

# Effect of Chinese Crop Insurance and its improvement: Farmer's Perspective

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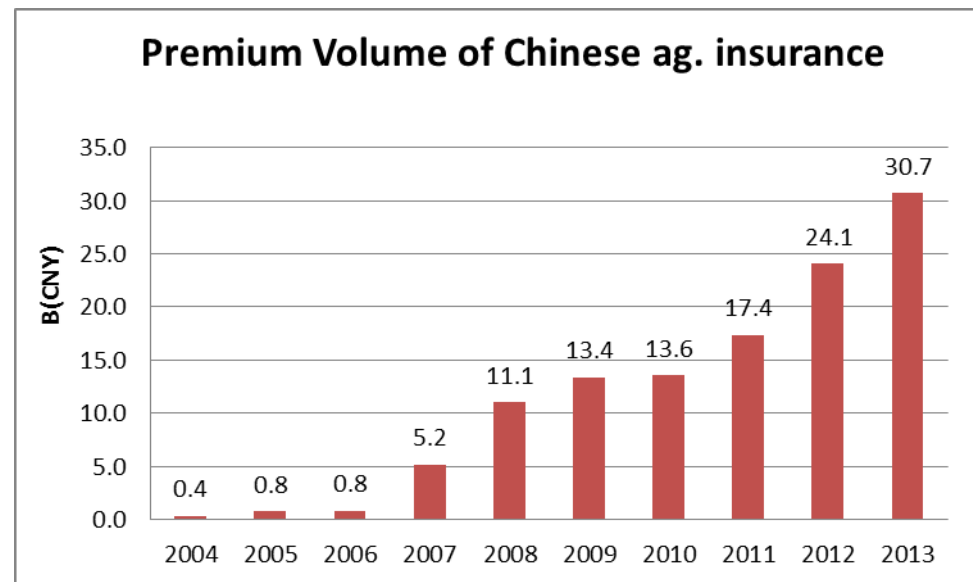
# Outline



- Background
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# Background

- ❑ As an effective and market-oriented risk management, crop insurance has been implemented/piloted in more than 100 countries (WB, 2010)
- ❑ Since 2007 when central Gov. provide premium subsidy, Chinese agriculture insurance program has made a great progress, and ranked to 2nd in the world in terms of premium volume.



# Background (Cont.)

## Brief introduction of Chinese Ag. insurance

- **Principals** Government guidance, market rules, voluntary participation and collaborative propulsion
- **Models** Decided by Provincial Government, Mostly PPP
- **Productions** Individual Insurance
- **Liability** Similar with MPCI that against yield loss risk
- **Insured Value** Only cover the physical costs during crop planting, 22% of crop value
- **Premium** Non actuarial, Uniform premium for specific crop in same province
- **Subsidy** Above 75% coming from the gov. of central, provincial and local
- **Deductible** Alter with Crop & region. Deductible and/or excess.

# Background (Cont.)

- ❑ It is clear to see that Chinese agricultural insurance should be improved in several aspects, such as ratemaking.
- ❑ Effect evaluation is an important work in the process of risk management, and has significant value for improving agricultural Insurance scheme.
- ❑ But, Studies on this issue are not enough

# Objective



- To evaluate the effect of Chinese crop insurance program in farmers' perspective
- To provide suggestions for the improvement of Chinese crop insurance by simulating the effect of modified insurance scheme

# Method

The basis idea to evaluate the effect of Chinese crop insurance and its improvement is to compare farmers' welfare in alternative scenarios, following the four steps.

Step 1-- representative farmers in county scale were calibrated by detrending, deflating and aggregating the datasets of individual farmers

- Rural CPIs are adopted to deflate all monetary variables such as price, income
- Log-linear trend are estimated to get the annual percentage growth of yield at the county level

$$\text{Log}(Y_t) = a + b * t + \varepsilon \quad Dy_{it} = y_{it} + y_{i1} * (1 - (1 + b)^{t-1})$$

- The statistic variables such as mean, cv are aggregated at county level by crops, and the correlation coefficient of yield and price by crops are also calculated.

# Method (Cont.)



Step 2--Simulation model were developed according to the characteristics of representative farmer with the assumption of joint kernel distribution and by using the method of Latin Hypercube Sampling

- Software program \_SIMETAR are used in this part.



# Method (Cont.)

Step 3-- Effect of Chinese crop insurance were evaluated by comparing the certainty equivalent (CE) of farmer's expected utility with/without crop insurance

- Power Utility function with CRRA equals to 2, 4, 6 are adopted in this paper

$$U(w_0 + w) = \frac{1}{1-\theta} (w + w_0)^{(1-\theta)}$$

$$w = w_0 + \sum P_i * Y_i * A_i + \text{farminc}_{\text{other}} + \text{off} + \text{Trincome} + \text{Zcincome} - \text{cost} + \text{Ind} - \text{Pre} + \text{sub}$$

$$CE = \{(1 - \theta)E[U(w_0 + w)]\}^{\left(\frac{1}{1-\theta}\right)} - W_0$$

# Method (Cont.)



Step 4-- Potential effect of modified crop insurance schemes were simulated to analyze the way of improving Chinese crop insurance

- Modified crop insurance schemes in this study are refer to
  - Ratemaking accurately
  - Increasing insured value
  - and flexible premium subsidy

# Data

1004 individual farmers coming from 20 counties of 10 main grain provinces are selected as the sample in t



图 5-1 样本农户地理位置分布 (点为样本农户所在县市)

# Data (Cont.)

## Description of Sample data

Province	Farm Type	Key Crops	# of Counties	# of farmer	Span
HB	Crop	Soybean, Corn, Cotton, Oilseed, Wheat	2	167	2003–2009
JL	Crop	Corn	2	53	2003–2008
HLJ	Crop	Soybean, Corn	2	74	2003–2008
JS	Crop	Soybean, Corn, Oilseed, Rice, Wheat	2	98	2003–2008
SD	Crop	Soybean, Corn, Cotton, Oilseed, Wheat	1	39	2003–2008
HN	Crop	Soybean, Corn, Cotton, Oilseed, Wheat	5	282	2003–2009
HuB	Crop	Corn, Oilseed, Rice, Wheat	1	43	2003–2008
SC	Crop	Soybean, Corn, Oilseed, Rice, Wheat	2	74	2003–2008
SX	Crop	Corn, Wheat	2	79	2003–2008
XJ	Crop	Corn, Cotton, Wheat	1	95	2003–2008
Total			20	1,004	2003–2008 (9)

**Source:** Individual farmers' data are obtained from China Rural Fixed Observation Office, MOA, China

# Data (Cont.)

- 40 variables are collected. Among them, 23 are coming from questionnaire NH4.1 and 17 from NH7

## 1.粮食作物生产经营情况

表 号: 农市(农研户)4表,  
制表机关: 农业部,  
批准机关: 国家统计局,  
批准文号: 国统制[2008]27号,  
有效期: 两年

省(自治区、直辖市) 地(市、州、盟) 县(区、市、旗)  
行政区划代码: □□□□□□□□□□  
综合机关名称: 200年

	粮 食 作 物					
	小麦	稻谷	玉米	大豆	薯类	其他
	NH4 A1	NH4 A2	NH4 A3	NH4 A4	NH4 A5	NH4 A6
1.播种面积(亩)	□	□	□	□	□	□
2.实际收获面积(亩)	□	□	□	□	□	□
3.总产量(千克)	□	□	□	□	□	□
4.总收入(元)	□	□	□	□	□	□
5.种子种苗费(元)	□	□	□	□	□	□
6.农家肥折价(元)	□	□	□	□	□	□
7.化肥费用(元)	□	□	□	□	□	□
8.农膜费用(元)	□	□	□	□	□	□
9.农药费用(元)	□	□	□	□	□	□
10.水电及灌溉费用(元)	□	□	□	□	□	□
11.畜力费(元)	□	□	□	□	□	□
12.机械作业费用(元)	□	□	□	□	□	□
13.固定资产折旧及修理费(元)	□	□	□	□	□	□
14.小农具购置费(元)	□	□	□	□	□	□
15.土地租赁费用(元)	□	□	□	□	□	□
16.其他费用(元)	□	□	□	□	□	□
17.投工量(日)	□	□	□	□	□	□
18.其中:雇工(日)	□	□	□	□	□	□
19.雇工费用(元)	□	□	□	□	□	□
20.副产品价值(元)	□	□	□	□	□	□

## (七) 家庭全年收支情况

表 号: 农市(农研户)7表,  
制表机关: 农业部,  
批准机关: 国家统计局,  
批准文号: 国统制[2008]27号,  
有效期: 两年

省(自治区、直辖市) 地(市、州、盟) 县(区、市、旗)  
行政区划代码: □□□□□□□□□□  
综合机关名称: 200年

	单位	代码	数值
			□□□□□□□□□□
家庭全年总收入	元	NH7-01	□□□□□□□□□□
一、家庭经营收入	元	NH7-02	□□□□□□□□□□
其中: 现金性收入	元	NH7-03	□□□□□□□□□□
二、乡村干部、教师工资收入	元	NH7-04	□□□□□□□□□□
三、本地从业工资性收入	元	NH7-05	□□□□□□□□□□
四、外出从业工资性收入	元	NH7-06	□□□□□□□□□□
五、租赁收入	元	NH7-07	□□□□□□□□□□
其中: 耕地转包收入	元	NH7-08	□□□□□□□□□□
林地转包收入	元	NH7-09	□□□□□□□□□□
六、利息、股息、红利收入	元	NH7-10	□□□□□□□□□□
其中: 从集体得到的收入	元	NH7-11	□□□□□□□□□□
从农民专业合作社得到的收入	元	NH7-12	□□□□□□□□□□
七、征地补偿款	元	NH7-13	□□□□□□□□□□
八、离退休金、养老金	元	NH7-14	□□□□□□□□□□
九、其他非借贷性收入	元	NH7-15	□□□□□□□□□□
1. 从政府得到的收入	元	NH7-16	□□□□□□□□□□
其中: 各种救济、救灾、抚恤金	元	NH7-17	□□□□□□□□□□
退耕还林、还草款	元	NH7-18	□□□□□□□□□□
粮食直接补贴	元	NH7-19	□□□□□□□□□□
良种补贴	元	NH7-20	□□□□□□□□□□
购买生产资料综合补贴	元	NH7-21	□□□□□□□□□□
购置和更新大型农机具补贴	元	NH7-22	□□□□□□□□□□
家电下乡补贴	元	NH7-23	□□□□□□□□□□
汽车摩托车下乡补贴	元	NH7-24	□□□□□□□□□□
2. 城市亲友赠送收入	元	NH7-25	□□□□□□□□□□
3. 家庭非常住人口寄回或带回	元	NH7-26	□□□□□□□□□□
4. 保险年金收入	元	NH7-27	□□□□□□□□□□
5. 医疗报销收入	元	NH7-28	□□□□□□□□□□



## Insured value and premium of crop Insurance program in sample provinces

	Insured value per MU (CNY)						Premium Ratio (%)						
	Soybean	Corn	Cotton	Oilseed	Rice	Wheat	Soybean	Corn	Cotton	Oilseed	Rice	Wheat	
JS			550	440	660	560	333		4.5	4.5	4.5	4.5	4.5
SD			400	600	400		500		2	3	4		1.6
HN	142		301	370	470	334	383	6	6	6	6	6	6
SC			300		280	300	300		7		5.5	7	7
SX			280	400	300	300	300		7	6	5	5	5
HB	300		260	400	350	300	300	6	7	6.5	4	6	5
JL	166.67		200		133.33	266.67		8	10		7	8	
HLJ	120		145			200	125	12.52	10.35			7.5	11.97
HuB			300	400	200	200			7	7	5	7	
XJ			300	600	400	600	400		7	7	5		5

# Results : Effect of Chinese Crop Insurance

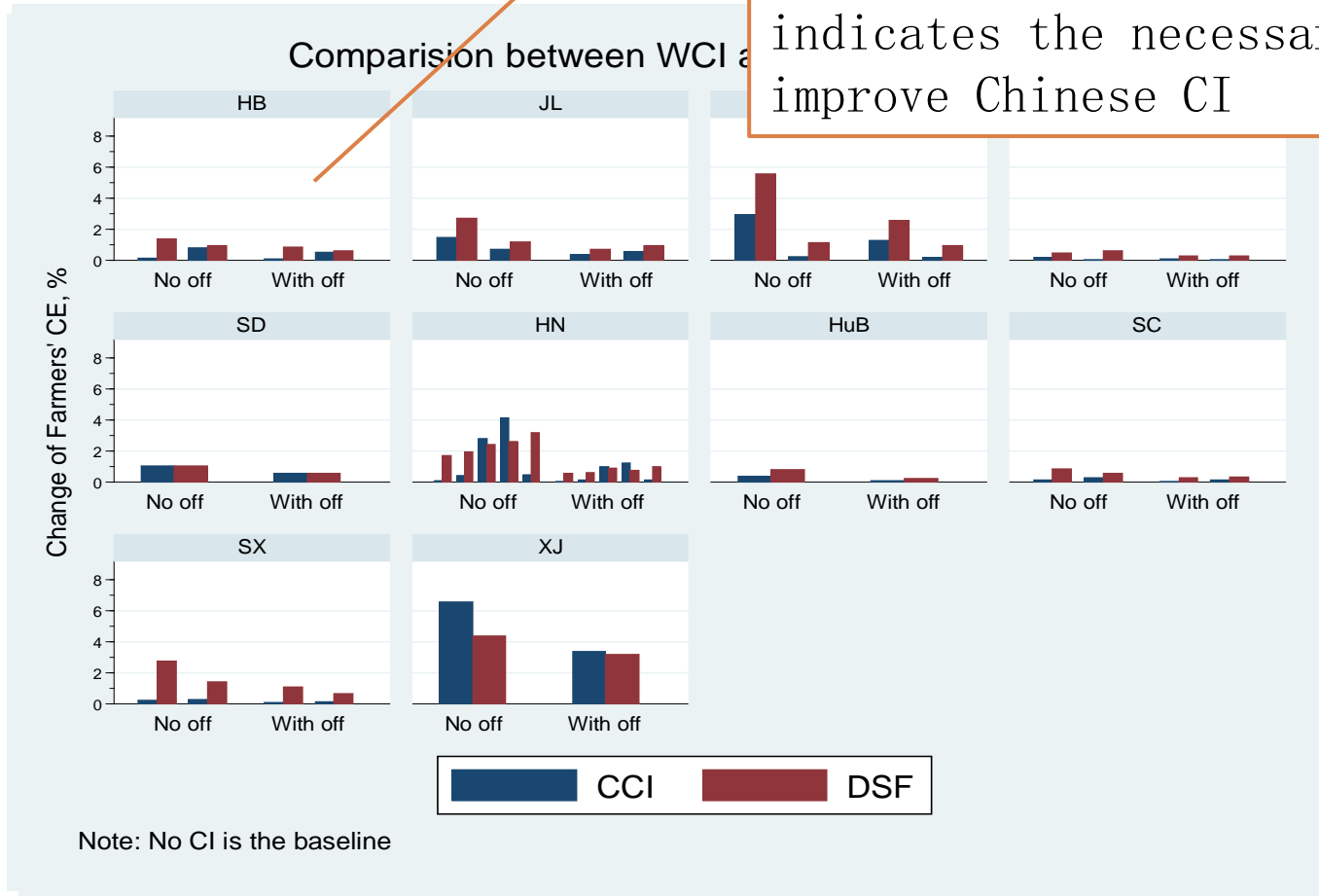
Impact of Crop Insurance on farmer's welfare (%, Off-farm incomes are not considered)													
	Code of County												
	1	2	3	4	5	6	7	9	10	11	12	14	Total
HB			0.15			0.79							0.47
JL	1.37			0.66									1.01
HLJ	2.52											0.2	1.36
JS				0.16			0.01						0.08
SD										0.99			0.99
HN		0.08		0.42		2.73			4.11		0.47		1.56
HuB				0.38									0.38
SC			0.13	0.27									0.2
SX						0.25		0.28					0.27
XJ					4.59								4.59
<b>Total</b>	1.94	0.08	0.14	0.38	4.59	1.26	0.01	0.28	4.11	0.99	0.47	0.2	1.03

1. Current CI with low coverage & rough pricing has no doubt increased farmer's welfare, 1.03% in average.
2. Farmers in main grain provinces will benefit more (> 1%) with CI.
3. The impact of crop insurance on farmer's welfare is appropriated as the income of grain only account 10%~30% to agri.

income



It shows that all farmers expect 2 in HN are prefer DSF consistently. The fact indicates the necessary to improve Chinese CI



Where, DSF means directly subsidy farmer instead of by crop insurance, with the subsidy amount keep fixed.

# Results : Effect of Pricing CI Accurately

Actuarial premium of Chinese CI and its comparison with current premium by counties

Province	Code of County	Premium in Practice (%)						Acturaial Premium (%)					
		soybean	corn	cotton	oilseed	rice	wheat	soybean	corn	cotton	oilseed	rice	wheat
HB	3	6	7	6.5	4	6	5	0.80	0.64	1.35	4.15		0.73
	6	6	7	6.5	4	6	5	11.25	13.25	2.11	3.65		15.38
JL	1	8	10		7	8		0.25	7.95		0.25	0.12	
	4	8	10		7	8		0.43	10.69		0.03	1.55	
HLJ	14	12.52	10.35			7.5	11.97	1.32	6.18			3.84	0.10
	1	12.52	10.35			7.5	11.97	12.50	18.30			8.33	0.00
JS	4		4.5	4.5	4.5	4.5	4.5		3.81	2.70	3.67	4.04	3.01
	7		4.5	4.5	4.5	4.5	4.5	0.19	0.18	2.13	2.79	5.51	

1. The premium in practice of Chinese CI is too rough, and the linkage with risk is weak.

2. Counties in the sample provinces do face different risk exposures, so pricing

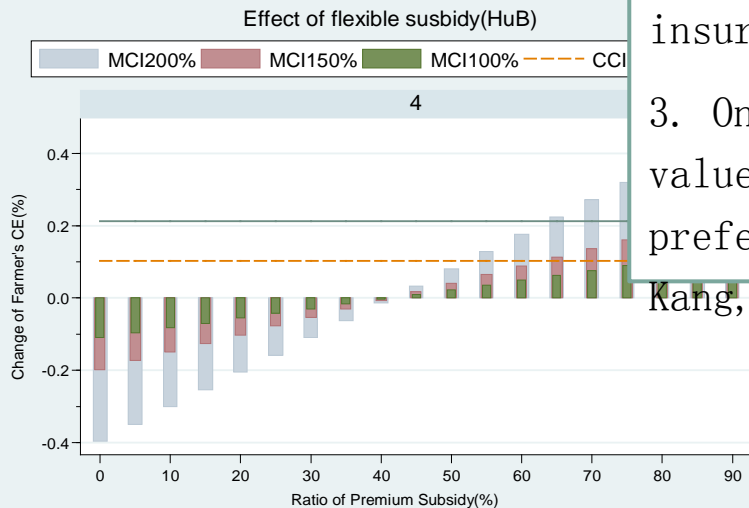
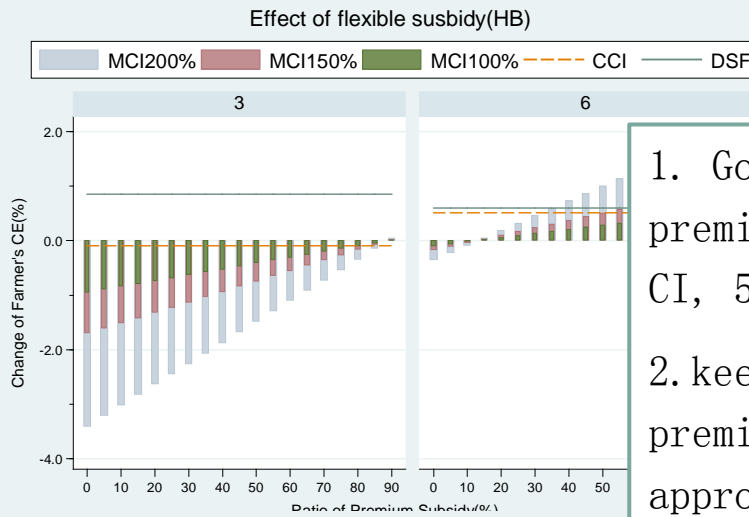
Chinese CI in county-level should be conducted as soon as possible.

SC	3	7		5.5	7	7		0.62	0.34	1.71	5.69		
	4	7		5.5	7	7		15.09		13.35	14.09	15.25	
SX	9	7	6	5	5	5		13.46	0.01	0.58	2.35	6.55	
	6	7	6	5	5	5		3.69	0.24	1.19		2.99	
XJ	5	7	7	5		5		4.31	7.42	18.57		4.16	

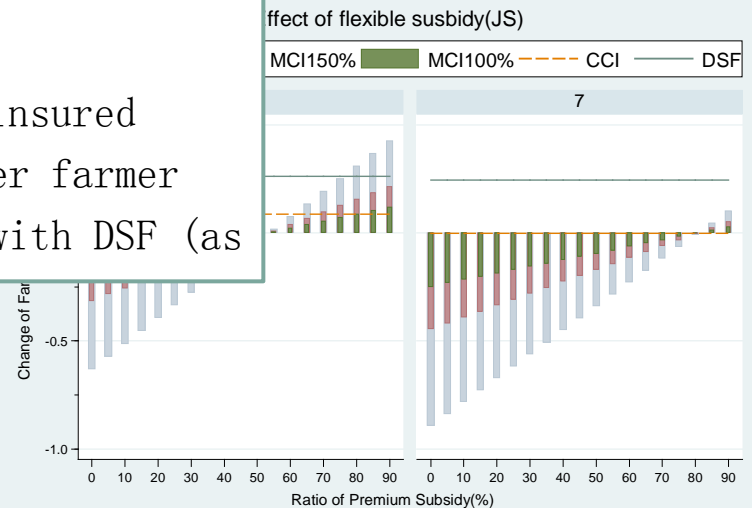
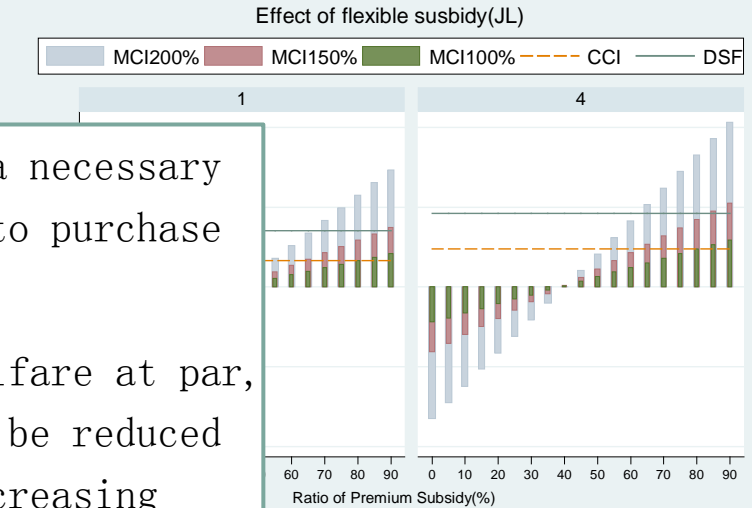
		Gr of high risk	Gr of low risk	Total
HB	Welfare chagne (%)	-0.11	0.19	0.04
	Subsidy change (%)	71.33	-88.22	-8.45
JL	Welfare chagne (%)	-0.02	0.04	0.01
	Subsidy change (%)	6.90	-20.50	-9.08
HLJ	Welfare chagne (%)	-0.13	0.09	-0.02
	Subsidy change (%)	21.81	-40.29	-9.24
JS	Welfare chagne (%)		0.02	0.02
	Subsidy change (%)		-27.87	-27.87
SD	Welfare chagne (%)	-0.94		-0.94
	Subsidy change (%)	667.70		667.70
HN	Welfare chagne (%)	-0.13	0.03	-0.10
	Subsidy change (%)	78.05	-14.17	63.25
HuB	Welfare chagne (%)		0.03	0.03
	Subsidy change (%)		-50.59	-50.59
SC	Welfare chagne (%)	-0.11		-0.11
	Subsidy change (%)	148.45		148.45
SX	Welfare chagne (%)	0.00		0.00
	Subsidy change (%)	12.67		12.67
XJ	Welfare chagne (%)		0.12	0.12
	Subsidy change (%)		-15.95	-15.95
Total	Welfare chagne (%)	-0.15	0.05	-0.09
	Subsidy change (%)	108.78	-32.76	64.98

1. Pricing CI accurately will not only increase farmers welfare but also can low gov. subsidy amount for 50% of sample provinces (HB, JL, JS, HuB, XJ).
2. HLJ will also benefit if pricing accurately
3. The overall effect of pricing CI seems not positive but mostly because of SD who adopted a very low premium in practice.
4. Generally, pricing CI has very positive effect (7 of 10 prov. will benefit)

# Results : Effect of flexible subsidy & increasing insured Value



1. Gov. subsidy is a necessary premise for farmer to purchase CI, 52% in average.
2. keep farmer's welfare at par, premium subsidy can be reduced appropriately by increasing insured value.
3. Only increasing insured value would not make farmer prefer CI compared with DSF (as Kang, 2012)

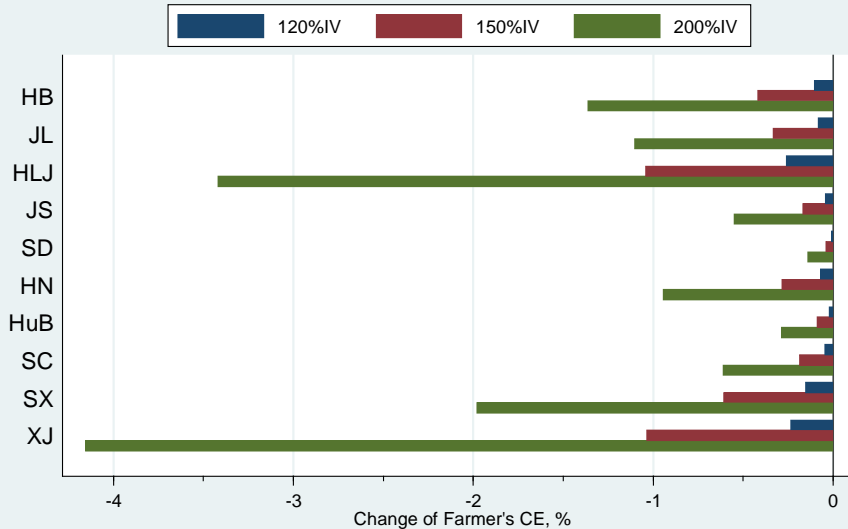


Note: No CI is the baseline

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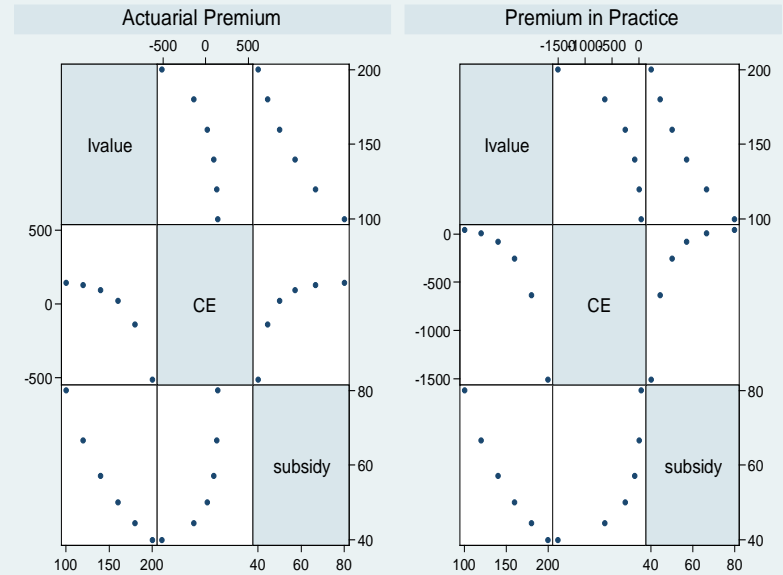
### Effect of increasing Insured Value(CRRA=2)

---Keep subsidy amount constant



Note: CCI is the baseline

### Insured Value, Subsidy and farmer's Welfare(HB)



When subsidy fund is fixed

- 1) increasing insured value will reduce farmer's CE, not prompting.
- 2) Farmers welfare is positive with subsidy rates, but negative with IV/coverage

And it shows the policy of “low coverage, more participators” is appropriated in China

# Summary

- Chinese CI in current status do increase farmer's welfare, but need to be improved.
- Pricing accurately by county is necessary and will benefit most farmers.
- Increasing the coverage capability will work provided the subsidy rates are increasing at the same time.
- If the subsidy amount is constant, farmer prefer higher subsidy, which shows the rational of Chinese CI policy of "low coverage, more participators"
- 52% of CI premium should be subsidized in average to motivate farmer's to be involved in China



# Thanks for your attention!

Comments and questions  
are welcome to

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