	24/30

The variations are due to the delivering process of the reform policy and the villages' voting decisions.

- Distribution of log forestation in each year



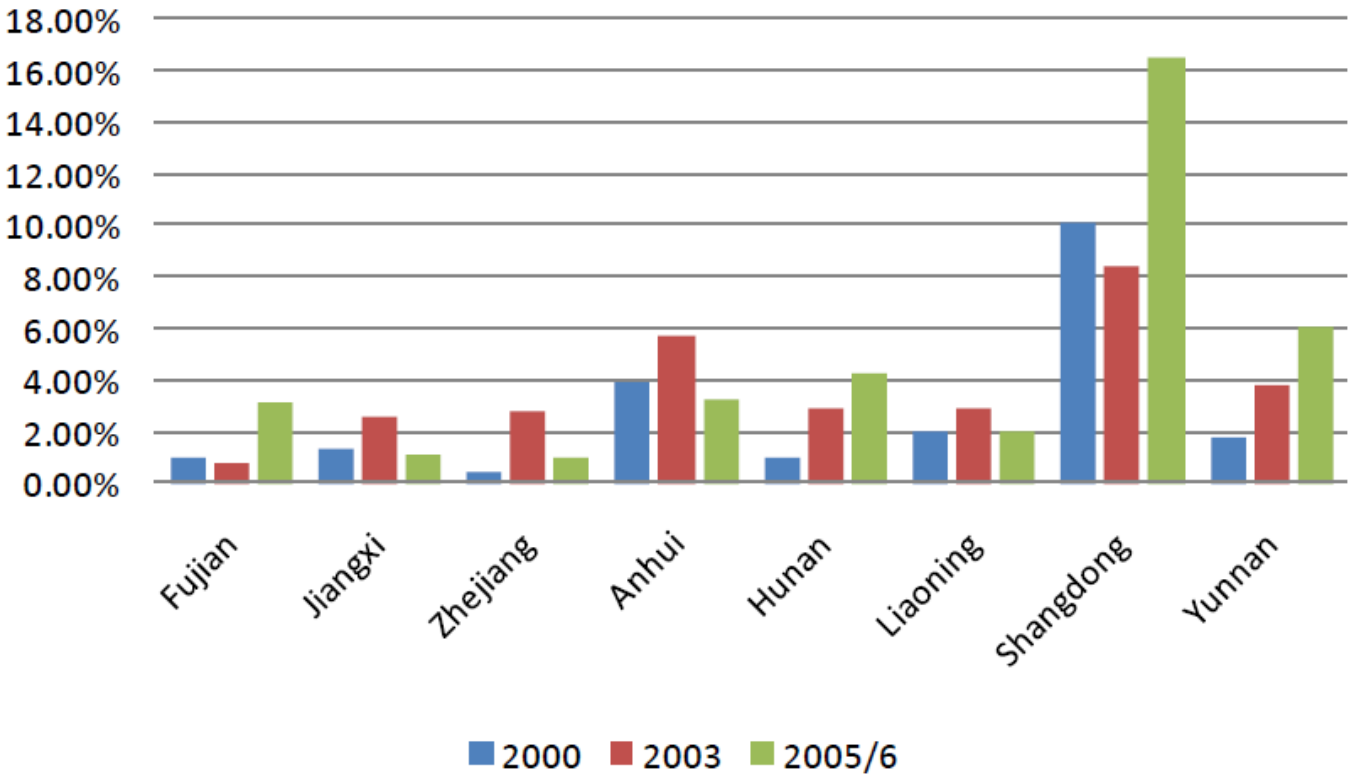
- Forestation comparison between villages with reform and those without reform

Table 4: Forestation in Percent With and Without Reform (unit: %)

	Reform = 1				
	Mean	Std. Dev.	Min	Max	N
Total	3.8778	10.31776	0	93.90625	241
Year=2000	7.29558	23.2375	0	93.90625	16
Year=2003	3.84763	8.83927	0	46.17882	52
Year=2005 and 2006	3.57077	8.78083	0	77.02465	173
	Reform = 0				
	Mean	Std. Dev.	Min	Max	N
Total	3.14849	9.4936	0	100	604
Year=2000	2.12119	8.33882	0	100	270
Year=2003	3.16983	7.22272	0	54.25318	234
Year=2005 and 2006	5.87227	15.06224	0	83.87097	100

- Variation across provinces by year

Figure 3.2: Average Percent Forestation per Village of Each Province in Each Year



Estimation

- The estimating equation is

$$fa_{icpt} = \alpha + \beta reform_{it} + c_i + \eta_t + \chi_{pt} + \varepsilon_{icpt}$$

fa_{icpt} : newly forested area in village i in county c of province p at time t

$reform_{it}$: binary variable. 1 if village i takes the reform at time t;
0 if not taking the reform before or at time t.

c_i : village fixed effects

η_t : time effects

χ_{pt} : province-by-year fixed effects

ε_{icpt} : least squared residual

- Self selection problem: It is up to the villages to decide whether to take the reform or not.

- IV: The exposure to the reform policy.

$$\text{exposure}_{ict} = 1 \text{ if county } c \text{ where village } i \text{ is}$$

$$\text{has been exposed to reform at time } t \text{ or before}$$

$$= 0 \text{ otherwise}$$

  - First stage regression shows significant coefficient of exposure.
  - How we create IV: regress timing of reform (ordered logit) on timing of exposure; by adding up, get probability of being reformed by t given exposure at t or before. Use probability as IV.

- IV justification

  - The National Documents went down to villagers step by step through provincial governments, county governments, township governments, and village leaders.

  - How fast the policy goes down to next administrative levels mainly depends on the efficiency of governments, and how they interpret the importance of the policy.

  - The governments are concerned with the median villages, which is not necessarily correlated with a specific village's characteristics.

Timing of Exposure Uncorrelated with…

	W/O province fixed effects		W/ province fixed effects	
	significant	insignificant	significant	insignificant
Revenue per m^3	x			x
Income		x		x
Distance to County		x		x
Forest/Land		x		x
Individual Forest/Forest		x		x
Volume/Forest		x		x
Ecoforest/Forest	x			x
Province-specific Constant		x		x
ALL	x			x

OLS and IV Regressions

Table 9 : OLS and Instrumental Variable Regressions: Forestation on Reform and controls.

	OLS				IV					
	1		2		3	4		5	6	
Reform	2.55496		2.73108		3.67769	7.86853		13.19488	13.27579	
	(1.05685)	**	(1.15468)	**	(4.2229)	(3.88849)	**	(9.44424)	(10.46326)	
Reform Lag			-1.05796			-6.93884		-13.52367	-13.39816	
			(2.065)			(8.12429)		(10.69509)	(10.84616)	
Land									6.20771	
									(37.5169)	
Revenue per m^3									0.00091	
									(0.01208)	
Village Fixed Effect	Y		Y		Y	Y		Y	Y	
Year Dummies	Y		Y		Y	Y		Y	Y	
Province-by-year Fixed Effects	Y		Y		Y	Y		Y	Y	
Number of Observations	845		845		845	845		581	581	

- Did the reform have any immediate effect on harvesting?
  - The opportunity to increase their immediate harvest and income.
  - However, limited by logging permits.
  - Analyzed in an instrumental variables regression, we do not find any significant effect of reform on harvest per mu.

- Predict the expected forestation for villages of each province in each year.
  - An increase in forestation of 7.9% of the forest land in the year of the reform
  - Forestation is increased by more than 200% from no reform to reform

- Short-run and long-run effect of reform are different

Thank You!