China's new rural income support policy:

Impact on grain production and rural income inequality

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Abstract

The impact of China's new rural income support policy and recent price trends on grain production and rural income inequality is assessed for two villages with different degrees of market access in Northeast Jiangxi Province. Two village-level general equilibrium models are used to analyze household decision making and interactions between households within these villages. Parameter estimation and model calibration is based on data collected during an extensive survey held in these villages in the year 2000. The household classification used in these models allows us to draw conclusions that are relevant for many other villages and regions in China. Simulation results show that the income support policy does not reach its goal of promoting grain production. The increased incomes allow farm households to buy more inputs for livestock production, which is a more profitable activity. Moreover, because leisure is valued higher with increasing incomes, farmers tend to switch to less intensive rice production. Selling of rice outside the villages declines more than rice production due to the higher own consumption of households. We further find that agricultural tax abolition has a much larger impact on incomes and production than the direct income support in 2004. Both measures tend to reduce income inequalities within villages, because the richest household groups (who are more involved in off-farm employment) benefit less. Tax abolition, however, tends to widen income inequalities between villages, because the absolute income gain is much larger in relatively rich villages. The switch from rice production towards more profitable activities like livestock production is therefore much stronger in these villages.

1. Introduction

Since the beginning of 2004, the Government of the P.R. China has replaced its centuries-old policy of taxing agriculture by a new policy aimed at subsidizing agriculture and stimulating rural incomes. To this end, agricultural taxes – standing at around 8 percent of agricultural incomes – were drastically reduced. By now they are abolished in most provinces. In addition, farmers growing grain receive a direct income subsidy, new seed varieties and mechanization are subsidized, and large public investments are made in agriculture and rural infrastructure. The main purpose of this policy is to raise rural incomes while at the same time promoting grain production (Gale et al. 2005).

During the first year of its introduction, the policy seems to have met with reasonable success. Per capita real annual net incomes of rural households increased by 6.85% in 2004, while the urban-rural income gap slightly decreased from 3.23 in 2003 to 3.20 in 2004 (NBS 2005a: Tables 9-3 and 10-2). The population in absolute poverty in rural areas (with annual per capita net income below RMB 668) declined from 29.0 to 26.1 million in 2004 (NBS 2005b). Total grain output increased by 9.0% to 469.5 million tons in 2004, after steadily declining from 512.3 to 430.7 million tons from 1998 to 2003 (NBS, 2005a: Table 13-17).

The rise in grain production was partly a result of the rapidly rising grain prices since October 2003 and favorable weather conditions in 2004. This raises the question to what extent the new rural income support policy has contributed to the increase in grain production and the rise in rural incomes, and to what extent other factors were responsible for these achievements. To analyze this question, we need to assess how farm households respond to rising grain prices and to the income support measures, under constant weather conditions. Farm household responses to price changes and income policy measures depend on the available resources within households for earning (on-farm or off-farm) incomes and on the

degree to which farm households are integrated into markets. The outcomes may therefore differ considerable between different groups of farm households and between different villages and regions. Insights into the groups that gain relatively more (or less) from the new rural income support measures, and the consequences for income inequality within rural areas, may provide important inputs into future policy making on reducing income gaps and avoiding social unrest.

The objective of this paper is therefore to examine farm household responses to recent price changes and the new rural income support measures and to assess the resulting effects on rural income inequality and grain production. To reach this objective, we run simulations with a village computable general equilibrium (CGE) model that is applied to two villages in Northeast Jiangxi Province. These villages differ fundamentally in their degree of market access. There is convincing empirical evidence that agricultural commodity markets in China have become highly integrated (Park et al., 2002; Huang et al., 2004). Transaction costs, however, differ considerably between villages with good market access and villages located in remote areas. Moreover, markets for production factors such as agricultural land, labor and credit face many institutional obstacles in China and remain underdeveloped in rural areas (Bowlus and Sicular, 2003; Zhang and Tan, 2004). These market imperfections have important implications for farm household choices between grain production and high value-added production, and hence for the income gains of different household groups. Model simulations of the impact of price changes and income support measures for two villages with different market access conditions allows us to assess such differences in household responses, income gains, and grain production levels. The classification of households within these villages is based on the resources that they have for either earning agricultural incomes and for earning off-farm incomes. Insights obtained from such an analysis are relevant for many other villages and regions in China.

The structure of the paper is as follows. Background information on the two villages and the method of data collection is provided in section 2. Section 3 describes the structure of the village CGE model and the scenarios that are used for the model simulations. Section 4 presents and interprets the results of the model simulations, while section 5 summarizes the major conclusions.

2. Description of the research sites

The two villages selected for the study are Gangyan village in Yanshan County and Shangzhu village in Guixi City, both in Northeast Jiangxi province. Gangyan village is located in a plain area at about 20 km distance from the county capital. Almost all arable land (97%) in this village is irrigated. Shangzhu village is located in a remote and hilly/mountainous area close to the border with Fujian Province. Rice is the main crop in both villages, with most rice land in Gangyan producing two crops a year and most rice land in Shangzhu village producing only one crop per year. An extensive household survey, to collect all data necessary for building village social accounting matrices (SAMs) covering the year 2000, was held in August 2000 and January 2001. A stratified random sample was used for selecting the households, with the hamlets (or 'natural villages') within each village forming the strata. In total, 168 households were interviewed in Gangyan village and 109 households in Shangzhu village, representing around 23% of the households in both villages.

Basic information on the two selected villages is presented in Table 1. Per capita income in the year 2000 was only 1,042 RMB (= $126) in Shangzhu village. In Gangyan village, it was 78% higher. Rice yields in Shangzu village are about 15% below the yields in Gangyan village. Off-farm incomes are an important share of household incomes, contributing 45% and

41% of household incomes in Gangyan village and Shangzhu village, respectively. Agricultural tax payments make up around 4% of farm incomes.

Table 1. Characteristics of the two selected villages, year 2000

	Gangyan	Shangzhu
Households	730	472
Sample size	168	109
Accessibility	Close to city	Remote
Land characteristics	Plain	97% upland
Irrigated land per household (mu)	6.06	5.06
Irrigated land / farmland	97%	86%
One-season rice area / total rice area	18.5%	71.6%
Major crops	Rice, vegetables, sugarcane	Rice, bamboo, bamboo shoots
Rice yield (kg/ha)	4,629	3,950
Fertilizer use in rice (kg/ha)	759	481
Income per capita (RMB)	1,854	1,042
Off-farm income share (%)	45.4	40.7
Tax payments per household (RMB)	492	227
Tax / household income (%)	5.9	5.0
Agricultural tax per household (RMB)	382	186
Agricultural tax / farm income (%)	4.5	3.8

Source: Household survey

3. Methodology

Simulations of the impact of recent price changes and farm income support policy are made with a village-level CGE-model which allows for simultaneous decision making on production, consumption and labor supply by farm households. The model applies a macro-level general equilibrium model structure, but is modified in such a way that the modeled household behavior is fully compatible with the rural household literature (Singh et al., 1986). Nonseparability of household decisions is build into the village-level equilibrium model using an approach suggested by Löfgren and Robinson (1999). The result is a hybrid village model that accounts for interactions among households within the village, while preserving individual rationality. The position of households in markets as net buyers, autarkic, or net sellers is made endogenous in the model through the use of mixed complementarity

constraints. Both the nonseparability of decision making and the endogeneity of the household position are departures from existing village models like those in Taylor and Adelman (1996).

Three commodity groups are distinguished in the model:

- Tradables: Are tradable outside the village; their prices are exogenous to the village.

- Village nontradables: Are tradable only within the village; their prices depend on demand and supply within the village.

- Household nontradables: Are not tradable; their (shadow) prices depend on demand and supply of the household.

Data from the household survey and insights obtained during the fieldwork are used for classifying commodities. Traction services, agricultural labor and locally produced consumption goods are classified as village nontradables, while arable land, manure and crop residues and, in Shangzhu village, forest land and fuelwood, are household nontradables. All the other commodities in the model are tradables. Village prices for agricultural labor and locally produced consumption goods and are assumed to be fixed, resulting in demand-driven markets and non-zero profits; traction services is governed by an endogenous village price.

Four household groups are distinguished in each village, based on the availability of resources for earning agricultural income and/or resources for earning off-farm income. The ownership of draught power (animals or tractors) was identified as the main resource for earning agricultural incomes in both villages. Explorative data analysis further indicates that the presence of a link outside the province (defined as the presence of a migrated household member or a relative sending remittances) is the most important resource for earning non-agricultural incomes in Gangyan village, while in Shangzhu village it is the number of educated household members (defined as members with more than four years schooling).

Table 2. Classification of household groups in the two villages.

		Household group			
	Village	1	2	3	4
Gangyan	Owns draught power:	No	Yes	No	Yes
	Link outside province:	No	No	Yes	Yes
	Number of households	18	23	59	68
Shangzhu	Owns draught power:		No	Yes	Yes
	Educated members	None	≥ 1	1 or 2	≥ 3
	Number of households	16	14	35	44

Table 2 shows the resulting classification. The four possible combinations of draught power ownership (yes/no) and presence of a link outside the province (yes/no) define the four groups in Gangyan village. In Shangzhu village, the first group consists of households with no educated household members; some of these households own draught power, others do not. The households with at least one educated household member are sub-divided into three groups. The first group consists of households owning no draught power, the second of households owning draught power and having one or two educated household members, while the last group consists of households owning draught power and having three or more educated members. Using this classification, a village SAM was constructed for each village. These SAMs were used for calibrating the village CGE model for each village.[1]

Table 3. Description of scenarios used in village model simulations

	Scenario 1	Scenario 2	Scenario 3
Price changes 2000-2004	Rice: +36.6%	Rice: +36.6%	Rice: +36.6%
	Pork: −2.8%	Pork: −2.8%	Pork: −2.8%
	Fertilizer: +13%	Fertilizer: +13%	Fertilizer: +13%
	CPI: +4.9%	CPI: +4.9%	CPI: +4.9%
Income support policy		10 Yuan per mu rice land	Full abolishment of agricultural tax

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[1] A detailed description of the structure of the model and the calibration of the model for Gangyan can be found in Kuiper, 2005

Three scenarios are run with the models. They are described in Table 3. The first scenario assesses the impact of price changes from 2000 until August 2004.[2,3] Considerable price changes took place over that period in Jiangxi Province (and the rest of China). Rice prices initially declined somewhat, but increased rapidly since the autumn of 2003, resulting in a price increase of more than 35% over the entire period. Prices of fertilizers, the main variable input in crop production, increased by about 13% during the same period, while pork prices declined by almost 3%. The inflation rate (as measured by the consumer price index) was almost 5% during this period. The first scenario simulates the impact of these price changes on household incomes, production levels and input use. The second and third scenario add the two main components of the rural income support policy, direct subsidies to grain farmers and agricultural tax cuts, to the price changes simulated in scenario 1. Farmers in Jiangxi Province received a subsidy of 10 Yuan per mu in 2004 for each plot with early rice, late rice or one-season rice (Gale et al., 2005: Table 2). The impact of this direct income support policy is simulated in scenario 2. Agricultural taxes have been cut in all provinces in China since the beginning of 2004 and were abolished in most provinces (including Jiangxi province) by the end of 2005. Scenario 3 simulates the impact of full tax abolition. By comparing the results for these three scenarios, we can separate household responses to the rapid price increases since the autumn of 2003 from the responses to the main new income support measures implemented in 2004 (under constant weather conditions).

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[2] This scenario is based on trends between 2000 and August 2004 for Jiangxi as whole. The authors would like to thank Nie Fengying of the CAAS Scientech Information and Documentation Center for providing us with the price data for Jiangxi Province.
[3] Model simulation runs with price trends until 2005, that have recently become available, will be presented at the IAAE Conference.

4. Simulation results

The results for scenario 1 are shown in Tables 4 and 5. The income gains from the price changes from 2000 to 2004 are about two percentage points smaller in the remote village (Shangzhu) than in the village with good market access (Ganyan), as can be seen from Table 4. In both villages, the household groups that possess resources for off-farm employment and have limited agricultural resources (group 3 in Gangyan and group 2 in Shangzhu), gain substantially less than the other three household groups. Since these are the richest groups in both villages, income inequality was reduced substantially by the price changes that occurred since 2000.

Table 4. Income results for scenario 1 (Price change scenario)

Village	Household group	1	2	3	4	Total
Gangyan	Owns draught power:	No	Yes	No	Yes	
	Link outside province:	No	No	Yes	Yes	
	Income 2000 (RMB)	6,204	7,273	9,098	8,997	8,497
	Increase Aug. 2004	27.0%	33.4%	11.8%	24.0%	20.7%
Shangzhu	Owns draught power:		No	Yes	Yes	
	Educated members	None	≥ 1	1 or 2	≥ 3	
	Income 2000 (RMB)	2,861	6,409	5,114	4,969	4,891
	Increase Aug. 2004	21.1%	7.0%	24.6%	17.6%	18.5%

Table 5 shows the changes in production activities resulting from the price changes. In Gangyan, all four income groups expand their production of two-season rice at the expense of one-season rice, raising pigs and (to a lesser extent) growing other crops. Due to the intensification of rice cultivation, the demand for traction services increases and as a result the price of this village nontradable goes up by 57%. This explains why the two household groups possessing oxen and tractors gain relatively more than the two other household groups. In Shangzhu, on the other hand, rice production is strongly dominated by one-season rice, and expanding two-season rice is not a realistic option. The rapid price increase for rice therefore

causes a very significant increase in one-season rice production at the expense of perennials and pigs (and small livestock). The area of irrigated land is constant in the model (see above), so the increase in rice production comes purely from increased input use. The price of traction services increases by 16% in this village, which adds to the income gains of the households possessing oxen.

Table 5. Production results for scenario 1 (Price change scenario)

Village	Household group	1	2	3	4	Total
Gangyan	Owns draught power:	No	Yes	No	Yes	
	Link outside province:	No	No	Yes	Yes	
	One-season rice	−54	−72	−61	−73	−68
	Two-season rice	23	39	34	39	36
	Other crops	−7	−9	−11	−11	−11
	Pigs	−51	−79	−46	−55	−53
Shangzhu	Owns draught power:		No	Yes	Yes	
	Educated members	None	≥ 1	1 or 2	≥ 3	
	One-season rice	58	132	95	90	91
	Two-season rice	4	−59	−53	−45	−42
	Other crops	−3	−4	−2	−22	−10
	Perennials	−69	−16	−83	−50	−61
	Pigs, chicken, ducks	−15	−48	−43	−43	−42

Note: Data in table are percentage changes with respect to the base scenario

Scenario 2 simulates the combined impact of the direct income subsidy to grain farmers and the same price changes as in scenario 1. The direct income subsidy is paid in Jiangxi province on the basis of grain areas reported for taxation (Guo, 2005). It therefore adds to the incomes of rural households, but is not directly related to rice planting decisions. The simulation results of this scenario are compared with the outcomes of scenario 1. Table 6 shows the impact on income and production activities. The policy has only a modest impact on incomes. The average income increase in Gangyan is 1.6% and in Shangzhu it is 1.3%. Again the richest household groups gain least from it, so the income support policy reduces inequality in both villages indeed.

Table 6. Income and production results for scenario 2 (Price change & direct income payment scenario)

Village	Household group	1	2	3	4	Total
Gangyan	Owns draught power:	No	Yes	No	Yes	
	Link outside province:	No	No	Yes	Yes	
	Household income	2.1	2.1	1.0	1.7	1.6
	One-season rice	2.0	2.2	1.0	1.8	1.6
	Two-season rice	−0.3	−0.2	−0.1	−0.2	−0.2
	Other crops	0.3	0.2	−0.3	0.4	0.1
	Pigs	1.9	2.4	−0.3	4.5	1.5
Shangzhu	Owns draught power:		No	Yes	Yes	
	Educated members	None	≥ 1	1 or 2	≥ 3	
	Household income	1.6	0.7	1.2	1.4	1.3
	One-season rice	−0.5	−0.1	−0.6	0.1	−0.2
	Two-season rice	0.3	−1.6	1.3	2.0	0.9
	Other crops	0.9	0.6	0.8	0.5	0.7
	Perennials	−3.8	−0.1	1.0	−1.3	−0.7
	Pigs, chicken, ducks	1.3	−1.0	1.1	1.4	0.9

Note: Data in table are percentage changes with respect to scenario 1 (price changes only)

Farm households in Gangyan respond to the income increase by raising more pigs (except for the richest group) and switching from two-season rice to one-season rice. Pigs production is intensive in the use of external inputs. The income increase means that farmers have more cash available, which they can use for buying such inputs. Moreover with the increase in wealth, households attach more value to leisure. The shadow price of labor increases 1.7 - 2.2 percent for household groups 1, 2 and 4, but only 0.9% for household group 3 (the richest group). The higher preference for leisure also induces farm households to switch to a less intensive way of rice cultivation. As a consequence, the direct income support policy does not reach one of its major goals, namely promoting grain production.

Households in Shangzhu also increase pigs production (except for the richest group), but their response is smaller and they do not seem to resort to less intensive rice cultivation. This may partly be explained from the smaller increase in the shadow price of labor, which equals 0.8 – 1.3 percent for household groups 1, 3 and 4, and only 0.1% for household group 2.

Table 7. Income and production results for scenario 3 (Price change & tax abolition scenario)

Village	Household group	1	2	3	4	Total
Gangyan	Owns draught power:	No	Yes	No	Yes	
	Link outside province:	No	No	Yes	Yes	
	Household income	16.5	14.8	7.4	11.0	10.7
	One-season rice	15.3	15.6	7.3	11.9	11.1
	Two-season rice	−2.3	−1.8	−0.9	−1.2	−1.3
	Other crops	2.6	1.1	−2.4	2.4	0.7
	Pigs	14.9	17.4	−2.2	29.0	9.9
Shangzhu	Owns draught power:		No	Yes	Yes	
	Educated members	None	≥ 1	1 or 2	≥ 3	
	Household income	6.8	4.2	3.9	5.9	5.0
	One-season rice	−1.7	0.4	−0.5	−0.4	−0.4
	Two-season rice	1.3	−8.6	16.8	6.3	4.4
	Other crops	4.3	3.5	0.4	3.5	2.3
	Perennials	−16.8	−0.8	3.8	−6.7	−3.8
	Pigs, chicken, ducks	5.5	−6.4	6.5	5.4	3.8

Note: Data in table are percentage changes with respect to scenario 1 (price changes only)

The third scenario simulates the combined effect of the full tax abolition and the price changes (Table 7). Results are again compared with those of the first scenario. The results are very similar to those of scenario 2, but the magnitude is much larger. The average income increase in Gangyan is 10.7%, while in Shangzhu it is only 5.0%. The absolute income increase caused by tax abolition is much larger in Gangyan village (see Table 1), and the cash available for buying external inputs therefore increases much more. It also leads to a much larger increase in the shadow wage in Ganyan village (11% – 17% for groups 1, 2 and 4; 7% for group 3) than in Shangzhu village (3.3% – 4.3% for groups 1, 2 and 4; 0.9% for group 2). So, although income inequality within villages declines, the inequality between villages increases. One of the major goals of this policy, to reduce income inequality, is therefore only partially realized.

Table 8, finally, shows the changes in commodity flows going out of the two villages as a result of the two income support measures. The amounts of rice sold outside the village decreases in both villages under both scenarios. This is caused on the one hand by income-

induced increases in rice consumption by households in the villages, and on the other hand by the lower production levels of two-season rice in Gangyan village and one-season rice in Shangzhu village (the two major crops in these villages). The switch from rice production to pigs production in Gangyan village causes an increase in pigs sold outside the village. In Shangzhu village, however, exports of all agricultural commodities decline.

Table 8. Agricultural commodity exports from the villages

Village	Scenario	2	3
Gangyan	Rice	−1.5	−10.7
	Other crops	−9.4	−67.2
	Pigs	1.4	9.2
Shangzhu	Rice	−0.9	−3.0
	Other crops	0.0	0.0
	Perennials	−1.5	−7.3
	Pigs, chicken, ducks	−7.0	−42.2

Note: Data in table are percentage changes with respect to scenario 1 (price changes only)

5. Conclusion

Since the beginning of 2004, the Chinese government has adopted a new rural income support policy that is more in line with WTO regulations. Its major purpose is to address the growing income inequality in China, while at the same time promoting grain production and food self-sufficiency. The two major measures taken in this respect are direct income support payments to grain farmers and abolition of agricultural taxes and fees paid by rural households. The results of the two village models discussed in this paper show that the policy does not reach its goal of promoting grain production; the large increase in grain production in 2004 was not caused by the income support policy but by the rapid price increases in 2003-2004. The increased incomes resulting from the new policy allow farm households to buy more inputs that can be used in livestock production. Moreover, because leisure is valued higher with increasing incomes, farmers tend to switch to less intensive grain production. Because own

grain consumption of households increases with higher incomes, the selling of rice outside the village declines even more than grain production.

We further find that tax abolition has a much larger impact on incomes and production than the direct income support (at around RMB 10 per mu) of 2004. Both measures tend to reduce income inequalities within villages, because the richest household groups (who are more involved in off-farm employment) benefit less. Tax abolition, however, tends to widen income inequalities between villages, because the absolute income gain is much larger in relatively rich villages. The switch towards more profitable activities like livestock production is therefore much stronger in these villages.

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