

The Economy of People's Republic of China from 1953

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Part 1 Introduction

- study growth and structural transformation of China in 1953-1978
- by using two-sector neoclassical growth model with wedges
- show how the policy cycle of the left (Maoist) and right (pragmatist) policies influence Chinese economy

- study growth and structural transformation of China in 1953-1978:

- 1953: 3 years after the founding of the People's Republic of China
- 1978: the start of the reform period
- fluctuations which can be explained by the left-wing and right-wing economic policies

- show how the policy cycle of the left (Maoist) and right (pragmatist) policies influence Chinese economy:
 - historical evidence and quantitative evidence
 - distinct effects of the left and right policies on the economy and the wedges

Part 3 Policy cycle

- features of the left and right policies
- classification of periods into the right and left policies:

- 1953-1957, the technocratic First Five Year Plan, **right strategy**
- 1958-1961, the Great Leap Forward, **left strategy**
- 1962-1966, the retrenchment and recovery period and the Agriculture First policy, **right strategy**
- 1967-1972, the Cultural Revolution and Lin Biao's coup against Mao, **left policy**
- 1973-1975, Deng Xiaoping as the da facto premier, **right policy**
- 1976-1977, the rule of the ultra-leftist Gang of Four, **left policy**

Part 4 Data and parametrization

- main sources of data: CSY, 60Y and HL
- construction of the data
- summary of the data:

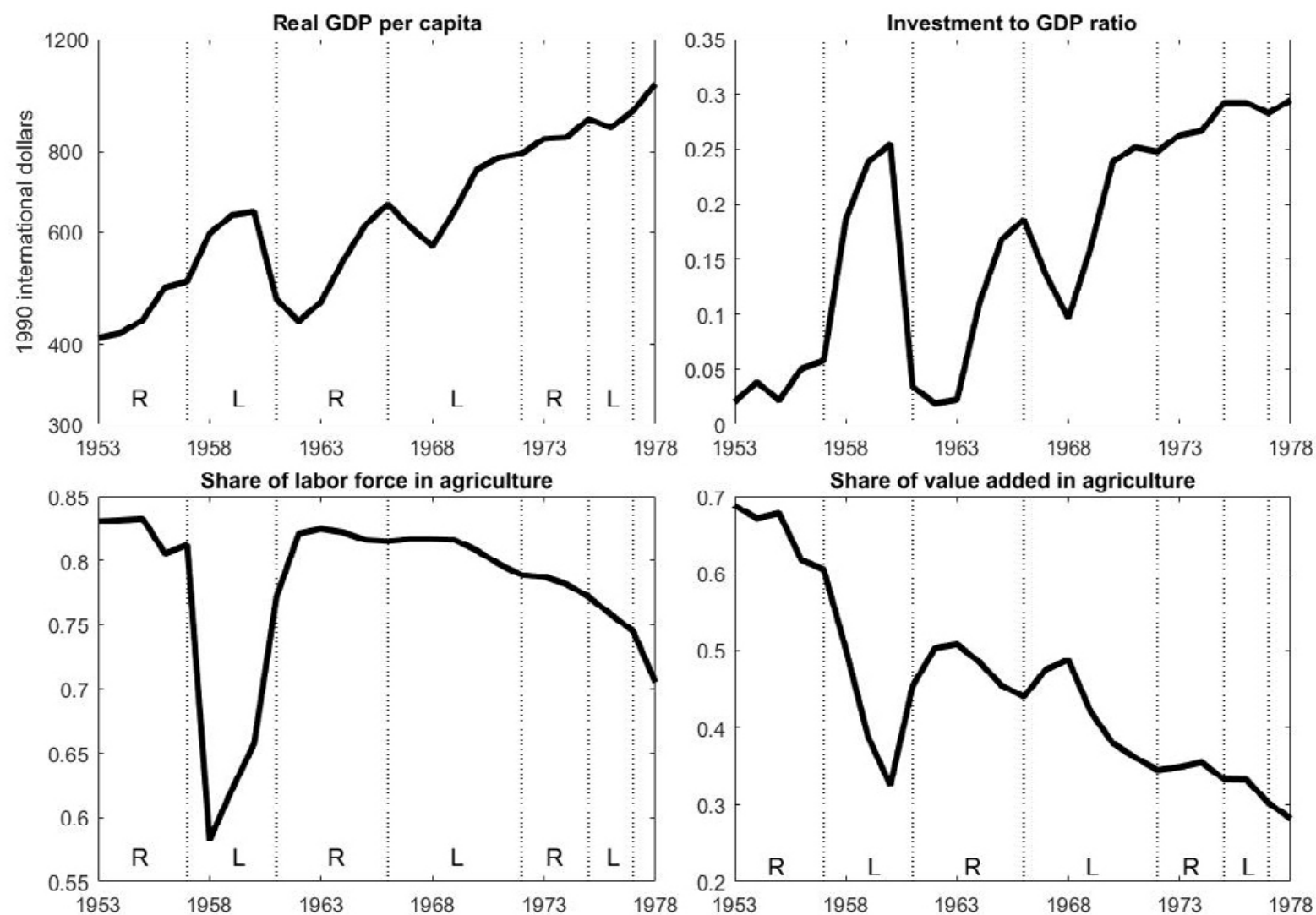


Figure 1: Macroeconomic indicators of People's Republic of China, 1953-78

	Annual Growth Rate		
	1953-78	Right Policies	Left Policies
Real GDP	5.6	8.1	2.9
Agricultural value added	2.1	6.1	-2.3
Non-agricultural value added	9.0	10.5	7.3
Labor Force	2.5	2.6	2.4
Share of Labor Force in Agriculture (p.p)	-0.5	-0.2	-0.8
Capital Stock	10.7	5.2	16.5

Table 1: Changes in economic indicators, 1953-78

Parametrization

- $\sigma = 1, \quad \eta = 0.15, \quad \beta = 0.96, \quad \delta = 0.05$
- $\gamma^A = 54$ yuan per capita per year in 1978 prices
- $\alpha_{K,A} = 0.14, \quad \alpha_{N,M} = 0.55, \quad \alpha_{K,M} = 0.3, \quad \alpha_{N,M} = 0.7$

Model

Preference are given by:

$$\sum_{t=0}^{\infty} \beta^t U(c_t^A, c_t^M)$$

where utility follows CES function:

$$U(c_t^A, c_t^M) = \left[\eta^{\frac{1}{\sigma}} (c_t^A - \gamma^A)^{\frac{\sigma-1}{\sigma}} + (1 - \eta)^{\frac{1}{\sigma}} (c_t^M)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

Model

Output is given by:

$$Y_t^i = F_t^i (K_t^i, N_t^i) = X_t^i (K_t^i)^{\alpha_{K,i}} (N_t^i)^{\alpha_{N,i}}$$

follows Cobb-Douglas function form.

Model

feasibility constraint for labor:

$$N_t^A + N_t^M = \chi_t N_t$$

feasibility constraint for capital allocation:

$$K^A + K^M = K_t$$

feasibility constraint for the two sectors:

$$N_t C_t^A + E_t^A = Y_t^A$$

$$N_t C_t^M + I_t + G_t^M + E_t^M = Y_t^M$$

law of motion:

$$K_{t+1} = I_t + (1 - \delta)K_t$$

Model

first order conditions:

$$1 + \tau_{W,t} = \frac{U_{M,t}}{U_{A,t}} \frac{F_{N,t}^M}{F_{N,t}^A}$$

$$1 + \tau_{R,t} = \frac{U_{M,t}}{U_{A,t}} \frac{F_{K,t}^M}{F_{K,t}^A}$$

$$1 + \tau_{K,t} = \left(1 + F_{K,t+1}^M - \delta\right) \beta \frac{U_{M,t+1}}{U_{M,t}}$$

which means optimal labor allocation, capital allocation, inter-temporal allocation respectively.

Model

The inter-temporal allocation can be derived from:

$$\mathcal{L}_0 = \sum_{t=0}^{\infty} \beta^t U(c_t, 1 - l_t) + \sum_{t=0}^{\infty} \lambda_t [(1 - \delta)k_t + F(k_t, l_t) - k_{t+1} - c_t]$$

FOC:

$$U_c(c_t, z_t) = \lambda_t$$

$$U_z(c_t, z_t) = \lambda_t F_L(k_t, l_t)$$

$$\lambda_t = \beta [1 - \delta + F_K(k_{t+1}, l_{t+1})] \lambda_{t+1}$$

Combining the above equations:

$$\frac{U_c(c_t, z_t)}{\beta U_c(c_{t+1}, z_{t+1})} = 1 - \delta + F_K(k_{t+1}, l_{t+1})$$

Model

Decompose the component of wedge:

$$\frac{U_{M,t}}{U_{A,t}} \frac{F_{N,t}^M}{F_{N,t}^A} = \frac{U_{M,t}/p_{M,t}}{U_{A,t}/p_{A,t}} \times \frac{p_{M,t}F_{N,t}^M/w_{M,t}}{p_{A,t}F_{N,t}^A/w_{A,t}} \times \frac{w_{M,t}}{w_{A,t}}$$

consumption component, production component, labor mobility component respectively.

$$\frac{U_{M,t}}{U_{A,t}} \frac{F_{K,t}^M}{F_{K,t}^A} = \frac{U_{M,t}/p_{M,t}}{U_{A,t}/p_{A,t}} \times \frac{p_{M,t}F_{K,t}^M}{p_{A,t}F_{K,t}^A}$$

consumption and non-consumption component respectively.

Calculating the effect of wedges

$$z_s - z_s^* = \sum_{t=1}^{\infty} \epsilon_{\tau,t}^{z,s} (\tau_t - \tau_t^*) + \epsilon_{x,0}^{z,s} (x_0 - x_0^*)$$

where $z_s \in \{y_s, x_{s+1}\}$ take $\mathbf{a} = \{x_t^*, y_t^*, \tau_t^*\}_{t=2}^{\infty}$, the formula becomes

$$z_{s+1}^* - z_s^* = \sum_{t=1}^{\infty} \epsilon_{\tau,t}^{z,s} (\tau_{t+1}^* - \tau_t^*) + \epsilon_{x,0}^{z,s} (x_1^* - x_0^*)$$

in log form:

$$\ln \frac{z_{s+1}}{z_s} = \sum_w \sum_{t=1}^{\infty} \epsilon_{w,t}^{z,s} \ln \frac{\tau_{w,t+1}}{\tau_{w,t}} + \epsilon_{x,0}^{z,s} \ln \frac{x_1}{x_0}$$

Calculating the effect of wedges

With a \bar{T} large enough, we have

$$\ln \frac{z_{s+1}}{z_s} = \sum_w \sum_{t=1}^{T-1} \epsilon_{w,t}^{z,s} \ln \frac{\tau_{w,t+1}}{\tau_{w,t}} + \sum_w \sum_{t=\bar{T}}^{\bar{T}-1} \epsilon_{w,t}^{z,s} \ln \frac{\tau_{w,t+1}}{\tau_{w,t}} + \epsilon_{x,0}^{z,s} \ln \frac{x_1}{x_0}$$

the accumulated effect is thus

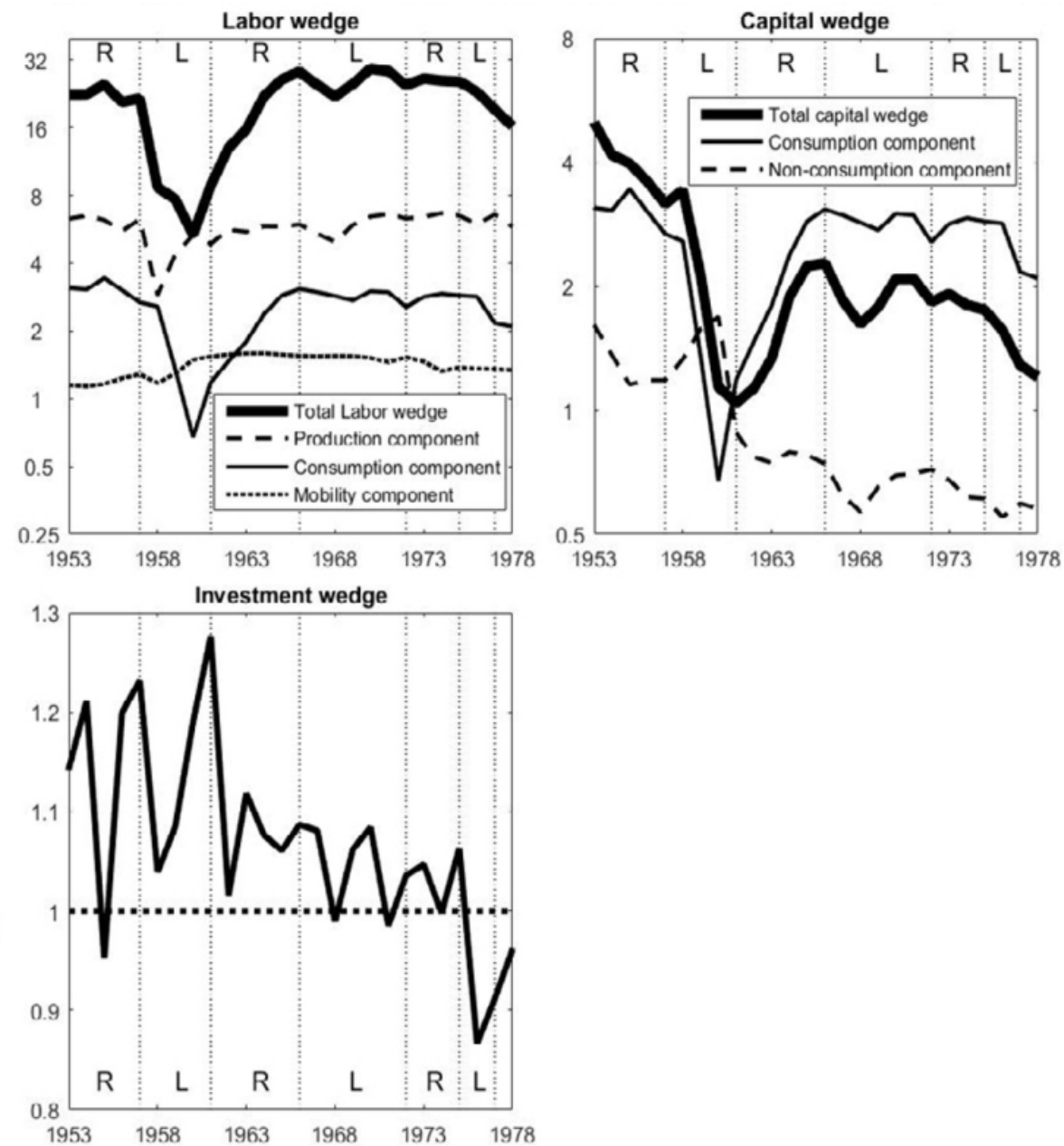
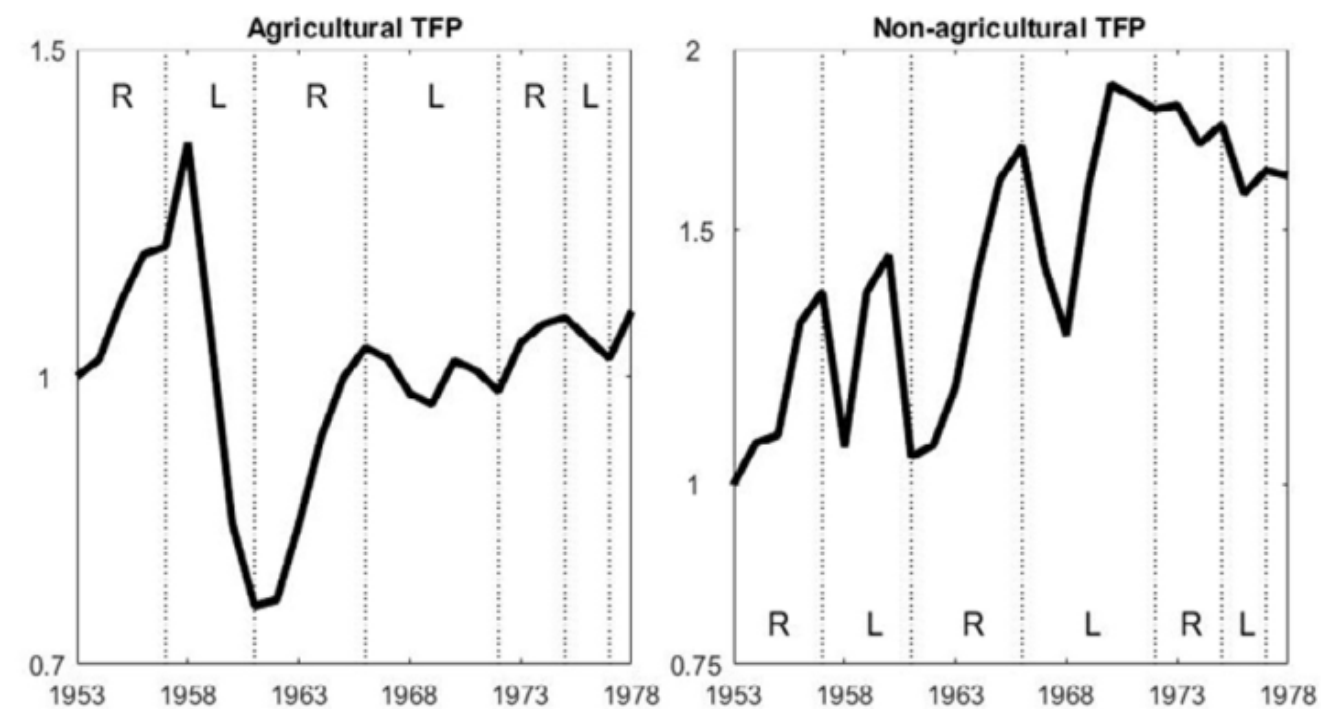
$$\ln \frac{z_T}{z_1} = \sum_w \sum_{t=1}^{T-1} \left(\sum_{s=1}^{T-1} \epsilon_{w,t}^{z,s} \right) \ln \frac{\tau_{w,t+1}}{\tau_{w,t}} + \\ \sum_w \sum_{t=\bar{T}}^{\bar{T}-1} \left(\sum_{s=1}^{T-1} \epsilon_{w,t}^{z,s} \right) \ln \frac{\tau_{w,t+1}}{\tau_{w,t}} + \left(\sum_{s=1}^{T-1} \epsilon_{x,0}^{z,s} \right) \ln \frac{x_1}{x_0}$$

Wedges

Three goals

- To observe the difference of wedges' components under different policies
- To provide evidence for the policies consistent with the behavior of the wedges
 - Detailed history account
 - Quantitative proxies for wedges
- To stimulate the model using the quantitative proxies

Path of wedges



Path of wedges

Ideology	Manufacturing TFP	Agricultural TFP	Labor wedge	Consumption component	Production component	Mobility component	Labor wedge	Consumption component
R	+5.9%	+4.8%	+ 7.6%	+6.8%	+0.8%	--	-1.9%	-1.9%
L	-2.3%	4.6%	-10.9%	-10.7%	-1.5%	+1.2%	-	-

Evidence for TFP fluctuation

- Left policy → decline in TFP:
 - Centralization of decision-making
 - Distorted incentives
 - Overall disruptions
 - Eg. Inefficiency of backyard steel furnaces
- Right policy → increase in TFP:
 - Decentralization
 - Focus on incentives
 - Technocratic management of the economy
 - Eg. The use of Soviet assistance in terms of transfer of advanced technology and advisors to operate the First Five Year Plan

Evidence for consumption component

- To observe the change in the degree of shortages
- 1. construct a measure of a price ratio caused by the shortages in the market for agricultural goods
 - 1.33(1957) → 4.13(1961) → 1.36(1964) → 1.69(1978)
- 2. difference between the purchase price and the Marxist real value

Evidence for production component

- The agricultural firm's objective: $(1 - \tau)p^A F^A(N^A) - w^A N^A$
- The first order condition: $\frac{p^A F_N^A}{w^A} = \frac{1}{(1-\tau)}$
- τ is a standard tax on output: when it rises, the agriculture becomes less attractive
- 1. $\tau = 1 - \frac{\text{gross grain procurement}}{\text{rural grain supply}}$
- 2. $\tau = \frac{\text{trade under assumption of zero-tax}}{\text{actual trade}}$

Evidence for mobility component

- Hukou System, sending urban youth to villages → increase in mobility

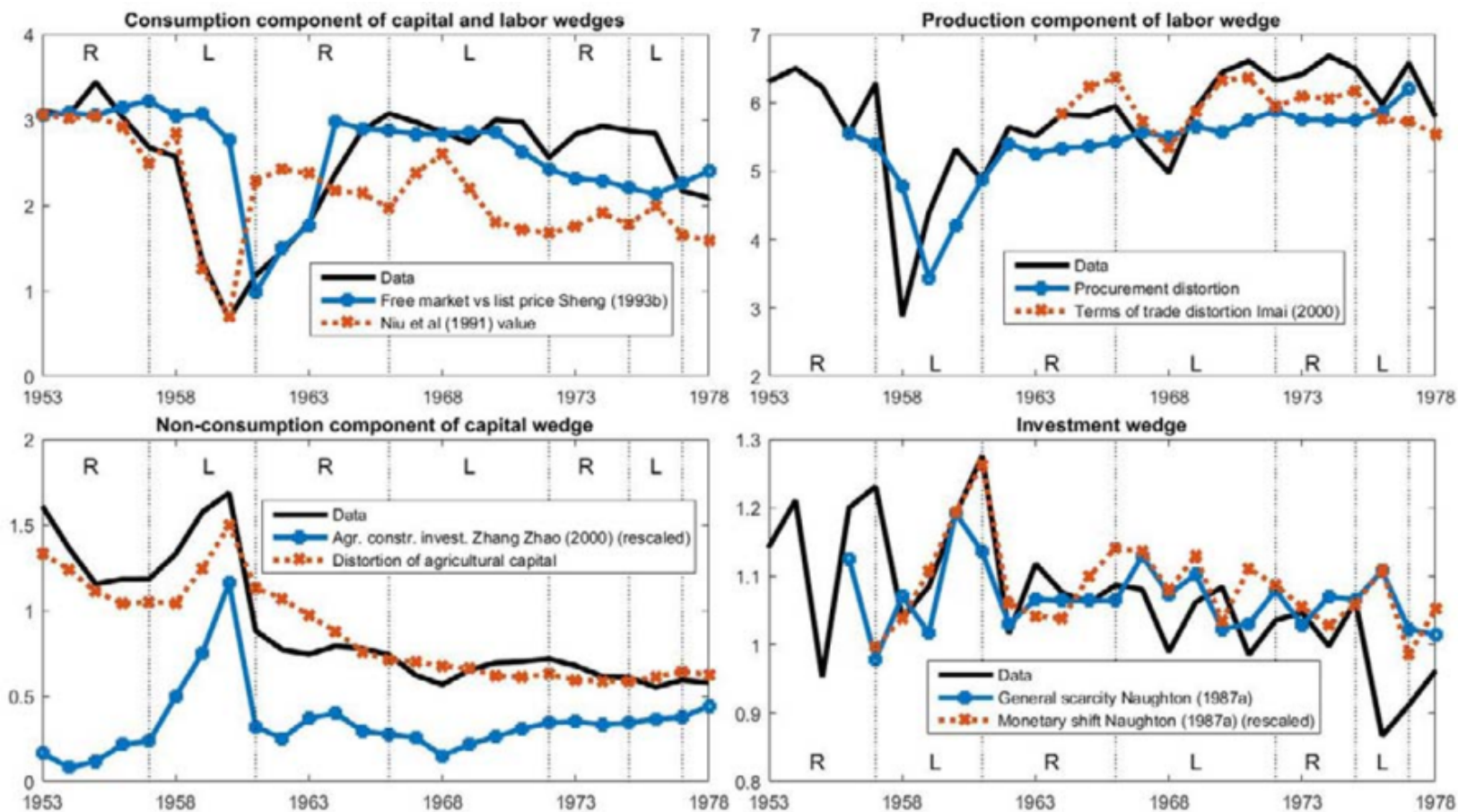
Evidence for non-consumption component

- Both the right and left policies in terms of capital allocation prioritized the industrial sector over the agricultural sector. Eg. The First Five-Year Plan → decline in non-consumption component
- Walking on two legs during the Great Leap Forward → increase in the non-consumption component
- Proxy: rate of return to the capital

Evidence for investment wedge

- The investment allocation between local and provincial governments
- Proxy for investment shortage:
 - General scarcity indicator = supply of consumer goods – consumers' purchase power
 - Monetary shift = the consumers' asset holding

The model with proxies



$$\Delta \text{ Economic variable} = \Sigma \left(\text{Elasticity} \times \Delta \text{ Wedge/TFP} \right) \textcircled{1}$$

- The effect of an increase in the wedge on the change in the an economic variable

$$\sum_{S=1}^{T-1} \epsilon_{w,t}^{z,s} = \epsilon_{w,t}^{z,t} + \sum_{S=1}^{T-1} \epsilon_{w,t}^{z,s(s \neq t)} \quad \textcircled{2}$$

- Finally, the integral elasticity is the sum of the contemporaneous elasticity and all cross-elasticities

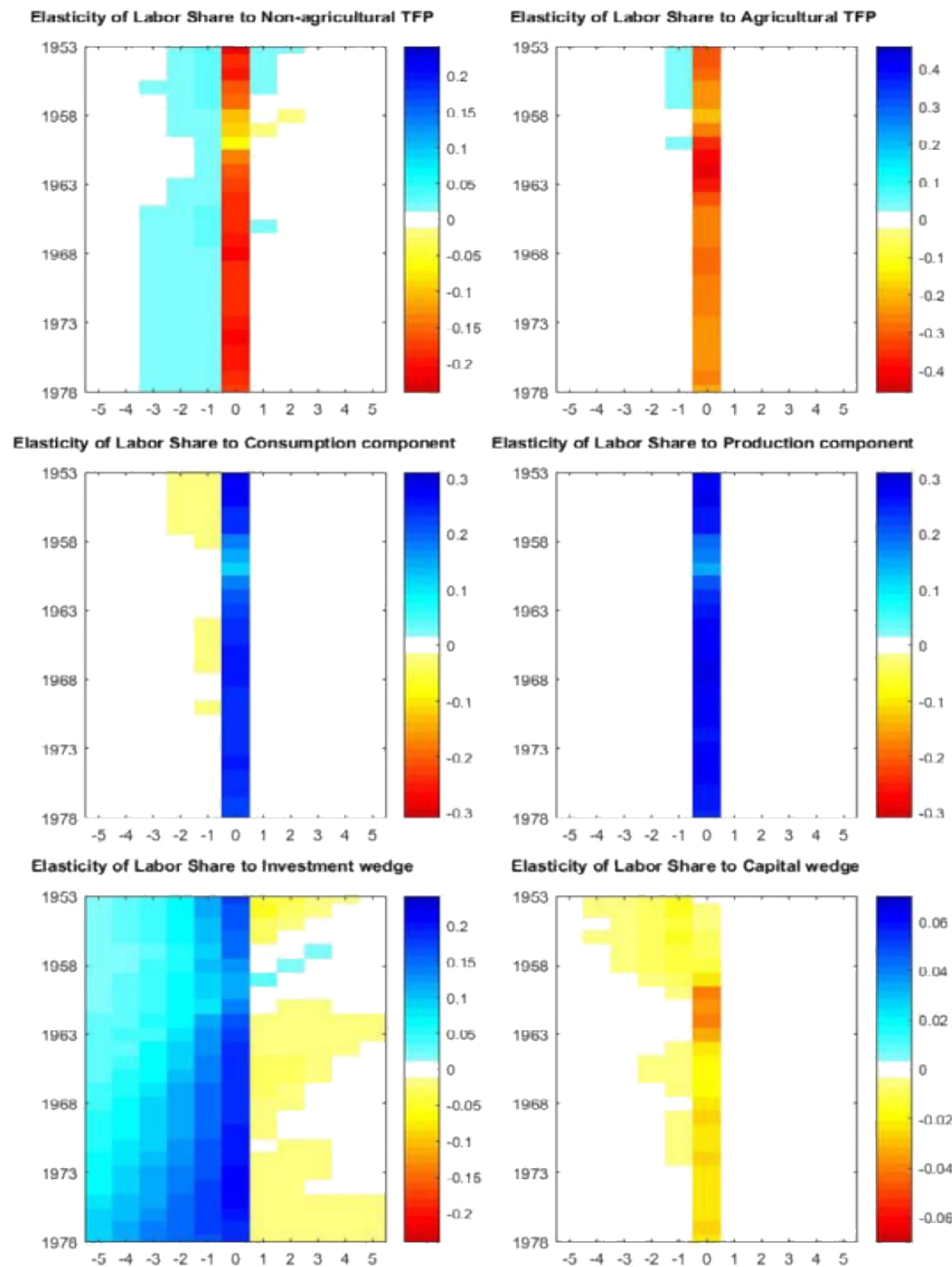


Figure 6: Elasticities of the labor share to wedges and TFPs

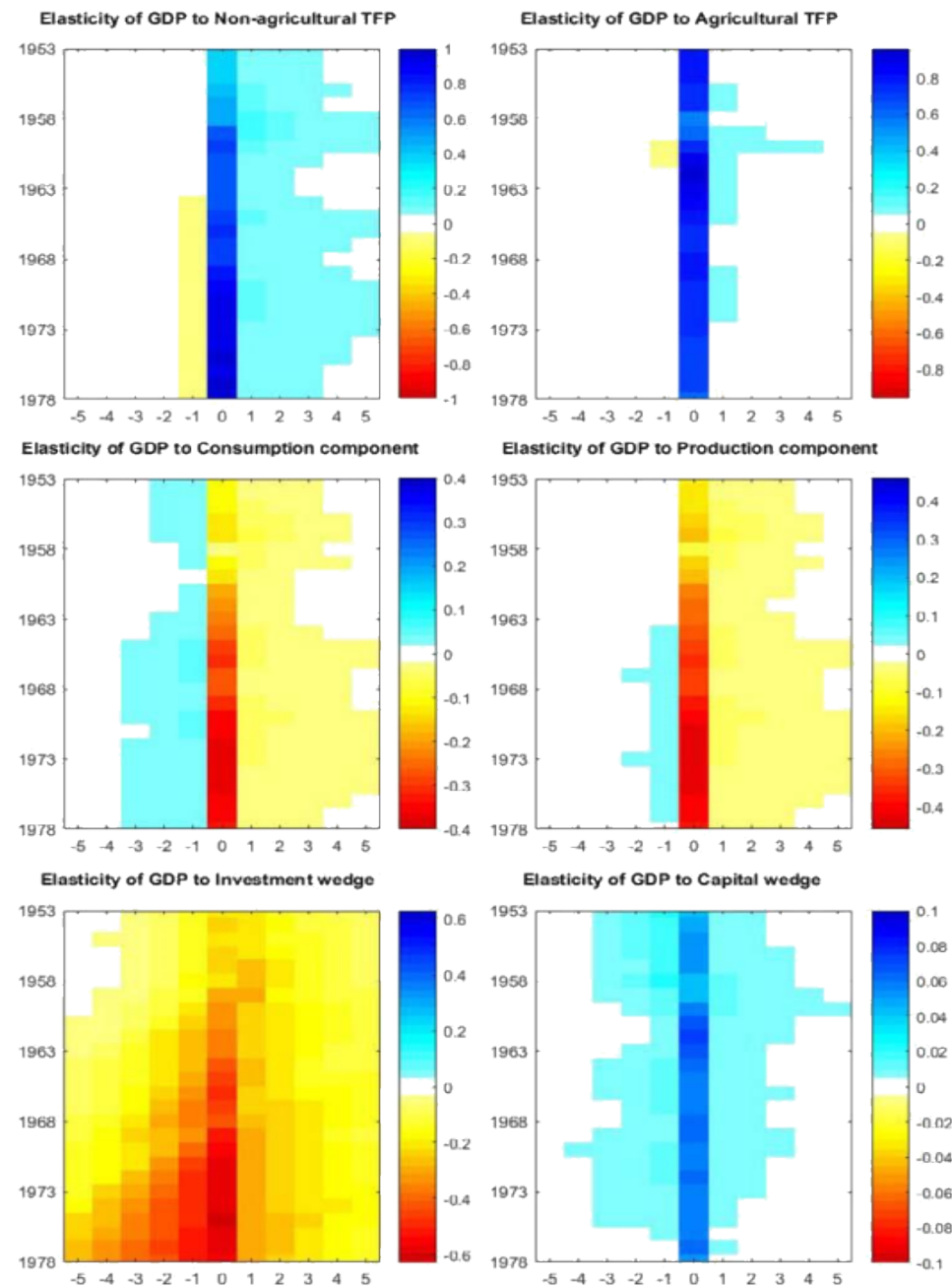


Figure 7: Elasticities of GDP to wedges and TFPs

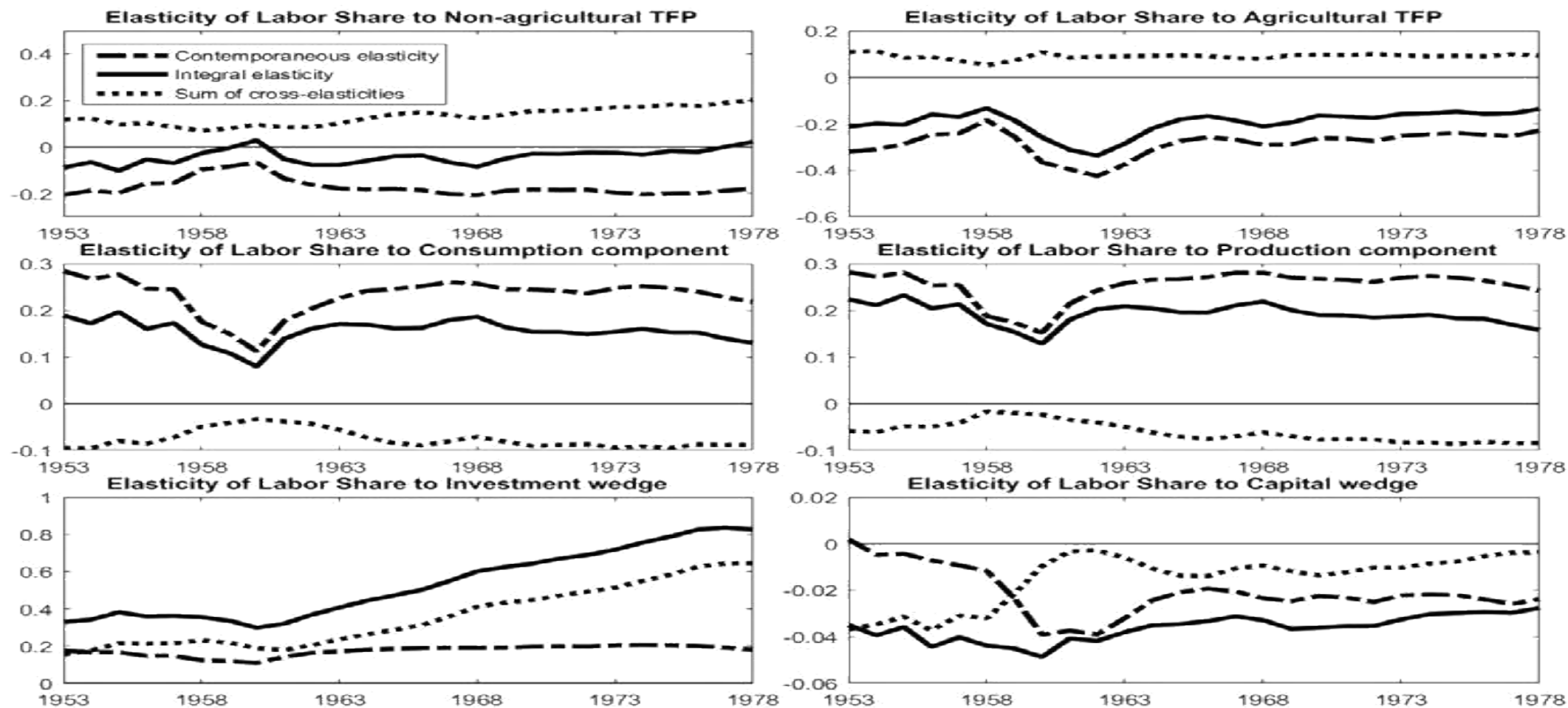


Figure 8: Elasticities of the labor share to wedges and TFPs

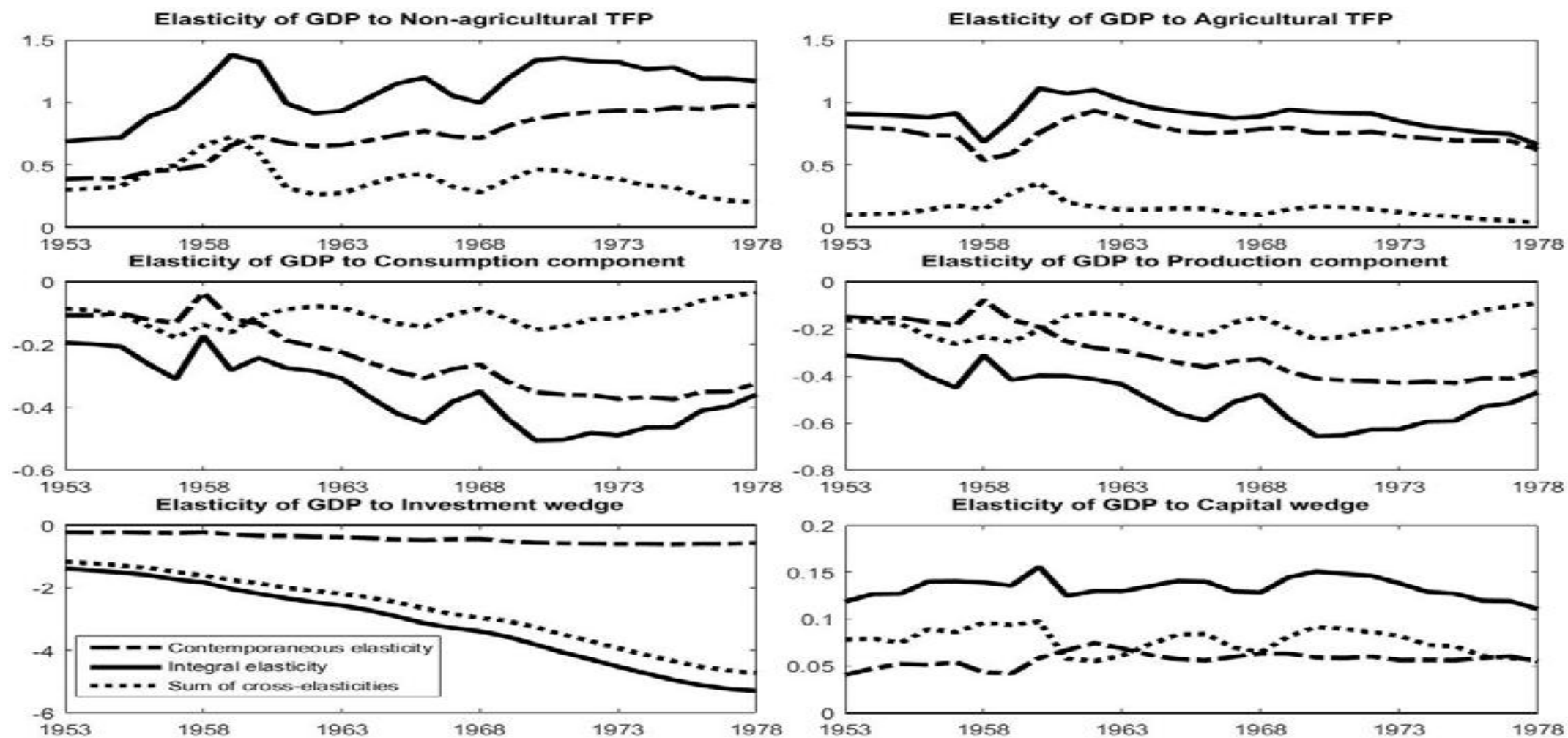
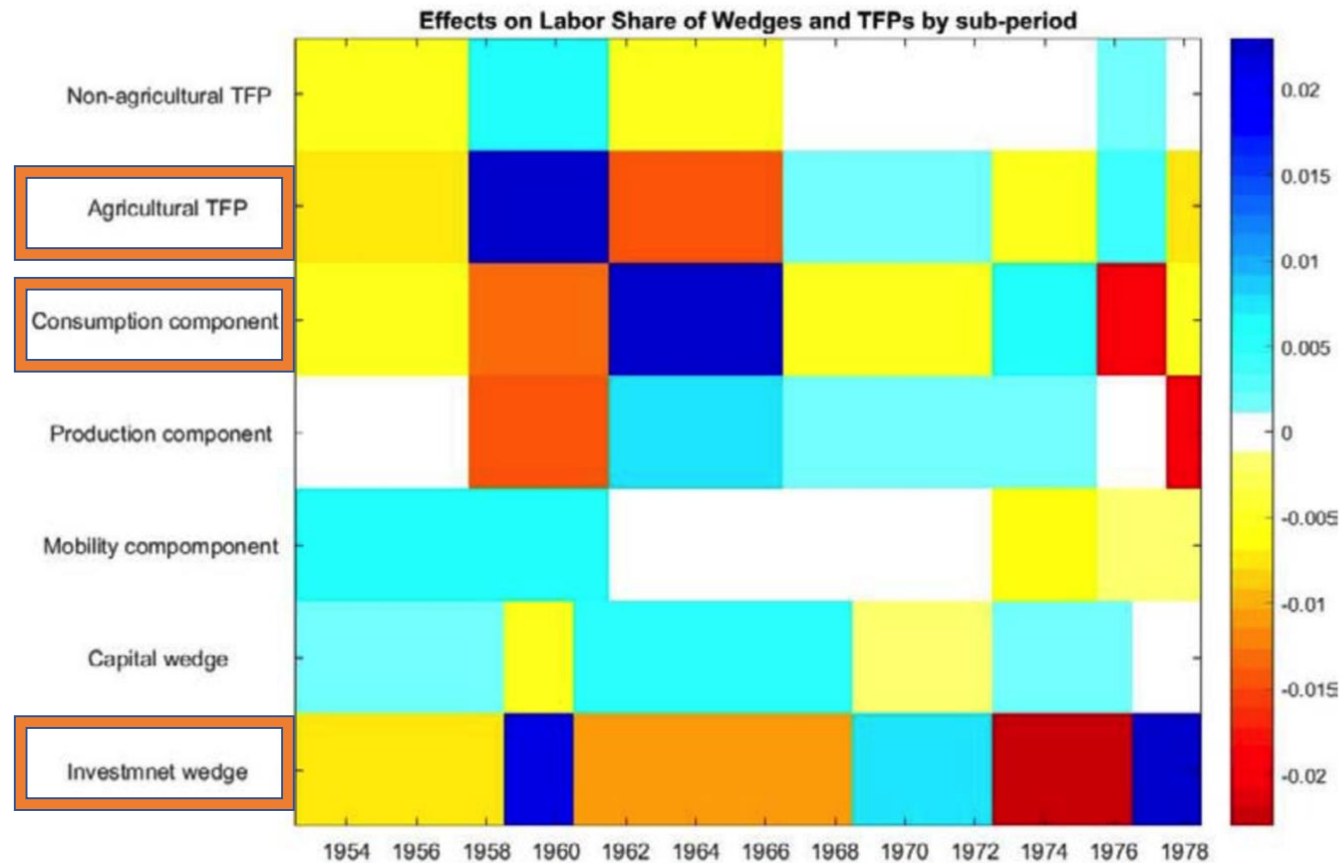


Figure 9: Elasticities of GDP to wedges and TFPs

6.3 Effects of wedges on economic variable

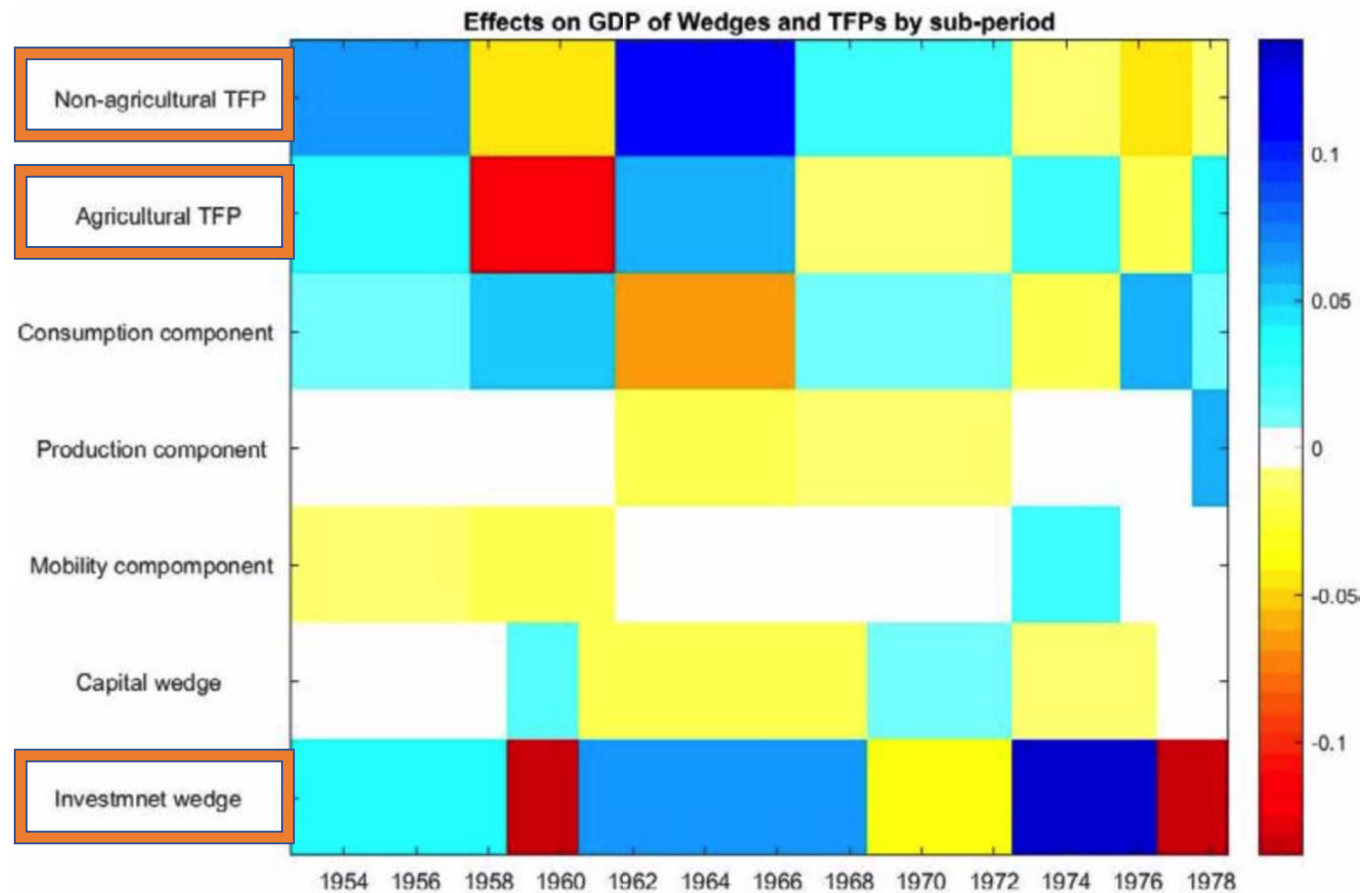
Effects of wedges on economic variable 1: labor share



- The largest contributors to changes in the labor share:
 1. Consumption component of the labor wedge
 2. Agricultural TFP
 3. The investment wedge
 4. The production component of the labor wedge
 5. Manufacturing TFP
- TFPs and wedges pull the economy in opposite directions along the policy cycle

Effects on labor share of changes in TFPs and wedges by sub period

Effects of wedges on economic variable 2: GDP



- The largest contributors to changes in the GDP:
 1. Manufacturing TFP
 2. Agricultural TFP
 3. Investment wedge
 4. Consumption component of the labor wedge
 5. The production component of the labor wedge
- TFPs and wedges pull the economy in opposite directions along the policy cycle

Effects on GDP of changes in TFPs and wedges by sub period

Effects of wedges on economic variables

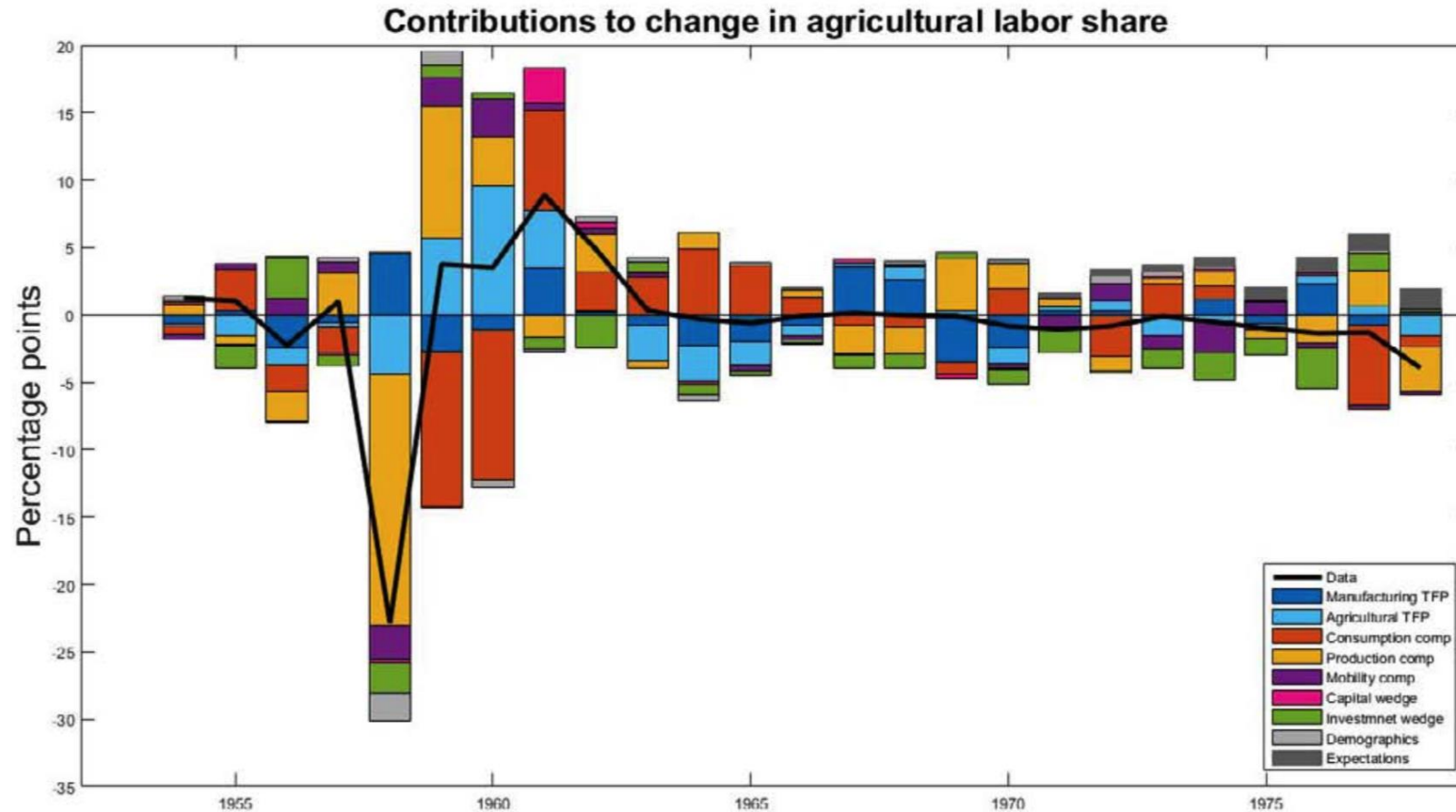
- Previous practices in other literature:

Considered the effects of a wedge **in a specific subperiod** on an economic variable over the whole sample.

- Contribution of this paper:

Also consider the effects of a wedge **in all periods** on the change in an economic variable in one period.

Effects of wedges on economic variables



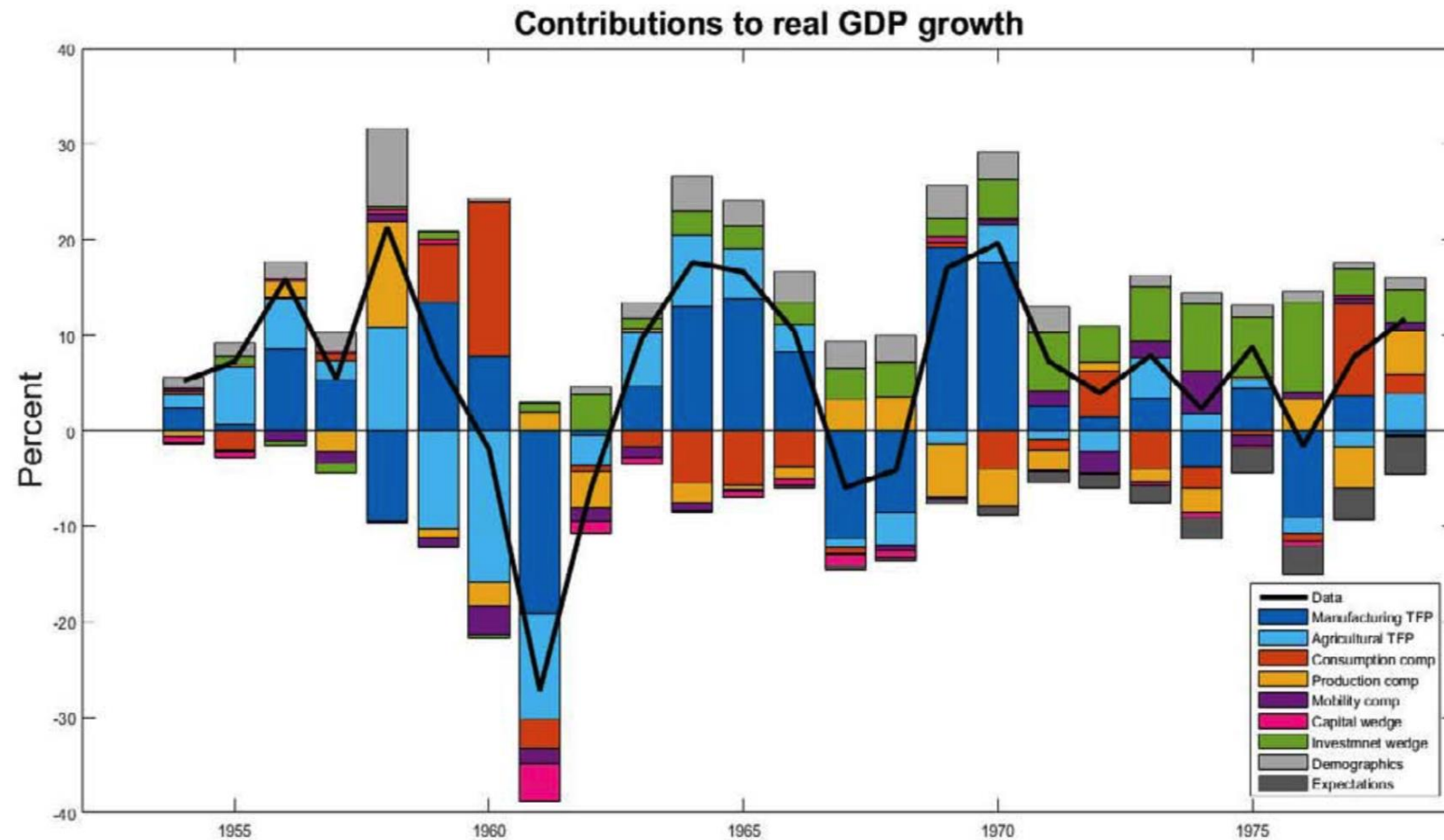
Decisive contributors:

1. Production comp. of labor share wedge
2. Consumption comp. of ~

Noticeable contributors:

1. Manufacturing TFP
2. Agricultural TFP

Effects of wedges on economic variables



Decisive contributors:

1. Manufacturing TFP
2. Agricultural TFP
3. Investment wedge

Limited contributors:

1. Production comp. of labor share wedge
2. Consumption comp. of ~ (Great Leap Forward; Cultural Revolution; power struggle)

Effects of wedges on economic variables

- Conclusion

1. The policies that affected TFP and the components of the labor wedge play the largest role in explaining fluctuations in the labor share and GDP.
2. The change of investment wedge accumulated gradually over time, which is hard to detect in a specific short period. The reduction of investment wedge in the long-term is important for the growth and transformation of Chinese economy in the pre-1978 period.