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Effects of agricultural production fluctuations on the Chinese macroeconomy

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Abstract

Based on a macro-model framed in terms of China's agricultural, industrial, government and household sectors, this paper aims to identify the effects of agricultural production fluctuations on the Chinese macroeconomy over the period 1949–89. Using annual national time-series data, Granger-causality tests indicate that fluctuations in China's agricultural production have been a statistically significant cause of changes in other types of Chinese macroeconomic activity. Impulse response analysis shows that shocks in China's agricultural production were followed by analogous responses in national consumption, industrial output, investment, exports and income which peaked with a two-year lag and vanished after 6 years. Variance decomposition analysis indicates that changes in China's agricultural production were the most important determinant of changes in the level of national consumption and the second most important determinant of changes in the level of industrial production, national investment, exports and national income.

1. Introduction

The analysis presented in this paper is focussed on the macroeconomic effects of fluctuations in China's agricultural production during the period from the founding of the People's Republic in 1949 to 1989. Over this period, the Chinese economy was largely a mixed plan-market system but with planning dominant so that the economy was largely supply determined. Agricultural production was characterised by: (1) a socialist economic system based on collective or state ownership of the means of production and a central planning system; and (2) rapid but unstable growth with major fluctuations in direction.

To indicate theoretically the likely paths of influence of agricultural production fluctuations on other types of macroeconomic activity, a simple diagrammatic model for the Chinese economy over the period 1949–1989 is postulated in Fig. 1. The model has two production sectors – an agricultural sector producing an agricultural product and an industrial sector producing an industrial product. The outputs of the two production sectors serve either as consumption goods or as inputs into future production. The household and

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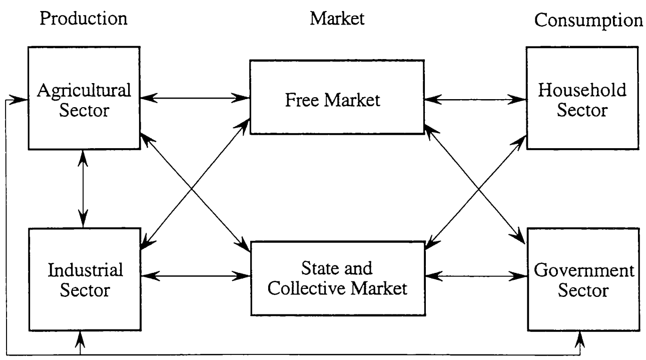

Fig. 1. Major flows among the sectors of the Chinese economy.

the government sectors are the final users of agricultural and industrial products. There are two kinds of market for the producers and the consumers. The major one is the state and collective (or state-cooperative) market in which prices are usually set below market-clearing levels by the planners. The other is the free market in which the prices are determined by the relationship of demand and supply. Usually, the price of the same goods in the free market is higher than that in the state-cooperative market. The major dynamic linkage flows postulated among the sectors of the simple model economy are shown in Fig. 1.

2. Theoretical macro-model

In this section, a simple theoretical macro-model involving eight equations and four identities is postulated to study the effects of fluctuations in China's agricultural production on other types of macroeconomic activity. The macro-model consists of four sectors, namely the agricultural, industrial, household and government sectors.

2.1. Agricultural sector

Agriculture is viewed as a supply-determined sector which produces a homogeneous good. The single agricultural product is produced by a constant returns to scale production process that uses labour, capital and other inputs. The production function is defined as:

$$\text{GOVA} = f(K_a, N_a, Q_1(\text{GOVI}), \text{GVED}, \text{OTHR}) \quad (1)$$

where GOVA is gross output of agriculture, K_a is capital stock in the agricultural sector, N_a is labour in the agricultural sector, Q_1(GOVI) represents industrial inputs, GVED government expenditure in the agricultural sector, and OTHR other inputs. It is assumed that the producer is to achieve the plan target and maximize profit. The decision to produce and market the product will depend on relative prices and the amount of agricultural output. Thus, the total supply of agricultural product is:

$$\text{XAS} = f(\text{GOVA}, W_a, P_a, P_i) \quad (2)$$

where XAS is total supply of agricultural product; W_a represents wages of agricultural labour; $P_a = \alpha P_{a1} + \beta P_{a2}$, in which $\alpha + \beta = 1$, P_{a1} the price of agricultural product in the free market, P_{a2} the price of agricultural product in the state and collective market; and $P_i = \lambda P_{i1} + \gamma P_{i2}$, in which $\lambda + \gamma = 1$, P_{i1} the price of industrial goods in the free market, and P_{i2} the price of industrial goods in the state and collective market.

2.2. Industrial sector

The industrial sector is also viewed as a supply-determined sector whose inputs are mainly from other sectors. The production function of the industrial sector is:

$$\text{GOVI} = f(K_i, N_i, A_1(\text{GOVA}), \text{GOED}, \text{OTHR}) \quad (3)$$

where GOVI is gross output value of the industrial sector, K_i is capital stock in the industrial sector, N_i is labour in the industrial sector, A_1(GOVA) is amount of agricultural product supply for the industrial sector, GOED is government expenditure in the industrial sector, and OTHR is other inputs. The total supply of industrial product is determined by the scale of production and the relative prices as:

$$\text{XIS} = f(\text{GOVI}, W_i, P_i, P_a) \quad (4)$$

where XIS is the amount of industrial product supply, and W_i represents wages of industrial labour.

2.3. Government sector

The government sector is assumed to carry out economic activities of consumption, investment and export (import is not considered in this study). Government consumption is determined by the available agricultural and industrial goods produced by the production sectors and the relative prices. That is:

$$\text{GOCM} = f(A_2(\text{GOVA}), Q_2(\text{GOVI}), P_a, P_i) \quad (5)$$

where GOCM is total consumption of the government sector, A_2(GOVA) is amount of agricultural product supplied for the government sector, and Q_2(GOVI) is amount of industrial product supplied for the government sector.

Total national investment outlay by the government is also determined by the total outputs of the agricultural and industrial sectors and the relevant prices as:

$$\text{INVT} = f(A_3(\text{GOVA}), Q_3(\text{GOVI}), P_a, P_i) \quad (6)$$

where INVT is total value of national investment, A_3(GOVA) is amount of agricultural product supplied for investment, and Q_3(GOVI) is amount of industrial product supplied for investment.

The total value of export is determined by the total outputs of the agricultural and industrial sectors and world market prices as:

$$\text{EXPT} = f(A_4(\text{GOVA}), Q_4(\text{GOVI}), P_{wa}, P_{wi}) \quad (7)$$

where EXPT is total value of export, A_4(GOVA) is amount of agricultural product for export, Q_4(GOVI) is amount of industrial product for export, P_{wa} is world price for agricultural product, and P_{wi} is world price for industrial product.

2.4. Household sector

The individual households in the model are consumers and suppliers of labour services. It is assumed that the objective of the representative household is to maximize its utility. The total consumption demand function is:

$$\text{HSCM} = f(A_5(\text{GOVA}), Q_5(\text{GOVI}), W_a, W_i, P_a, P_i) \quad (8)$$

where HSCM is consumption of goods by the household sector, A_5(GOVA) is amount of agricultural product supplied for household consumption, and Q_5(GOVI) is amount of industrial product supplied for household consumption.

2.5. Structural model

In order to analyze the effects of agricultural output changes, the complete structural model is constructed with a market equilibrium identity, such that total supply of agricultural and industrial products (XS) is equal to total demand (QD). Assembling the above Eqs. (1) to (8) together with the identities of Eqs. (9) to (12) the complete structural model is given by:

$$\text{GOVA} = f(K_a, N_a, Q_1(\text{GOVI}), \text{GVED}, \text{OTHR}) \quad (1)$$

$$\text{XAS} = f(\text{GOVA}, W_a, P_a, P_i) \quad (2)$$

$$\text{GOVI} = f(K_i, N_i, A_1(\text{GOVA}), \text{GOED}, \text{OTHR}) \quad (3)$$

$$\text{XIS} = f(\text{GOVI}, W_i, P_i, P_a) \quad (4)$$

$$\text{GOCM} = f(A_2(\text{GOVA}), Q_2(\text{GOVI}), P_a, P_i) \quad (5)$$

$$\text{INVT} = f(A_3(\text{GOVA}), Q_3(\text{GOVI}), P_a, P_i) \quad (6)$$

$$\text{EXPT} = f(A_4(\text{GOVA}), Q_4(\text{GOVI}), P_{wa}, P_{wi}) \quad (7)$$

$$\text{HSCM} = f(A_5(\text{GOVA}), Q_5(\text{GOVI}), W_a, W_i, P_a, P_i) \quad (8)$$

$$\text{NACM} = \text{GOCM} + \text{HSCM} \quad (9)$$

$$\text{QD} = \text{NACM} + \text{INVT} + \text{EXPT} \quad (10)$$

$$\text{XS} = \text{XAS} + \text{XIS} \quad (11)$$

$$\text{XS} = \text{QD} = \text{NACM} + \text{INVT} + \text{EXPT} \quad (12)$$

where NACM is national consumption.

This postulated macro-model is by no means exhaustive. However, it does reflect the important possible causality effects between variables. Relative to agricultural output (GOVA), the main causality properties of the model are indicated in Fig. 2. The unidirectional links from GVED to GOVA and from GOED to GOVI represent the respective production functions. Thus output, either agricultural or industrial, is determined on the supply-side. Bidirectional causality is implied between GOVA and GOVI. Finally, the model implies that there is unidirectional causality from

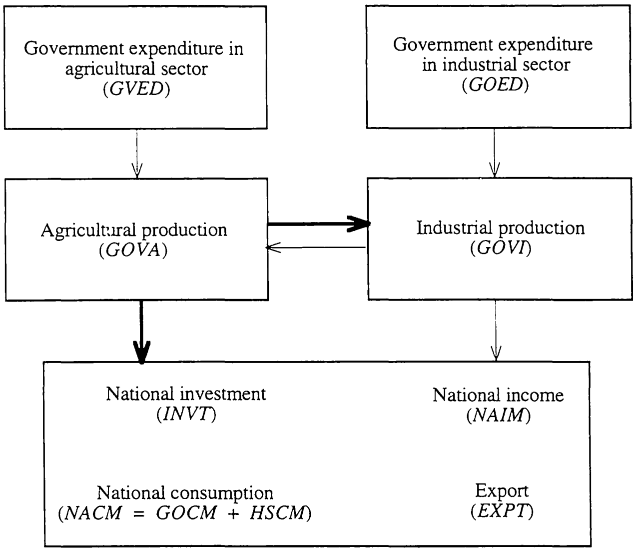

Fig. 2. Causality properties of the macro-model.

both GOVA and GOVI to the real variables on the demand-side, such as national investment (INVT), national consumption (NACM), national income (NAIM) and the international variable, export (EXPT), and also implies that there is implicit bidirectional causality between consumption, investment, income and export.

In the following section, the causality properties of the macro-model are assessed empirically using a small vector autoregressive system. Appraisal is based on the Granger-causality test, impulse response analysis and variance decomposition analysis. Reflecting the main objective of this study, which is to assess the effects of agricultural production fluctuations on China's macroeconomy, only the causal linkages from GOVA to other macro variables (as indicated by the thicker arrows in Fig. 2) have been investigated.

3. Empirical analysis and results

Using annual time-series data for the period 1949–89, the influence of changes in the level of agricultural production on other macroeconomic variables was tested by using the following Nth order vector autoregressive (VAR) model in first differences:

$$\mathrm{d}(\ln Y)_t = \alpha + \sum_{i=1}^{N} \beta_i \,\mathrm{d}(\ln Y)_{t-i} + \sum_{i=1}^{N} \lambda_i \,\mathrm{d}(\ln \text{GOVA})_{t-i} + U_t \tag{13}$$

where d denotes first difference so that, for example, $\mathrm{d}(\ln Y)_t = \ln Y_t - \ln Y_{t-1}$, ln denotes log value, GOVA is gross output value of agriculture, Y denotes other types of macroeconomic activity, U is an error term, t $(= 1, 2, \ldots, T)$ is a time subscript, i is a lag indicator, and N is the maximum lag. The macroeconomic variables, respectively, corresponding to Y are gross value of national investment (INVT), gross output value of industry (GOVI), gross value of exports (EXPT), national consumption (NACM), and national income (NAIM). Definition of these variables is given in the Appendix. As listed in Appendix Table A, the data on the variables consisted of annual observations in index form (1952 = 100) for the period 1949–1989 as recently published by China's State Statistical Bureau (SSB, 1989,1990). The index series are based on comparable prices (SSB, 1986).

To ensure non-spurious regression in the sense of Granger and Newbold (1974) and Phillips (1986), non-stationarity of the variables in log form in both levels and first differences was tested for via the two procedures, respectively, proposed by Phillips and Perron (1988) and Park and Choi (1988). Respectively, these test statistics are denoted here by PP and PC. The results of these tests are reported in Table 1. The PP and PC tests both suggest that all the variables are nonstationary in levels but stationary in their first differences. Accordingly, it is concluded that all the variables are stationary in the first differences of their logarithms.

Cointegration between GOVA and the other five variables, all in logarithmic form, was tested for via the PP and POC (Park et al., 1988) test procedures. The results are reported in Table 2. They indicate that the null hypothesis of no cointegration between GOVA and each of the other variables cannot be rejected at the 10% level. It is

Table 1
Results of tests for non-stationarity in the logarithms of the data series

Variable	PP test [a]	PC test [b]	
		$J_2(0,3)$	$J_2(1,5)$
In levels			
GOVA	−2.02	22.53	1.11
INVT	−3.09	46.50	1.33
GOVI	−2.72	43.14	1.48
EXPT	−0.13	44.71	11.00
NACM	−2.58	25.18	8.76
NAIM	−1.15	35.71	1.18
In first differences			
GOVA	−3.65	0.13	0.13
INVT	−4.09	0.18	0.15
GOVI	−3.69	0.17	0.15
EXPT	−3.39	0.33	0.25
NACM	−3.25	0.28	0.28
NAIM	−3.90	0.12	0.13

[a] Critical value −3.20 (−3.42) at the 10% (5%) significance level (Phillips and Perron, 1988). PP corresponds to the unit root test with trend. Test values less than the critical value indicate stationarity.
[b] Critical value 0.33 for $J_2(0,3)$ and 0.295 for $J_2(1,5)$ at the 5% significance level (Park and Choi, 1988). $J_2(0,3)$ corresponds to the unit root test without trend and $J_2(1,5)$ corresponds to the unit root test with trend. Test values less than the critical values indicate stationarity.

concluded that GOVA is not cointegrated with any of the other variables.

Given the evidence that GOVA, INVT, GOVI, EXPT, NACM and NAIM are stationary in their first differences and that GOVA is not cointegrated with the other variables, following Granger (1988), causality was tested via the VAR model in first differences as specified by Eq. (13). As proposed by Granger (1969), a causal relationship from a variable X to a variable Y exists if taking account of past values of X leads to improved prediction of Y, i.e., the direction of causality can be detected when there is a temporal lead-lag relationship between the two variables. In the Granger causality test, it is crucial to choose the appropriate lag lengths. In particular, ad hoc approaches, such as considering arbitrary lag length specifications or employing rules of thumb, can give misleading results. Lag lengths used in the estimation of Eq. (13), as listed in Table 3, were chosen

Table 2
Results of tests for cointegration in logarithmic form of GOVA with other variables

Variable	PP test [a]	POC test [b]	
		$J_2(0,3)$	$J_2(1,5)$
INVT	−2.85	0.94	1.52
GOVI	−3.21	3.09	1.43
EXPT	−1.86	3.01	5.06
NACM	−2.49	3.51	1.52
NAIM	−3.05	1.01	0.38

[a] Critical value −3.50 at the 10% significance level (Phillips and Perron, 1988). Test values greater than the critical value indicate the absence of cointegration with GOVA.
[b] Critical value 0.33 for $J_2(0,3)$ and 0.295 for $J_2(1,5)$ at the 5% significance level (Park and Choi, 1988). Test values greater than the critical value indicate the absence of cointegration with GOVA.

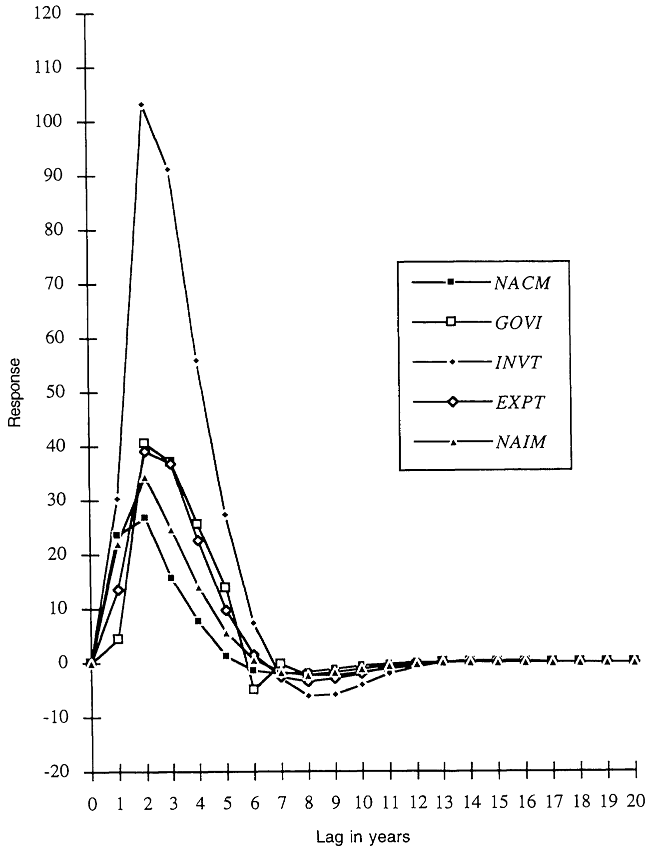

Fig. 3. Impulse responses of Chinese national consumption (NACM), industrial output (GOVI), national investment (INVT), exports (EXPT) and national income (NAIM) to shocks in agricultural output (GOVA).

on the basis of the criteria of Akaike (1974) and Schwarz (1978).

3.1. Effect of fluctuations in GOVA on other macroeconomic variables

The results of asymptotic F-tests for Granger-causality are presented in Table 3. These tests indicate, at the 5% level of significance, that GOVA has a causal influence on INVT, EXPT and NACM with a one-year lag and on GOVI and NAIM with a two-year lag. In each case, as indicated by the estimated coefficients, the influence of GOVA is a positive one, with the elasticity of response (measured by λ_i) ranging from a low of 0.61 in the case of NACM to a high of 2.64 in the case of INVT. These results, of course, are not surprising given the large size of China's agricultural sector relative to the national economy and the prima facie relationship between GOVA and the other variables.

3.2. Impulse response analysis

Impulse response analysis (Litterman, 1979; Ford, 1986) was used to appraise the dynamic effects of fluctuations in GOVA on the other macroeconomic variables. Because of contemporaneous correlation causing the error covariance matrix to be non-diagonal, the errors needed to be orthogonalized. This was done by Cholesky decomposition. Impulse response analysis was carried out for several orderings of the variables. As reported by Ran (1992), all yielded very similar results. The results reported here are based on the ordering GOVA, NACM, GOVI, INVT, EXPT, NAIM.

Fig. 3 presents the responses of NACM, GOVI, INVT, EXPT and NAIM to a one-time shock of one positive unit of standard deviation in GOVA. The impulse response functions indicate that positive shocks in agricultural output are followed by positive responses in NACM, GOVI, INVT, EXPT and

Table 3
Test of Granger-causality of GOVA on other macroeconomic variables

Model [a]	Causal relationship tested from GOVA to:	Optimal lag length [b] (years)	Test values [c]	Estimated values of coefficients [d]	
				β_i	λ_i
A	INVT	1	F(1,36) = 13.37 * D.W. = 2.03 $R^2 = 0.36$	$\beta_1 = 0.22$ (1.58)	$\lambda_1 = 2.64$ (3.65) **
B	GOVI	2	F(2,33) = 4.56 * D.W. = 2.07 $R^2 = 0.41$	$\beta_1 = 0.31$ (1.97) $\beta_2 = 0.29$ (1.92)	$\lambda_1 = 0.29$ (0.65) $\lambda_2 = 0.93$ (2.02) **
C	EXPT	1	F(1,36) = 7.25 * D.W. = 1.76 $R^2 = 0.44$	$\beta_1 = 0.44$ (3.32)	$\lambda_1 = 0.84$ (2.69) **
D	NACM	1	F(1,36) = 14.41 * D.W. = 1.96 $R^2 = 0.52$	$\beta_1 = 0.06$ (0.35)	$\lambda_1 = 0.61$ (3.98) **
E	NAIM	2	F(2,33) = 8.56 * D.W. = 2.18 $R^2 = 0.48$	$\beta 1 = 0.12$ (0.95) $\beta_2 = -0.41$ (−2.72)	$\lambda_1 = 0.39$ (1.42) $\lambda_2 = 0.97$ (2.63) **

* Indicates that there exists a causal flow from GOVA to INVT, GOVI, EXPT, NACM and NAIM, respectively, at the 5% significance level.

** Indicates that the estimated value of the coefficient λ_i is statistically significant at the 5% level.

[a] Corresponding to (13), the models A, B, C, D and E are, respectively, INVT = f(GOVA, INVT), GOVI = f(GOVA, GOVI), EXPT = f(GOVA, EXPT), NACM = f(GOVA, NACM) and NAIM = f(GOVA, NAIM).

[b] Based on the Akaike (1974) and Schwarz (1978) criteria, both of which gave the same optimal lag lengths.

[c] Critical values for the F-test at the 5% significance level are $F(1,36) = 4.08$ for models A, C and D, and $F(2,33) = 3.23$ for models B and E.

[d] t-value in parentheses.

NAIM which peak after 2 years and last in total for about 6 years. These results are consistent with the Granger causality tests which indicated that changes in agricultural output have a positive causal influence on the other macroeconomic variables.

While the responses shown in Fig. 3 are quite similar in pattern, they differ in magnitude. That for national investment (INVT) is largest while that for national consumption (NACM) is smallest. Doubtless this is because China's national investment has depended mainly on transfers out of the agricultural sector and because national consumption was heavily controlled by the Chinese government over the period 1949 to 1989.

3.3. Variance decomposition analysis

The results of variance decomposition analysis (Litterman, 1979) are presented in Table 4 for each of the six macroeconomic variables taken as the dependent variable in a VAR model analogous to Eq. (1) but with all the variables as lagged independent variables. Results are presented for a model using the ordering: GOVA, NACM, GOVI, INVT, EXPT, NAIM. All other orderings yielded similar results. For each dependent variable, stability in the variance decomposition of its forecast error was reached after 12 years.

The stable (year 12) decompositions indicate that changes in agricultural production were an

Table 4
Variance decomposition of forecast error in GOVA, NACM, GOVI, INVT, EXPT and NAIM

Forecast variable	Period (years)	Source and share of variance of forecast error (%)					
		GOVA	NACM	GOVI	INVT	EXPT	NAIM
GOVA	1	100.00	0.00	0.00	0.00	0.00	0.00
	2	88.02	0.30	10.15	0.15	0.38	1.00
	4	77.80	0.29	17.96	0.17	0.88	2.90
	8	76.88	0.35	18.24	0.17	0.93	3.42
	12	76.85	0.35	18.26	0.18	0.93	3.43
NACM	1	42.57	57.43	0.00	0.00	0.00	0.00
	2	58.44	34.72	5.33	0.61	0.24	0.65
	4	56.12	27.25	14.24	0.59	0.51	1.29
	8	54.93	26.53	15.34	0.59	0.65	1.96
	12	54.93	26.51	15.36	0.59	0.65	1.96
GOVI	1	0.13	11.66	88.21	0.00	0.00	0.00
	2	9.17	10.00	76.35	0.63	1.16	2.68
	4	17.86	9.13	68.56	0.56	1.13	2.76
	8	18.36	8.87	68.07	0.56	1.21	2.92
	12	18.39	8.87	68.04	0.56	1.21	2.92
INVT	1	1.70	16.27	65.58	16.45	0.00	0.00
	2	16.03	14.84	51.24	14.22	0.44	3.23
	4	26.63	12.55	45.29	11.93	0.48	3.12
	8	26.70	12.15	45.57	11.56	0.64	3.37
	12	26.74	12.14	45.55	11.55	0.64	3.37
EXPT	1	1.87	6.76	5.43	8.80	77.14	0.00
	2	11.49	8.24	6.33	11.19	62.52	0.22
	4	18.93	6.94	13.71	9.31	50.67	0.41
	8	18.79	6.68	15.83	8.95	48.69	1.05
	12	18.84	6.68	15.83	8.94	48.66	1.05
NAIM	1	8.02	15.35	72.02	0.14	0.08	4.38
	2	22.34	12.87	58.68	1.00	1.24	3.86
	4	28.48	11.27	54.73	0.86	1.15	3.50
	8	28.18	10.98	54.93	0.84	1.19	3.87
	12	28.22	10.97	54.90	0.84	1.19	3.87

important source of changes in all the macroeconomic variables studied – for GOVA and NACM they were the most important, and for GOVI, INVT, EXPT and NAIM they were the second most important. The major influences on each variable were as follows: 77% of change in GOVA is attributable to changes in GOVA itself and 18% to changes in GOVI; for NACM, 55% of variation comes from GOVA, 26% from NACM and 15% from GOVI; variation in GOVI is largely due to changes in GOVI itself (68%) and in GOVA (18%); for INVT, changes in GOVI are the most important (46%), followed by changes in GOVA (27%), NACM (12%) and INVT (12%); for EXPT, changes in EXPT itself contribute 49% of the variation, followed by GOVA (19%) and GOVI (16%); and for NAIM, changes in GOVI and GOVA contribute 55% and 28%, respectively, of the variation in forecast error.

4. Conclusion

Based on a macro-model postulated to identify the effects of agricultural production fluctuations on the Chinese macroeconomy, this study has shown empirically that fluctuations in China's agricultural production had a significant effect upon the Chinese macroeconomy over the period 1949–89.

The results of Granger-causality testing (Table 3) indicate that there was a statistically significant positive causal influence from changes in agricultural production (GOVA) to changes in national investment (INVT) (response elasticity $\lambda = 2.64$), exports (EXPT) ($\lambda = 0.84$), and consumption (NACM) ($\lambda = 0.61$) with a one-year lag, and to industrial production (GOVI) ($\lambda = 0.93$) and national income (NAIM) ($\lambda = 0.97$) with a two-year lag.

Impulse response analysis (Fig. 3) indicates that positive shocks in agricultural output are followed by positive responses in NACM, GOVI, INVT and NAIM which peak after 2 years and last in total about 6 years. Reflecting the response elasticities generated in Granger-causality testing, national investment (INVT) was most responsive to shocks in agricultural production (GOVA) while national consumption (NACM) was least responsive.

Variance decomposition analysis (Table 4) indicated that changes in China's agricultural production accounted for a majority (55%) of the variance of forecast error in national consumption (NACM) and was the second most important source of variance for industrial production (GOVI) (19%), investment (INVT) (27%), exports (EXPT) (19%) and national income (NAIM) (28%).

Given the structural changes that have occurred in the Chinese economy since 1989 with its move away from central planning to a more free market system, it is, of course, a moot question as to what extent the results of this empirical analysis may be indicative of China's new economy. Without doubt, however, agriculture remains very important in China and must be expected to still significantly influence other elements of the macroeconomy.

Appendix 1

All data used, as listed in Appendix Table A, are based on the definition of SSB (1990) and measured at comparable prices. The variables, all on an annual basis, are defined as follows: GOVA (gross output value of agriculture) refers to the total volume of production from crop cultivation, forestry, animal husbandry, sideline occupations and fishery expressed in value terms. INVT (national investment) refers to investment in fixed assets of state-owned units. GOVI (gross value of industry) is the total volume of industrial products expressed in value terms. EXPT (gross value of exports) is the total volume of exports expressed in value terms. NACM (national consumption) is the aggregate of expenditure by individuals as personal consumption and by the state as public consumption. NAIM (national income) is the aggregate net output value of agriculture, industry, transport, construction and commerce.

Appendix Table A Annual index series of Chinese macroeconomic variables, 1949–89, at comparable prices (1952 = 100)

Year	GOVA	INVT	GOVI	EXPT	NACM	NAIM
1949	67.40	23.17	40.80	66.42	63.42	60.80
1950	79.30	26.03	55.70	74.54	70.19	72.30
1951	86.80	53.86	75.64	89.30	81.89	84.40
1952	100.00	100.00	100.00	100.00	100.00	100.00
1953	103.10	210.26	130.30	128.41	111.00	114.00
1954	106.60	235.72	151.60	147.60	112.50	120.60
1955	114.70	241.61	160.10	179.70	122.70	128.30
1956	120.50	369.24	205.00	205.54	132.10	146.40
1957	124.80	347.18	228.60	201.85	137.20	153.00
1958	127.80	640.63	353.90	247.23	142.60	186.70
1959	110.40	844.86	481.80	288.19	135.90	202.00
1960	96.40	956.34	535.70	233.58	129.60	199.10
1961	94.10	358.26	330.80	176.38	117.60	140.00
1962	99.90	200.37	276.00	173.80	124.10	130.90
1963	111.50	267.81	299.40	184.50	138.80	144.90
1964	126.70	380.83	358.10	204.43	151.80	168.80
1965	137.10	497.93	452.60	232.84	169.50	197.40
1966	149.00	584.94	547.40	243.54	182.00	231.00
1967	151.30	430.95	471.80	216.97	192.20	214.30
1968	147.60	347.96	448.10	212.55	189.40	200.30
1969	149.20	566.85	601.60	220.66	203.00	239.00
1970	157.80	845.00	798.10	209.59	216.00	294.60
1971	162.90	958.01	915.30	252.77	226.50	315.30
1972	161.20	947.68	978.20	305.90	239.60	324.30
1973	174.50	1005.79	1071.40	431.37	257.10	351.20
1974	180.70	1063.34	1077.80	514.39	262.80	355.20
1975	186.30	1251.01	1244.80	527.68	274.30	384.70
1976	185.50	1202.00	1274.90	494.46	283.10	374.50
1977	184.80	1258.72	1461.10	515.50	291.50	403.70
1978	199.80	1535.17	1659.00	618.45	312.90	453.40
1979	214.80	1605.51	1805.30	781.18	346.70	485.10
1980	217.90	1712.35	1972.30	1005.17	380.80	516.30
1981	230.50	1532.39	2057.10	1356.46	411.00	541.50
1982	256.50	1940.56	2217.70	1526.94	441.40	585.80
1983	276.50	2185.40	2465.80	1617.34	479.20	644.20
1984	310.40	2720.80	2867.30	2142.44	547.40	731.90
1985	321.00	3857.92	3480.70	2984.87	633.80	830.60
1986	331.80	4542.01	3886.80	3992.99	682.90	894.50
1987	351.00	5275.46	4574.50	5424.35	737.50	985.70
1988	364.90	6342.42	5525.40	6522.51	798.70	1095.10
1989	376.20	5820.66	5995.10	7217.71	799.20	1133.40

Source: SSB (1989,1990.

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