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Domestic Savings-driven Growth: Unveiling Internal Economic Dynamics in China, 1980-2010

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Abstract

It has been commonly believed that economic reforms in the post-Mao Era since 1980 have changed China from autarky to an export-oriented developmental path, accompanied by inward and cheap FDI with advanced foreign technology. This paper challenges this view with quantitative evidence and shows that China's recent growth has depended heavily on a domestic source of capital coming from newly available household savings, stemming from (1) state mandatory price control over food as a wage good on the one hand and (2) a fast-growing wage level due to arising labour productivity on the other.

I Introduction and Motivations

China's three-decade-long growth from 1980 to 2010 has been regarded as a success story for 'communist reforms', regarding its uninterrupted motion and its gradual and seamless approach.¹ Remarkably also, China's new growth resembles Walt Rostow's 'growth stages' in a relatively closed economy.² Much credit has so far been attributed to a change from a

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¹ Jeffery Sachs, *Poland's Jump to the Market Economy* (Cambridge: MIT Press, 1993); Jeffrey Sachs and Wing Thye Woo, 'Structural Factors in Economic Reform in China, Eastern Europe, and the Former Soviet Union', *Economic Policy* 18 (1994): 101–145; Justin Yifu Lin and Valery Makarov, 'Transition to A Market-oriented Economy, China versus Eastern Europe and Russia', in Yujiro Hayami and Masahiko Aoki (eds) *The Institutional Foundations of East Asian Economic Development* (Basingstoke: Palgrave Macmillan, 1998), pp. 215–51.

² Walt W. Rostow, 'The Stages of Economic Growth', *Economic History Review* 12/1 (1959): 1–16.

planned autarky to an export-friendly market.³ Intuitively, a developmental state seems to have been responsible for steering a closed economy to an open one,⁴ a narrative that finds some evidence to support.⁵

This study challenges this narrative after scrutiny of China's growth mechanisms from 1980 to 2010. Our findings point to China's domestic private household savings as the internal driving force that fuelled China's unprecedented growth *à la* Adam Smith.⁶ This is an untold story until now.

The said household savings were resulted from an increasing gap between low-priced wage goods (mainly food) by default and a rising wage income thanks to the reforms.⁷ It is true that household savings function as 'capital accumulation' and not yet 'capital investment' that relies on the banking sector. By definition, however, the legal owners of savings-*cum*-capital were private depositors, not banks. What banks do is merely to turn private depositors' capital into investment funds for businesses. In Mainland China,

³ Dwight H. Perkins, 'Reforming China's Economic System', *Journal of Economic Literature* XXVI (1988): 601–645.

⁴ The concept of 'developmental state' is firstly developed by Chalmers Johnson; see his *MITI and the Japanese Miracle: The Growth of Industrial Policy, 1925–1975* (California: Stanford University Press, 1982); see also Qimiao Fan and Peter Nolan (eds), *China's Economic Reforms: The Costs and Benefits of Incrementalism* (Basingstoke: Palgrave Macmillan, 1994).

⁵ This is also known as the governed market in East Asian industrialization; see Robert H. Wade, *Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization* (Princeton: Princeton University Press, 1990).

⁶ Adam Smith sees the drive for economic growth in individuals' innate self-interest that leads to endogenous saving and capital accumulation: 'An augmentation of fortune is the means by which the greater part of men proposes and wish to better their condition. ... and the most likely way of augmenting their fortune is to save and accumulate some part of what they acquire, either regularly and annually, or upon some extraordinary occasions.' Adam Smith, 1776, *An Inquiry into the Nature and Causes of the Wealth of Nations* (Chicago: University of Chicago Press, 1976), Book I, pp. 62-3. This Smithian doctrine continues among thinkers in economics, e.g. Alfred Marshall, *Principle of Economics* (London: Macmillan, 1920), Book IV, ch. 8; Arthur Lewis, 'Economic Development with Unlimited Supplies of Labour', *The Manchester School*, 22 (1954): 139-91; Donald Winch, 'Adam Smith Problem and Ours', *Scottish Journal of Political Economy* 44/4 (1997): 384–402.

⁷ Raaj Kumar Sah and Joseph E. Stiglitz, 'The Architecture of Economic Systems: Hierarchies and Polyarchies', *American Economic Review* 76/4 (1986): 716–27; Raaj Kumar Sah and Joseph E. Stiglitz, *Peasants versus City-Dwellers: Taxation and the Burden of Economic Development* (Oxford: Clarendon Press, 1992); John Knight, 'Price Scissors and Intersectoral Resource Transfers: Who Paid for Industrialization in China?' *Oxford Economic Papers* 47/ (1995): 117–35; Jane Du and Cheng King, 'Unravelling China's Food Security Puzzle, 1979-2008', *China Quarterly* 235 (2018): 804–27; Jane Du and Cheng King, 'China's Government Finance and Food Security Nexus: A Regime Switching Analysis,' *Applied Economics* 50/4 (2018): 1–18.

the capital investment function of the state-owned banks has remained unchanged since the 1950s (hence also by default) despite the fact that private household savings were insignificant prior to 1980. But after 1980 private household savings have claimed the lion's share in the country's capital terms and consequently become the engine of China's new growth.

This phenomenon points us to the Solow-Sawn approach to a closed economy like what China was when post-Mao reforms started. Economic growth can be generated by savings-*cum*-capital investment, while technological progress embodied in labour productivity or total factor productivity generates more savings to form a virtuous cycle.⁸

But the source of domestic savings (sY) needs explanation. The present study sees savings ultimately coming from an increase in total factor productivity (*hereafter* TFP) in general and labour productivity in particular. The dynamism between output per unit of technology-embodied labour (labour productivity) and capital stock can be expressed by the following format:⁹

$$y(t) = \frac{Y(t)}{A(t) L(t)} = k(t)^\alpha, \quad 0 < \alpha < 1. \quad (1)$$

Where y stands for labour productivity; Y , the total output; A , production knowledge; L , labour input; and k , growth in capital stock (subject to diminishing returns). Noted, conceptually capital investment rate can be expressed as

$$k(t)^\alpha = \frac{\dot{K}}{K} = sA - \delta \quad (2)$$

⁸ See Robert M. Solow, 'Technological Changes and the Aggregate Production Function', *Review of Economics and Statistics* 39/3 (1957): 312-20; Daron Acemoglu, 'The Solow Growth Model', in his *Introduction to Modern Economic Growth* (Princeton: Princeton University Press, 2009), pp. 26-76.

⁹ Derived from the original Solow-Swan Production Function $Y(t) = K(t)^\alpha (A(t) L(t))^{1-\alpha}$.

Where capital accumulation $\dot{K}$ depends on domestic saving rate (s) minus capital depreciation rate (δ) when production knowledge remains unchanged in the short term.

Here, one can assume that individual's output level (y) – labour productivity – is a proxy for workers' wages. By definition, wages can be divided into subsistent living costs c (including food bills) and disposable income d . If workers' food bills are taken as a proxy for living costs, a proportion of disposable income ends up as savings. Hence,

$$sY(t) = f(c, d), \text{ where } f'(c) < 0, f'(d) > 0. \quad (3)$$

This study argues that a gap between artificially low food prices which was inherited from Mao's era and TFP-driven wages which came from Deng's economic reforms created the momentum for private household savings which in turn for boosted China's domestic capital formation and capital investment. The implications here are two-fold: (1) the debate on China's gradualism may be superficial, as Mao's legacy in food pricing and banking continued in post-Mao times; (2) Deng's reforms may not be as radical as one might think.

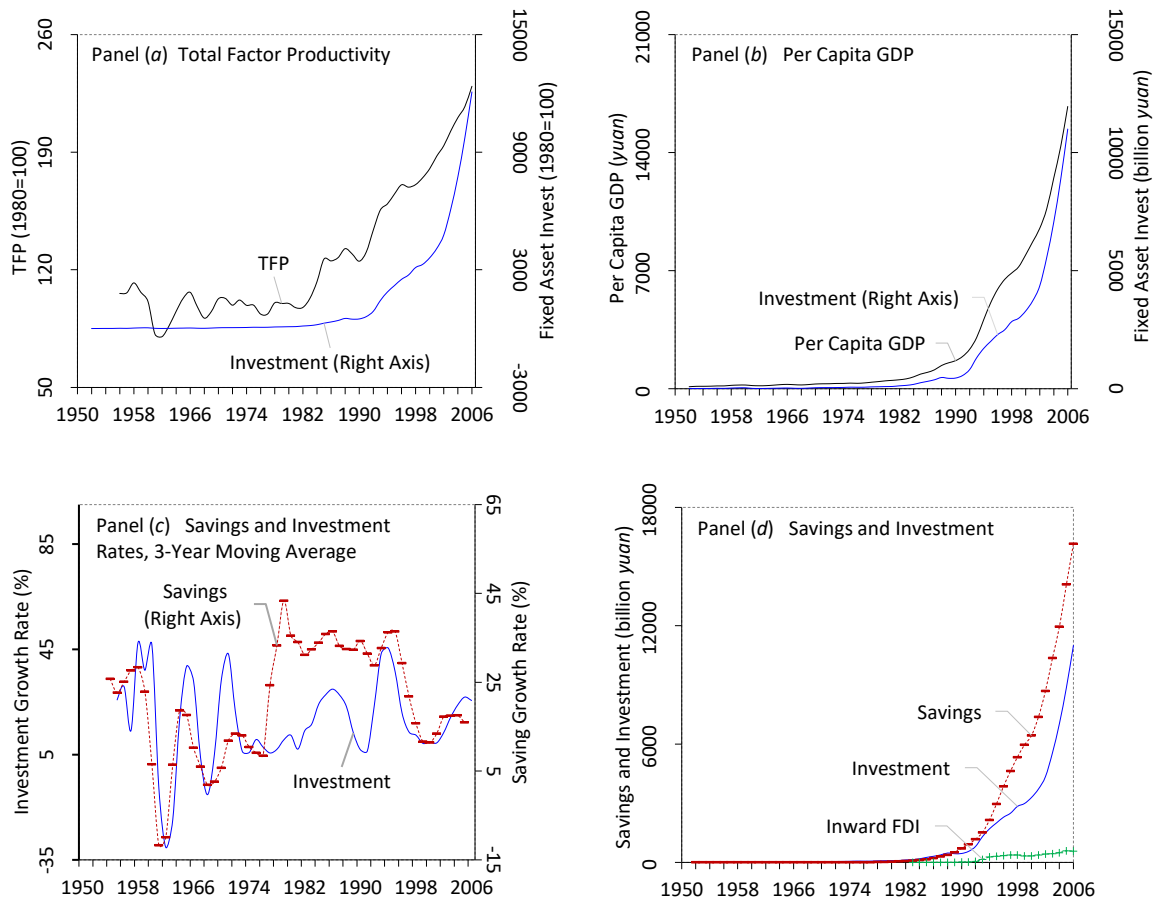
Following Introduction and Motivations, Section II provides an overview of China's post-1980 track record. Section III theorizes China's departure from a Soviet command economy using a two-sector model. Section IV empirically simulates gradualist mechanisms of nursing the market step by step. Section V discusses the principal component factors behind China's long-term productivity growth and assesses the main findings.

II An Overview of China's Track Record

II.1 General trends

Our observations are highlighted by Figure 1 which shows trends in TFP, savings, capital investment, and economic growth (GDP per capita) in China since 1950.

Figure 1 Productivity and Capital Market Changes



Sources: National Bureau of Statistics, *China's Compendium of Statistics 1949-2008* (Beijing: China's Statistics Press, 2010); National Bureau of Statistics, *Statistical Yearbook of China's Investment in Fixed Assets* (Beijing: China's Statistics Press, various years); National Bureau of Statistics, *China's Statistical Yearbook* (Beijing: China's Statistics Press, various years); CEIC, *China's Premium Database*, available *vide* <<https://www.ceicdata.com/en/products/china-economic-database>>, as on 15 August 2023.

In Figure 1, Panels *a* and *b* show that both TFP and per capita GDP move ahead of capital investment. In particular, (1) a fast growth in TFP began in the 1980s and accelerated in the 1990s (Panel *a*) which can be attributed to Deng's reforms; and (2) growth in per capita GDP is close to capital investment performance during reforms (Panel *b*). If so, China's growth may

be qualified as ‘TFP-led’. Moreover, Panels *c* and *d* shows that domestic savings also moved ahead of investment in post-Mao times. If one uses the investment level as a benchmark, across Panels *a*, *b* and *c*, visually a correlation between TFP, per capital GDP and savings emerges.

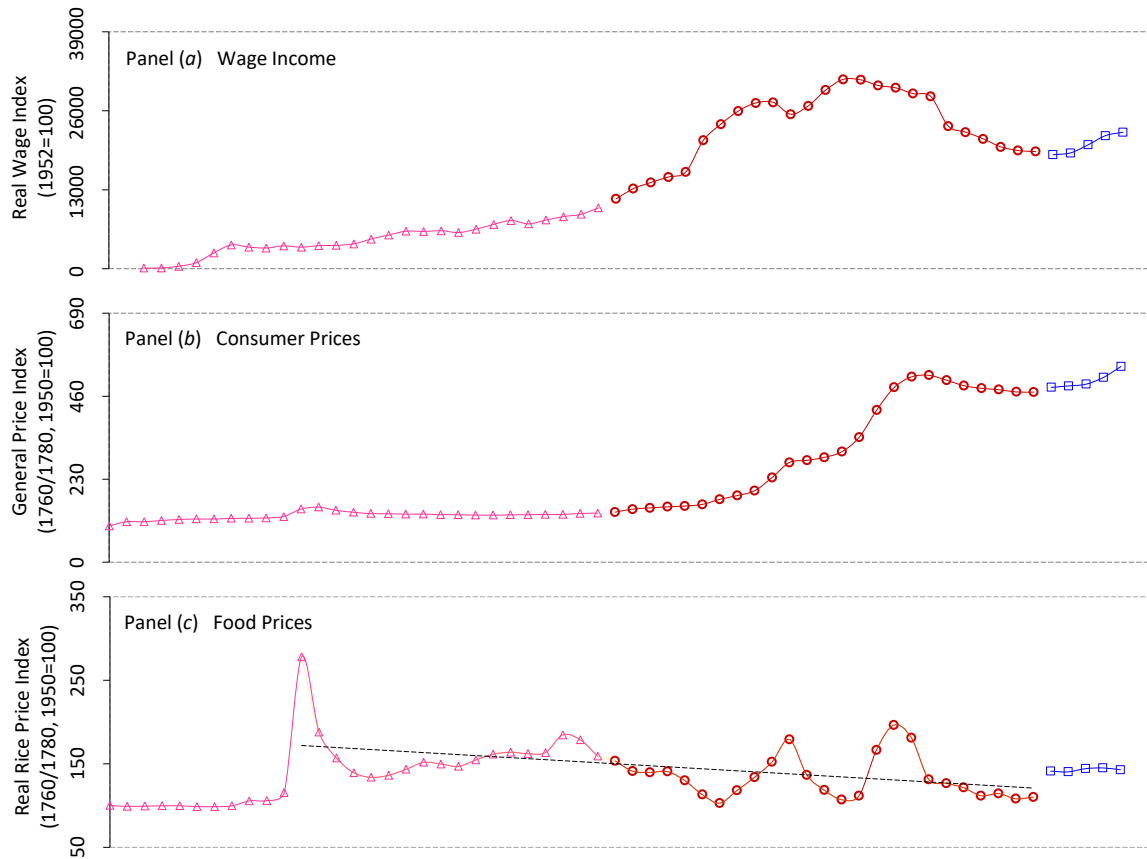
Conceptually, post-Mao growth in China has been ‘domestic savings-driven’. This is supported by the fact that until the Year 2000 the amount of inward foreign direct investment (FDI) remained trivial and fell well behind that of domestic capital investment (Panel *d*). Thus, China’s main source of capital was necessarily domestically based. The notion that China’s fast growth rode on cheap capital influx becomes questionable.

If China’s growth was domestic savings-driven, one naturally wonders where such savings actually came from. The answer lies in a gap between wage income and living costs. Figure 2 shows relevant patterns: (1) wages took off after reforms (Panel *a*) which matched the country’s GDP performance (Panel *d*); but food prices were on decline (Panel *b*).¹⁰ The gap between wages and living costs of food supports a ‘savings for growth’ hypothesis, as long as wage-earners did not spend all their dispensable income on consumer goods. Fortunately, a chronical lack of public goods

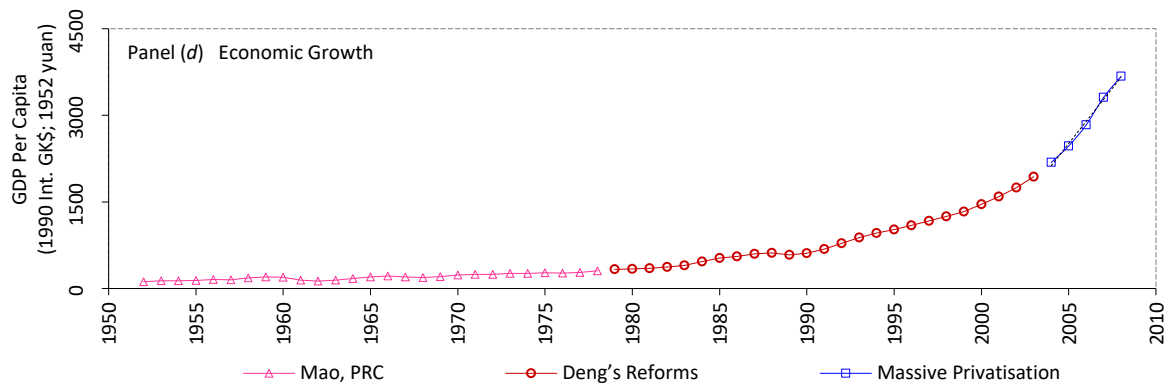
¹⁰ There is no rural wage data for our period as farmers operated in a different system known as ‘production responsibilities’.

provision including children's education, family medical care and aged pensions in both the urban and rural sectors forced households to save.¹¹

Figure 2 Long-run Wages and Consumer Prices, since the 1950s



¹¹ Simply put, a decline in government spending on social services during the economic transition in the 1980s and 90s forced ordinary Chinese to save. Numerous publications, e.g. Xin Meng, 'Unemployment, Consumption Smoothing, and Precautionary Savings in Urban China', *Journal of Comparative Economics* 31/3 (2003): 465-85; Charles Y. Horika and Junmin Wan, 'The Determinants of Household Savings in China', *Journal of Money, Credit and Banking* 39/8 (2007): 2077-96; Xinhua He and Yongfu Cao, 'Understanding High Savings Rates in China', *China and World Economy* 15/1 (2007): 1-13; Riccardo Cristadoro and Daniela Marconi, 'Household Savings in China', *Journal of Chinese Economic and Business Studies* 10/3 (2012): 275-99; Marcos Chamon, Kai Liu, and Eswar Prasad, 'Income Uncertainty and Household Savings in China', *Journal of Envelopment Economics* 105 (2013): 164-77; Hui He, Feng Huang, Zheng Liu, and Dongming Zhu, 'Breaking the "Iron Bowl": Evidence of Precautionary Savings from the Chinese State-owned Enterprises Reform', *Journal of Monetary Economics* 94 (2018): 94-113; Longmei Zhang, Ray Brooks, Ding Ding, Haiyan Ding, Hui He, Jing Lu, and Rui Mano, 'China's High Savings: Drivers, Prospects, and Policies', *IMF Working Paper 18/277* (2018), *vide* https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjQoNjI2qKCAxWsQUEAHVJlClEQFnoECBIQAQ&url=https%3A%2F%2Fwww.imf.org%2F-%2Fmedia%2FFiles%2FPublications%2FWP%2F2018%2Fwp18277.ashx&usg=AOvVaw2EzzlT1IcD_36Jv2k9AH_&opi=89978449, available on 1st November, 2023.



Notes: (1) Data in this figure cover the Maoist rule, Deng's reforms and current massive privatisation in China. During the post-Mao reforms, China's food market prices declined (1980-2003). As a result, real wages in the urban sector increased but more slowly compared with the price changes in non-food consumer goods. (2) Real rice price (Panel c) and consumer price (Panel b) data come from *China's Compendium of Statistics 1949-2008*, *Statistical Yearbook of China's Investment in Fixed Assets* and *China's Statistical Yearbook*; the urban wage index is based on CEIC, 'Premium Data for China'.

Sources: National Bureau of Statistics, *China's Compendium of Statistics 1949-2008* (Beijing: China's Statistics Press, 2010); National Bureau of Statistics, *Statistical Yearbook of China's Investment in Fixed Assets* (Beijing: China's Statistics Press, various years); National Bureau of Statistics, *China's Statistical Yearbook* (Beijing: China's Statistics Press, various years); CEIC, 'Premium Data for China', available *vide*: <<https://www.ceicdata.com/en>>, available on 15 August 2023; Ministry of Agriculture, *China's Agriculture Yearbook* (Beijing: China's Agriculture Press, various years); National Bureau of Statistics, *China's Price Statistical Yearbook* (Beijing: China's Statistics Press, various years).

II.2 Food-price control by default and its impact

Historically, food availability remained *the* paramount concern by most rulers in China, a doctrine known as 'food is people's heaven' (*min yi shi wei tian*) – or 'food entitlement for the ordinary people' in a modern interpretation – on which the mandate for the ruler was based,¹² a belief which eventually gained the axiom status. As a result, prior to *circa* the 1850s the state-run 'ever-normal granary' (*changping cang*) was the Holy Grail of Imperial China's statecraft. Mao himself did not escape such an ideological constraint. He re-conceptualised it as 'food commands the first

¹² This was first declared by a political consultant named Li Sheng in *circa* 199 BC as 'people's support is a ruler's heaven, while food is people's heaven' (*wangzhu yi minren wei tian, er minren yi shi wei tian*); see Sima Qian's *Shi Ji* (*The Book of History*) written in 91 B.C. Its modern reprinted: *Ershiwu Shi* (*The Twenty-five Official Histories*) (Shanghai: Shanghai Books 1986), vol. 1, p. 301.

state priority' (*yi liang wei gang*).¹³ The post-Mao food policy has followed the same incumbent principle.¹⁴ Call it path dependence if you will.

If one goes further, this policy choice was deeply rooted in China's timeless doctrine of a 'state-peasant alliance' which can be traced all the way back to Shang Yang's Reforms (*shangyang bianfa*) in *circa* 356 BC which aided China's unification process in 221 BC.¹⁵ Thanks to this alliance, the peasantry in China was legally granted a high social status only below the ruling *literati*. In addition, the peasantry possessed farmland with private property rights whereby high-yield agriculture was created.¹⁶ This alliance also explains why until 1949 Mao's political undertaking was a peasant movement in real terms as recognised so by Stalin and Comintern of the time.¹⁷ Even Mao's revolution strategy of 'encircling cities from the countryside' (*nongchun baowei chengshi*), was copied from Zeng Guofan (1811-1872), a Qing military leader who led a victory against the urban based Taipings in the 1850s and 1870s.¹⁸

¹³ Indeed, the notorious 1959-61 Great Leap Famine *per se* was caused by a wide-spread rumour that an unprecedented bumper harvest arrived all over Mainland China, a hoax that was created by an army of local officials who were keen on personal promotions. The damage caused by Great Leap Famine was so great that Beijing decided to reverse its rural communist utopia and granted the peasantry limited property rights to allow the rural economy to recover. Recover it did by 1965.

¹⁴ Although the state resisted at first against more food regulations, in 1985 it opted for a policy of '70:30 ratio' (*dao san qi*) because 'the central finance is overwhelmed' by the burden of food procurement. For details, see Chinese Communist Party Central Committee, 'Zhonggong Zhongyang Guowuyuan Guanyu Jinyibu Huoyue Nongcun Jingji De Shixiang Zhengce' (Ten Policies of the Central Committee and the State Council for Further Enlivening the Rural Economy) (Beijing: Chinese Communist Party Central Committee), 1 January 1985. See also Jane Du and Kent Deng, 'Getting Food Prices Right: The State versus the Market in Reforming China, 1979-2006', *European Review of Economic History* 21/3 (2017): 302-25.

¹⁵ Gang Deng, *The Chinese Premodern Economy – Structural Equilibrium and Capitalist Sterility* (London and New York: Routledge, 1999), ch. 3.

¹⁶ Deng, *Chinese Premodern Economy*, ch. 2; Mark Elvin, *The Pattern of the Chinese Past* (Stanford: Stanford University Press, 1973) pt 3; Kenneth Pomeranz, *The Great Divergence* (Princeton: Princeton University Press, PUP, 2000), ch. 1.

¹⁷ See Peter Vladimirov, *The Vladimirov Diaries, Yenan, China: 1942–1945* (New York: Doubleday, 1975), pp. 152, 357, 465 and 474.

¹⁸ Mao himself openly admitted that 'Amongst all the recent figures in history, I only admire Zeng Wezheng [Zeng Guofan] in that he did such a perfect job to eliminate Hong Xiuquan and Yang Xiuqing [of the Taipings]', in Mao Zengdong, "1917 Nian 8 Yue 23 Ri Zhi Li Jinxi Xin" (Letter to Li Jinxi in 23 August 1917), in Institute of Documents of Chinese Communist Party Central Committee and Hunan Provincial Committee of the Chinese Communist Party, eds, *Mao Zedong Zaoqi Wengao (Early Writings of Mao Zedong)* (Changsha: Hunan Press, 1990), p. 85.

Thus, in the 1980s and 1990s, the state monopsony set the state procurement numeration below the free market price whereby living-cost subsidies for urban residents were achieved.¹⁹ Table 1 categorises government two signature approaches during the reform period: (1) income subsidies in the urban sector, (2) monopsonic rights and (3) price control over food.²⁰

¹⁹ On the one hand, the real grain purchase price changed little; on the other, inflation caused a substantial rise in the cost of grain production. The ever-increasing cost of agricultural production and the static grain purchase price deterred many farmers from entering supply contracts with the state.

²⁰ These categories are measured independently later for empirical analysis.

Table 1 Documented State Mandatory Food-Price Controls, 1979-2006

Date (I)	Policy (II)	Sources (III)	Classification (IV)
1979	Increase in procurement prices, and Household responsibility system	PCCD No. 4, 1979 PCCD No. 4, 1979	Food price control Output pricing Food monopsony
1983	Food sales go beyond fiscal burden	PCCD No.137, 1982	Food monopsony
1985	70-30 Ratio (<i>dao san qi</i>)	PCCD No. 1, 1985	Food monopsony; food price control Output pricing
1987	Further deepen the rural reform	PCCD No. 5, 1987	Food price control
1988	Three Links (<i>san gua gou</i>)	PCCD No. 1, 1988	Food price control Input pricing
1990	Grain monopsony (<i>guojia dinggou</i>)	SCD No. 55, 1990	Food monopsony
1991	Rationing and prices of food	SCD No. 18, 1991	Food monopsony, food price control
1992	Price control over food procurement, and Reduction of food subsidies	SCD No. 15, 1992 SCD No. 9, 1993	Food price control Food price control, urban income
1993	Changes in urban food rationing; Changes in state monopsony of food sales	1993 Agricultural Law PCCD No. 11, 1993	Food price control, urban income Food monopsony
1994	Provincial Grain Responsibility System, and Decentralising food price control	SCD No. 32, 1994 SCD No. 76, 1994	Food monopsony Food price control, urban income
1997	Cost-profit guideline (<i>baoben weili</i>)	SCD No. 38, 1997	Food monopsony, food price control
1998	Flexible prices according to quality (<i>anzhi lunjia</i>), Dual price tracks (<i>shunjia xiaoshou</i>), and Decentralising food price control	SCD No. 244, 1998 SCD No. 244, 1998 SCD No. 35, 1998	Food monopsony Food price control, urban income Food monopsony
1999	Deregulating food price control	SCD No. 20, 1999	Food monopsony, food price control
2004	Food price liberalisation Marketization of food prices, and Reduction of agricultural taxes	SCD No.1, 2004 SCD No. 407, 2004 PCCD No. 1, 2005	Food monopsony Food price control Food monopsony
2005	Termination of agricultural taxes	PCCD No. 1, 2006	Food monopsony
2006	Subsidising food producers	PCCD No. 1, 2007	Food price control

Notes: PCCD stands for Party Central Committee Document; SCD, State Council Document/Decree.

Source: Compiled by the authors.

In a nutshell, Deng's reforms followed a roadmap from 1980 to 2010:

*The state-controlled food prices by default to keep living cost
artificially low when reforms began.*

⇓

*The state at the same time deregulated wages to encourage labour
productivity; urban wage rate arose.*

⇓

A low food price plus a high wage rate led to more household savings.

⇓

*State-owned banks took the advantage of new household savings and
invested in the domestic economy.*

⇓

More growth was generated.

Counterfactually, if the Russian shock-therapy had been adopted by post-Mao reformers, prices of wage goods (mainly food) would increase with wages, leaving less room for household savings to be made. Then, capital investment would become more externally dependent which is inevitable for the Russian model.²¹

III A Two-Sector Model and Baseline Interventions

III.1 Non-market allocation of resources

With *a priori* constraint of a soviet command economy,²² a two-sector model (Sectors One and Two) can be set up,²³ starting from a closed economy with

²¹ Studies show that a radical switch to a market economy made a dysfunctional planned economy performing worse, although post-reform growth may have little to do with the shock therapy itself; see e.g. Alan Smith, 'Shock Therapy or Gradualism? Economic Controversies with Political Undercurrents', *Slavonic and East European Review* 72/4 (1994): 692-701.

²² This was implemented in all the Soviet economies that were unable to have access to resources from the international market (or allies).

²³ Hirofumi Uzawa, 'Neutral Inventions and the Stability of Growth Equilibrium', *The Review of Economic Studies* 28/2 (1961): 117-24; Hirofumi Uzawa, 'Production Functions with Constant Elasticities of Substitution', *Review of Economic Studies* 29/4 (1962): 291-299; Ken-ichi Inada, 'On a Two-Sector Model of Economic Growth: Comments and a Generalization', *The Review of Economic Studies* 30/2 (1963): 119-27.

little access to international market.

$$Y_i = F_i(K_i, L_i) = A_i K_i^\alpha L_i^\beta \quad (4)$$

Where $i = 1, 2$ and F satisfies $F' > 0$ and $F'' < 0$.²⁴

This model has three stakeholders: (1) capital goods producer of Sector One $i = 1$, (2) consumer goods (i.e. necessity) producer of Sector Two $i = 2$, and (3) a central planner to control both sectors. Sector One uses inputs L_1 and K_1 to produce capital goods Y_1 for both sectors (e.g. fixed assets). Sector Two produces basic consumer goods Y_2 for both sectors with the inputs of L_2 and K_2 .

With the absence of a labour market and household savings, the central planner acts as the *persona* of the capital goods accumulation. So on a centrally planned stage $t = 0$, the workforce size of each sector stays stable: $\sigma = L_1/L$ in Sector One, and $1 - \sigma = L_2/L$ in Sector Two. The central planner controls the share θ of capital goods Y_1 ($0 < \theta < 1$) for growth, meanwhile maintains a minimum share c of Y_2 to sustain the standing population at the subsistence level $Y_2 = cL$.

III.2 General relationship between capital goods and consumer goods

When reforms start at $t = 1$, the planner hands resource allocation over to the market. At the beginning, no savings exist, the economy operates at the level of meeting people's basic needs. Reforms allow the market to perform resource allocation, and flow of production factors. Such a flow changes workforce size of both sectors σ and $(1 - \sigma)$; transaction cost of capital

²⁴ Solow conditions include (1) labour and capital flow between sectors, and (2) part of wage income transfers as saving. Should L and K be allowed to flow freely between sectors and individuals permitted to save a proportion of their wage income, the initial setup would be similar to the standard Solow-Swan paradigm. However, Solow conditions usually do not apply to underdeveloped economies. See Robert M. Solow, 'A Contribution to the Theory of Economic Growth', *Quarterly Journal of Economics* 70/1 (1956): 65-94.

φ ($0 < \varphi < 1$) and capital depreciation μ (at $t = 0$, $\theta \in \mu$) kick in.²⁵

Meanwhile, as the workforce needs consumer goods to meet basic needs, Sector One needs to make the following ends meet:

$$\begin{aligned} cL_1 &= \frac{L_1}{L} Y_2^{t1} \\ &= \sigma[Y_1^{t1} + (1 - \varphi)(K_1^{t1} + K_2^{t1})] \end{aligned} \quad (5)$$

The problem however is that if σ and φ are excessively large Y_2 could eat into Sector One's own capital stock. Moreover, if Sector Two now attracts more capital stock, Sector One produces fewer capital goods for the future production cycle, and economic growth slows down. Soon, the original capital allocation balance between the two sectors ends at $t = 1$. Meanwhile, if Sector Two produces more consumer manufactures and less food, prices of food go up.²⁶ It makes savings difficult.

Conceptually, the annual output of capital goods should compensate the depreciation of capital $f'(k) = r + \mu$. If the state share θ is sufficiently large, the sectorial residential savings may not be able to cover capital depreciation, if $\theta > \mu$. If so, the role of capital investment may depend heavily on the state:

$$\frac{U'(c_t)}{U'(c_{t+1})} = \frac{1 + r_{t+1}}{1 + \zeta} \quad (6)$$

Where ζ is a discount factor.

If the state gives up control over wages, household incomes (i.e. wages and

²⁵ Noted here, Mao's economic planners did not use the concept of 'capital depreciation' because they did not recognise the value of capital. Rather, they saw capital stock as the 'materialised labour', a dogmatic idea coming from Karl Marx; see his *Das Kapital*, translated by Samuel Moore (Scotts Valley [California]: Createspace Independent Press, 2011), vol. 1.

²⁶ The 1979-80 Inflation in China had some characteristics fitting this description.

capital income) may exceed the cost of their basic needs, which in turn makes private savings feasible. This is a subtle shift of capital accumulation from the state to private savers.

$$\dot{c}_t = \frac{r_t - \zeta}{\pi(1 + r_t)} \quad (7)$$

Where π the risk aversion coefficient $0 < \pi < 1$.

III.3 Low prices for wage goods and consequential household savings

The removal of factor flow restriction between the two sectors changes capital budget from

$$\alpha_i = y_i - \mu k_i \quad (8)$$

To

$$\alpha_i = y_i + (1 - \mu)k_i \quad (9)$$

Consequently, the household utility, made of consumption c and savings s , also changes:

$$c = y_2 l_2 \quad (10)$$

$$s = y_1 l_1 + (1 - \mu)k \quad (11)$$

And,

$$u = c^h s^\gamma \quad (12)$$

Ideally, households have the option to alienate their capital stock. So, households liquidate their capital assets in exchange of consumer goods.²⁷ If so, the consumption goods market price p^{t1} behaves as follows:

²⁷ Here also refers to firms at latter stage of transition.

$$p^{t1} = \frac{hs}{\gamma c} = \frac{h}{\gamma} \frac{y_1 l_1 + (1 - \mu)(k_1 l_1 + k_2 l_2)}{y_2 l_2} \quad (13)$$

An overshoot in consumer goods price during market reforms may be a result.

Now, to assume the per capita capital goods output under the planner economy is similar to capital depreciation, and to factor in a discount rate at $(\mu \mid \theta \in \mu)$ for simplicity, from $t = 0$ to $t = 1$, an extreme price change occurs. Even if the planner does not control the capital stock $\mu = 0\%$ at $t = 0$, the price for consumer goods could still increase 2.3 times with the economic transition.²⁸

Moreover, waged workers may be more responsive to changes in wage goods prices than to capital goods prices, which may create imbalance between the two sectors. Three factors may be involved:

- Factor 1: Capital shortage. If the economy is hunger for capital, the banking sector offers depositors a high interest rate to attract savings or economic growth slows down.
- Factor 2: Saving incentives. If public goods provision is inadequate, citizens will save for the rainy days. Savings continue.
- Factor 3: A zero-sum between consumption and savings. Income-price inelastic items occupy an increasing weight in the consumers' basket, which may at best be compensated by income-price elastic goods which become cheaper owing to 'consumers' surplus'. Savings are not increased.

Factors 1 and 2 are unlikely to change in the short term as they rely on ordinary people's incomes. The danger of price overshoot in wage goods

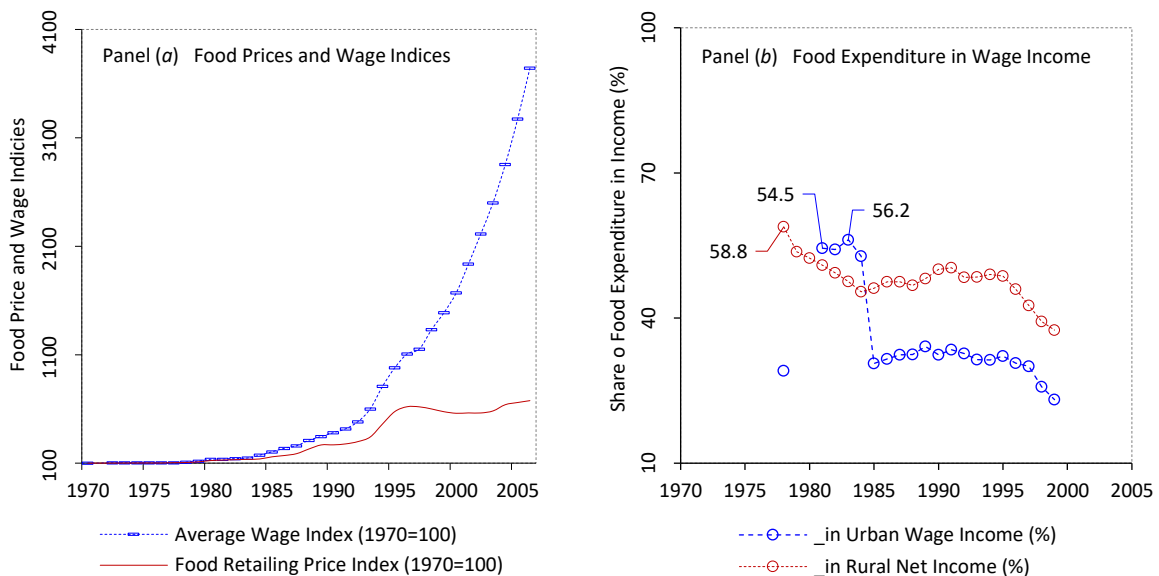
²⁸ Wei-Bin Zhang, 'A Discrete Two-Sector Economic Growth Model', *Discrete Dynamics in Nature and Society* (2007), Article No. 089464: p. 13.

looms large only with Factor 3 which agrees with the Russian shock-therapy reforms,²⁹ in which wages fell behind consumer goods prices.²²

III.4 Evidence for low food prices side by side with China's new growth

Not until the mid-1980s did wages in China accelerate (Figure 3, Panel *a*). Meanwhile, China's Engel coefficients were on the decline specially in the urban sector, meaning that food bills became smaller in people's consumption basket (Figure 3, Panel *b*).³⁰ With the hindsight it is the state interference with prices of wage goods that allowed for private savings to grow.³¹

Figure 3. Changes in Food Prices and Wage Income



Notes: (1) Panel *a* plots the food retail price index and industrial wage index in the urban sector. (2) Panel *b* converts information in Panel *a* into the ratio of food expenditure in urban wage income to illustrate food consumption burden at the household level.

Sources: National Bureau of Statistics, *China's Compendium of Statistics 1949-2008* (Beijing: China's Statistics Press, 2010); National Bureau of Statistics, *China's Statistical Yearbook* (Beijing: China's Statistics Press, various years).

²⁹ After 1992, the shock therapy in former Soviet states made marketization of primary goods sector much faster than the rest. Rapidly increased consumer goods price lowered people's purchase power, resulting in a serious shortage of primary goods and underestimation of capitals.

³⁰ Share of food expenditure in urban per capita wage income reaches 54.5 per cent in 1981 as is shown in Panel *b* of Figure 3.

³¹ Du and King, 'Food Security Puzzle'.

IV Domestic Household Saving-Driven Growth

Prime facie, in 1980 when reforms just began in China, each citizen saved on average 40.35 *yuan*,³² or 1.3 months' pay on the post-apprenticeship level. In another account, in 1978 China's rural per capita bank deposit was mere 6.93 *yuan*, applicable to 80 percent of China's total population of the time.³³ The aggregate private deposits in all banks were insignificant, equivalent to 8.8 percent of China's total annual GDP of 1980.³⁴ In 2000, however, the aggregate private deposits reached 6,433.2 billion *yuan*, equivalent to 72 percent of China's total GDP that year,³⁵ or over eight times the level of 1979. In addition, it was documented that Mao's state routinely reinvested a quarter of China's GDP in the economy each year.³⁶ If the same practice was expected, private savings eventually fulfilled the need for reinvestment in the economy.

IV.1 Empirical framework and summary of statistics

To better understand how domestic savings were created internally during the reforms in 1980-2006, empirical modelling is set up with three types of data:

- (1) *China's Agriculture Yearbook* (for food data);
- (2) *Almanac of China's Finance and Banking*, *Statistical Yearbook of Price and Urban Household Survey*, and *China's Price Statistical Yearbook* (for price indices and fiscal conditions); and
- (3) *China's Statistical Yearbook*, *Compilation of Statistics 1949-2008*, *China's Statistical Abstract*, *Statistical Yearbook of China's Investment in Fixed Assets*, and CEIC, 'Premium Data for China' (for macro-economic indicators).

Table 2 reports the statistics.

³² China's 1979 GDP was 403.8 billion *yuan*; see National Bureau of Statistics, *Zhongguo Tongji Nianjian, 2002* (*China's Statistical Year Book, 2002*) (Beijing: China's Statistics Press, 2002), p. 51. For China's 1979 population, see National Bureau of Statistics, *Zhongguo Tongji Nianjian, 1986* (*China's Statistical Year Book, 1986*) (Beijing: China's Statistics Press, 1986), p. 91.

³³ Lu, *Survey of Social Strata*, p. 165.

³⁴ Based on the 1980 data, see Ministry of Finance, *Zhongguo Caizheng Nianjian, 2004* (*China's Financial Year Book, 2004*) (Beijing: China's Finance Magazine Press, 2004), p. 411.

³⁵ Ministry of Finance, *Financial Year Book, 2004*, p. 411.

³⁶ Ministry of Finance, *Financial Year Book, 1997*, p. 479; National Bureau of Statistics, *Statistical Year Book, 2002*, p. 51.

Table 2. Summary Statistics and Their Sources

Variables (1)	Obs. (2)	Mean (3)	S.D. (4)	Median (5)	Min. (6)	Max. (7)	Description and source (8)
Panel (a) Identifying determinants of savings							
Private saving deposits (SAV_t)	27	6.001	1.271	6.150	3.600	7.870	Logarithmic average saving deposit per capita as spending power in 1978 <i>yuan</i> ; from CSY
Wage income (WAG_t)	27	233.112	54.272	234.880	131.750	311.770	Industrial wage index of urban state-owned enterprises, 1978=100; from CEIC and CSA
Food retail price for China (FOD_t)	27	119.425	25.897	119.270	87.320	164.010	Urban food retail price index, 1978=100 (after CPI); from CSY, CPSY and CSYP
Panel (b) Controlling the supply of wage goods							
Private saving deposits (SAV_t)	27	6.001	1.271	6.150	3.600	7.870	As above
Food retail price for China (FOD_t)	27	119.425	25.897	119.270	87.320	164.010	Urban food retail price index, 1978=100 (after CPI); from CSY, CPSY and CSYP
Price intervention frequency (rf_{it}^{pr})	27	0.444	0.497	0.000	0.000	1.000	Frequency of intervention in food price; for year with intervention take 1, otherwise 0
Monopoly intervention frequency (rf_{it}^{mo})	27	0.407	0.491	0.000	0.000	1.000	Frequency of intervention in monopoly rights; for year with intervention take 1, otherwise 0
Wage income (WAG_t)	27	233.112	54.272	234.880	131.750	311.770	Industrial wage index of urban state-owned enterprises, 1978=100; from CEIC and CSA
Economic growth (GDP_t)	27	27.885	0.712	27.898	26.761	29.170	Logarithmic GDP in the 1978 <i>yuan</i> ; from CSY
Interest rate (INR_t)	27	5.853	2.966	5.760	1.980	10.980	One-year deposit interest percentage rate %; from ACFB
Population growth (POP_t)	27	1.112	0.351	1.149	0.529	1.668	Year-on-year change of total population, from CSY
Engel's coefficient (ENG_t)	27	50.652	7.920	54.100	35.500	59.900	Engel's coefficients at national level %; from CSY
Grain output (OUT_t)	27	19.883	0.128	19.914	19.586	20.054	Logarithmic total grain output in tonnes; from CAY and CSY
Food prices of Russia (FOD_t^{ru})	27	70025.2	57230.4	57800.0	100.0	174567.7	Price index of total food for Russia from 1992 to 2018 (1992=100); from FRED

Panel (c) Principal component factors for growth

Population growth (POP_t)	27	1.112	0.351	1.149	0.529	1.668	As above
Working-age ratio (WOK_t)	27	2.003	0.306	1.980	1.460	2.660	Ratio of working-age population to dependent population; from UN
Urbanisation (URB_t)	27	30.013	7.359	27.990	19.390	44.340	Urbanisation rate %; from CSY
Consumer price index (CPI_t)	27	294.422	142.459	273.290	109.540	471.250	Consumer price index, 1978=100; from CSY
Foreign capital inflows (FDI_t)	27	6.970	5.390	6.710	0.000	17.070	Share of inward FDI in total fixed assets investment in China; from CSB and CSY
Primary education (PED_t)	27	11.158	1.704	10.980	8.190	14.820	Percentage of student enrolment of primary schools in total population %; from CSY
Higher education (HED_t)	27	0.546	0.497	0.380	0.110	1.820	Percentage of student enrolment of colleges and universities in total population %; from CSY
Industry output (IND_t)	27	27.111	0.751	27.000	26.000	28.000	Logarithmic industrial GDP in 1978 <i>yuan</i> ; from CSY
Fiscal expenditure (FIS_t)	27	26.148	0.602	26.000	25.000	27.000	Logarithmic fiscal expenditure at national level in 1978 <i>yuan</i> ; from CSY
Consumer goods sales (CSM_t)	27	27.074	0.675	27.000	26.000	28.000	Logarithmic total retail sales of consumer goods in 1978 <i>yuan</i> ; from CSY
Energy consumption (ENG)	27	20.889	0.577	21.000	20.000	22.000	Logarithmic total energy consumption in standard coal; from CSY
Fixed asset investment (CAP_t)	27	26.630	0.926	27.000	25.000	28.000	Logarithmic total Investment in fixed assets in 1978 <i>yuan</i> ; from CSY
Household disposable income (INC_t)	27	6.815	0.681	7.000	6.000	8.000	Logarithmic per capita disposal income in 1978 <i>yuan</i> ; from CSY
Export (EXP_t)	27	25.963	1.255	26.000	24.000	28.000	Logarithmic total export in 1978 <i>yuan</i> ; from CSY
Medical care system (MED_t)	27	15.000	0.000	15.000	15.000	15.000	Logarithmic number of health facility beds in health care and medical institutions; from CSY
Passenger turnover (PAS_t)	27	27.296	0.724	27.000	26.000	28.000	Logarithmic passenger turnover in passenger-kilometres; from ND
Freight turnover (FRE_t)	27	28.778	0.641	29.000	28.000	30.000	Logarithmic freight turnover in tonne-kilometres; from ND

Sources: ACFB stands for People's Bank of China, and China's Society for Finance and Banking, *Zhongguo Jinrong Nianjian* (Almanac of China's Finance and Banking) (Beijing: China's Finance Publishing House, various years); CAY for Ministry of Agriculture, *Zhongguo Nongye Nianjian* (China's Agriculture Yearbook) (Beijing: China's Agriculture Press, various years); CEIC, 'Premium Data for China', various years', *vide*: <<https://www.ceicdata.com/en>>, available on 15 August 2023; CPSY for National Bureau of Statistics, *Zhongguo Jiage Tongji Nianjian* (China's Price Statistical Yearbook) (Beijing: China's Statistics Press, various years); CSA for National Bureau of Statistics, *Zhongguo Tongji Zhaiyao* (China's Statistical Abstract) (Beijing: China's Statistics Press, various years); CSB for National Bureau of Statistics, *Xin Zhongguo Liushinian Tongji Ziliao Huibian, 1949-2008* (Comprehensive Statistical Data for Sixty Years of New China, 1949-2008) (Beijing: China's Statistics Press, 2010); CSY for National Bureau of Statistics, *Zhongguo Tongji Nianjian* (China's Statistical Yearbook) (Beijing: China's Statistics Press, various years); CSYP for National Bureau of Statistics, *Zhongguo Jiage Ji Chengzhen Jumin, Jiating Shouzhi Diaocha Tongji Nianjian* (China's Statistical Yearbook of Surveys of Prices, Urban Family Incomes and Expenditures) (Beijing: China's Statistics Press, various years); FRED for Federal State Statistics Service, 'Federal Reserve Economic Data, various years', *vide*: <<https://eng.rosstat.gov.ru/Publications/document/13967>>, available on 15 August 2023; FYC for Ministry of Finance, *Zhongguo Caizheng Nianjian* (Finance Yearbook of China) (Beijing: China's State Finance Magazine, various years); and ND for National Bureau of Statistics, 'National Data, various years', *vide* <<https://data.stats.gov.cn/index.htm>>, available on 15 August 2023; UN for United Nations, Department of Economic and Social Affairs, Population Division, 'World Population Prospects 2022', *vide*: <<https://population.un.org/wpp/>>, available on 15 August 2023.

Panel *a* of Table 2 contains variables for a threshold analysis of residential saving deposits in response to wage income and food pricing from 1980 to 2006. The private savings are taken as a proxy for China's domestic saving pool for further growth to be made. Wage income is represented by non-state-owned industrial wage index,³⁷ while and the food retail price is a proxy for the state food price control.

Panel *b* includes data for state-controlled food pricing, using frequencies of food price manipulation under state monopsony, bank interest rates, Engel's coefficients, and macro-economic controls. In addition, market prices of food in post-reform Russia are introduced as 'uncontrolled food price' for a counterfactual analysis.

Panel *c* collects 16 major economic indicators of different economic departments to detect the principal factors that sustained China's long-term endogenous growth. Among all, Fixed asset investment represents capital formation for investment. FDI reveals external capital for China's growth. China's GDP is a proxy for new growth with Deng's reforms. All data are deflated and in real terms.

IV.1 Determinants of Residential Savings

Priori premise, private current account surpluses did not exist when Deng took over the state power in China. A way out is to examine tipping points in growth of two components – wage goods consumption and wage incomes – a gap between the two is made of private savings.

Threshold autoregression distributed lag method (ADL) is applied to the data in Panel *a*, Table 2. The role of savings is identified when a close co-

³⁷ Given that wage information can be biased due to the state direct subsidy to state-owned enterprises (SOEs), a total wage index of the non-state collectively owned enterprise is employed as the proxy to estimate price change in urban labour market, and also to bridge the unavailability in wage data of private firms at the early stage of reform.

movement shows in Equations (14) and (15):³⁸

$$\begin{aligned}
\Delta SAV_t &= c + (\alpha_1 SAV_{t-1} + \alpha_2 WAG_{t-1} + \alpha_3 FOD_{t-1})I_t \\
&+ (\alpha_4 SAV_{t-1} + \alpha_5 WAG_{t-1} + \alpha_6 FOD_{t-1})I'_t \\
&+ \sum_{i=1}^n \gamma_i \Delta SAV_{t-i} + \sum_{i=0}^n \delta_i \Delta WAG_{t-i} + \sum_{i=0}^n \theta_i \Delta FOD_{t-i} + \varepsilon_t;
\end{aligned} \tag{14}$$

$$\begin{aligned}
\Delta SAV_t &= c + \sum_{i=1}^n \gamma_i \Delta SAV_{t-i} + \sum_{i=1}^n \delta_i \Delta WAG_{t-i} + \sum_{i=1}^n \theta_i \Delta FOD_{t-i} \\
&+ \lambda_1 e_{t-1}^+ + \lambda_2 e_{t-1}^- + \varepsilon_t.
\end{aligned} \tag{15}$$

Table 3 presents the results.³⁹

³⁸ Li, Jing and Junsoo Lee, ‘ADL Test for Threshold Cointegration’, *Journal of Time Series Analysis* 31 (2010): 241-54.

³⁹ Unit root test results for threshold cointegration are presented in Appendix Table A.

Table 3. Threshold Causalities from Wage Income and Food Prices to Private Savings

<i>Private savings</i>					
<i>Wage income</i>		<i>Food prices</i>		<i>Wage income + Food prices</i>	
(1)		(2)		(3)	
<i>Private savings</i> (−1)· I_t	−0.046*** (0.015)	<i>Private savings</i> (−1)· I_t	−0.122*** (0.030)	<i>Private savings</i> (−1)· I_t	−0.101*** (0.021)
<i>Private savings</i> (−1)· I'_t	−0.038* (0.019)	<i>Private saving</i> (−1)· I'_t	−0.094** (0.041)	<i>Private savings</i> (−1)· I'_t	0.257* (0.134)
<i>Wage income</i> (−1)· I_t	0.000 (0.000)	<i>Food prices</i> (−1)· I_t	0.003** (0.001)	<i>Wage income</i> (−1)· I_t	−0.001 (0.000)
<i>Wage income</i> (−1)· I'_t	−0.001 (0.000)	<i>Food prices</i> (−1)· I'_t	0.002 (0.002)	<i>Wage income</i> (−1)· I'_t	−0.001 (0.001)
Δ <i>Pri savings</i> (−1)	0.160 (0.282)	Δ <i>Pri savings</i> (−1)	0.000 (0.197)	<i>Food prices</i> (−1)· I_t	0.004*** (0.001)
Δ <i>Pri savings</i> (−2)	−0.620** (0.253)	Δ <i>Pri savings</i> (−2)	−0.401* (0.195)	<i>Food prices</i> (−1)· I'_t	−0.016** (0.007)
Δ <i>Wage income</i>	0.001 (0.001)	Δ <i>Food price</i>	0.001 (0.001)	Δ <i>Pri savings</i> (−1)	−0.584** (0.254)
Δ <i>Wage income</i> (−1)	0.000 (0.001)	Δ <i>Food prices</i> (−1)	−0.001 (0.001)	Δ <i>Pri savings</i> (−2)	−1.069*** (0.243)
Δ <i>Wage income</i> (−2)	0.000 (0.001)	Δ <i>Food prices</i> (−2)	−0.001 (0.001)	Δ <i>Wage income</i>	0.000 (0.001)
				Δ <i>Wage income</i> (−1)	0.002* (0.001)
				Δ <i>Wage income</i> (−2)	0.002** (0.001)
				Δ <i>Food price</i>	−0.001 (0.001)
				Δ <i>Food prices</i> (−1)	−0.001 (0.001)

				$\Delta Food\ prices\ (-2)$	-0.002^* (0.001)
Constant	0.568*** (0.140)		0.593*** (0.108)		0.734*** (0.138)
Threshold value (τ)	0.169		0.300		0.727
Percentage	0.556		0.593		0.778
Cointegration (BO)	10.017	Cointegration (BO)	24.100***	Cointegration (BO)	28.906**
Short-run causality	0.737	Short-run causality	2.384	Short-run causality_1	6.107**
Long-run causality	4.585	Long-run causality	5.129*	_2	3.985
Strong causality_1	5.715	Strong causality_1	5.166	Long-run causality	4.981*
_2	5.775	_2	2.394	Strong causality_1	9.546*
				_2	8.204
$LM\ (-1)^a$	0.000 [1.000]		0.070 [0.795]		0.000 [0.986]
$LM\ (-2)$	1.372 [1.000]		0.517 [0.607]		0.120 [0.888]
$ARCH\ (-1)^b$	0.868 [0.362]		0.235 [0.633]		0.019 [0.891]
$ARCH\ (-2)$	1.372 [0.291]		0.124 [0.884]		0.061 [0.941]
$Jarque-Bera^c$	2.709 [0.258]		27.224 [0.000]		3.735 [0.154]

Notes: ^a Breusch-Godfrey serial correlation LM test; ^b ARCH heteroscedasticity test; ^c Jacque-Bera normality test; Standard errors are reported in parentheses, while p -ratio and t -ratio are reported in square brackets. $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Remarkably, a nonlinear correlation does not appear between wages and capability to save across 1980 to 2006. However, food prices show a strong cointegration with private savings (BO statistics = 24.100), as shown in Column 2. When one looks further at the threshold causality, private expenditure on food shows a determinative impact on savings in the long run, while food prices and wage income jointly generate a strong determinative impact on private savings in both short and long runs (Column 3). Moreover, with threshold tipping generated by wage and food prices to savings, identified by I_t ,⁴⁰ Figure 4 reveals a taking-off in savings in 1981 (Figure 4, Panel *c*) after a long delay under Mao's rule. Compared to the impact of wage income (Panel *a*), which shows significance only after 2000, food prices (Panel *b*) play a key role in generating savings for capital accumulation throughout the 1980s to the 1990s. In other words, waged workers' food bills determined China's capital accumulation.

⁴⁰ A regime change indicator can be either $I_t = I(e_{t-1} < e_{t-1}^*(\tau))$ for Indicator *A* or $I'_t = I(\Delta e_{t-1} < \Delta e_{t-1}^*(\tau))$ for Indicator *B*, where e_t represents residuals obtained from linear equations. For both indicators, we have $I_t + I'_t = 1$. Threshold values are indicated by $e_{t-1}^*(\tau)$, where τ presents the τ th percentile of the distribution of e_{t-1} or Δe_{t-1} ; τ is obtained by maximising the test statistics for the null hypothesis between 15 and 85 percent percentiles of the sorted series e_{t-1} and Δe_{t-1} .

Figure 4. Tipping Years of Wages and Food Prices on Private Savings



Note: Food pricing had more direct and frequent influence on the private savings than wage income.

IV.2 State price control over food as a ‘wage good’

Now, to trace the hidden state impact on food pricing as a wage good, we apply multiple instrumental analysis to testify state actions. To address potential confounding factors in food pricing, state food intervention is set as $rf_{it} = [rf_{it}^{pr}, rf_{it}^{mo}]$, where (rf_{it}^{pr}) and (rf_{it}^{mo}) represent pricing intervention frequency and food monopsony, respectively (based on Table 1). Equation (16) deals with impact of the state food price control on household savings.

$$\begin{aligned}
 SAV_i = & c + \alpha_1 FOD_{it} + \alpha_2 rf_{it} + \alpha_3 rf_{it} \cdot FOD_{it} + \alpha_4 WAG_{it} \\
 & + \sum MacVar + \sum SocVar + \varepsilon_{it} .
 \end{aligned} \tag{16}$$

Where WAG_{it} is the total wage income. $MacVar$ and $SocVar$ represent a set of social and economic control variables to make analysis consistent. Among all coefficients, α_1 and α_4 reveal how food prices and wage income separately and/or jointly shaped China's residential savings for capital accumulation.

OLS regression is conducted which is followed by two-stage least square (*2SLS*) with the first lag in food prices FOD_{it-1} as instrumental variables for the sake of possible endogeneity. Hence,

$$\hat{\theta}_{2SLS} = \left(\sum_{i=1}^n \hat{X}_i' \hat{X}_i \right)^{-1} \left(\sum_{i=1}^n \hat{X}_i' y_i \right) \quad \text{in which} \quad (17)$$

$$\hat{X}_i = Z_i \left(\sum_{i=1}^n Z_i' Z_i \right)^{-1} \quad \text{with } cov(X_i, Z_i) \neq 0 \quad \text{and} \quad cov(Z_i, \varepsilon_i) = 0$$

Moreover, limited information maximum likelihood estimation (*LIML*) is used to correct *2SLS* if weak instruments are at play. Gaussian mixture model (*GMM*) are used, finally, for robustness to eliminate serial correlation and heteroskedasticity:

$$\hat{\theta}_{GMM} = \{J(\hat{\theta})\}_{ML} = \left\{ n g_n(\hat{\theta})' W_n g_n(\hat{\theta}) \right\}_{ML} \quad \text{in which} \quad (18)$$

$$g_n(\hat{\theta}) = \frac{1}{n} \sum_{i=1}^n Z_i' (y_i - X_i \hat{\theta}) = 0$$

Table 4 reports all results.

Table 4 State Food Monopsony and Private Savings

	<i>Private savings</i>								
	<i>OLS</i>			<i>2SLS</i>		<i>LIML</i>		<i>GMM</i>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Food price</i>	−0.005** (0.002)	−0.005** (0.002)	−0.005** (0.002)	−0.006*** (0.001)	−0.005* (0.003)	−0.006*** (0.001)	−0.005* (0.003)	−0.006*** (0.001)	−0.005* (0.003)
<i>rf_{pr}</i>		−0.086* (0.049)		−0.132 (0.208)		−0.132 (0.208)		−0.132 (0.208)	
<i>rf_{pr} · Food price</i>				0.000 (0.002)		0.000 (0.002)		0.000 (0.002)	
<i>rf_{mo}</i>			−0.016 (0.534)		−0.030 (0.299)		−0.030 (0.299)		−0.030 (0.299)
<i>rf_{mo} · Food price</i>					0.000 (0.002)		0.000 (0.002)		0.000 (0.002)
<i>Wage income</i>	0.002 (0.001)	0.002 (0.001)	0.001 (0.001)	0.002** (0.001)	0.002 (0.001)	0.002** (0.001)	0.002 (0.001)	0.002** (0.001)	0.002 (0.001)
Macroeconomic controls									
<i>Economic growth</i>	1.926*** (0.481)	2.067*** (0.463)	1.967*** (0.510)	2.102*** (0.283)	1.903*** (0.315)	2.102*** (0.283)	1.903*** (0.315)	2.102*** (0.283)	1.903*** (0.315)
<i>Interest rate</i>	−0.011 (0.025)	−0.024 (0.024)	−0.011 (0.025)	−0.024* (0.013)	−0.011 (0.018)	−0.024* (0.013)	−0.011 (0.018)	−0.024* (0.013)	−0.011 (0.018)
Socio-economic controls									
<i>Population growth</i>	0.051 (0.248)	0.010 (0.237)	−0.044 (0.255)	−0.055 (0.182)	−0.142 (0.249)	−0.055 (0.182)	−0.142 (0.249)	−0.055 (0.182)	−0.142 (0.249)
<i>Engel's Coefficient</i>	0.024 (0.031)	0.033 (0.030)	0.027 (0.033)	0.037** (0.018)	0.025 (0.019)	0.037** (0.018)	0.025 (0.019)	0.037** (0.018)	0.025 (0.019)
<i>Food output</i>	1.137 (0.674)	0.897 (0.654)	1.173 (0.701)	0.759* (0.426)	1.071* (0.607)	0.759* (0.426)	1.071* (0.607)	0.759* (0.426)	1.071* (0.607)
<i>Constant</i>	−31.249***	−28.036**	−32.332***	−25.603***	−29.740***	−25.603***	−29.740***	−25.603***	−29.740***

	(10.313)	(9.946)	(11.143)	(7.074)	(11.243)	(7.074)	(11.243)	(7.074)	(11.243)
<i>Observations</i>	27	27	27	26	26	26	26	26	26
<i>R</i> ²	0.995	0.995	0.995	0.995	0.994	0.995	0.994	0.995	0.994
<i>Hansen's J</i>	--	--	--	(0.000)	(0.000)	--	--	--	--
	--	--	--	--	--	--	--	--	--
<i>K. P. LM</i>	--	--	--	7.599	9.224	--	--	--	--
	--	--	--	[0.006]	[0.002]	--	--	--	--

Notes: Standard errors are reported in parentheses, while p-value is reported in square brackets; *** p < 0.01, significant at 1%; ** p < 0.05, significant at 5%; * p < 0.1, significant at 10%.

In general, a decrease in food prices determinatively increases residential savings (see negative coefficients of food price), while effect of wage income on savings is insignificant in a linear framework albeit positive (Table 4, Columns 1-3). This effect is highly expected as inelasticity in wage goods expenditure limits household savings. When the same data are applied to 2SLS, *Hansen's J* tells the same story (Columns 4 and 5). Meanwhile, *LIML* and *GMM* estimators are largely unbiased with coefficients identical 2SLS (Columns 6-7 and 8-9). The estimation results are thus robust.

Interestingly, when state intervention frequencies ($rf_{it}^{pr}, rf_{it}^{mo}$) and their interaction term ($rf_{it}^{pr,mo} \cdot FOD_{it}$) – the joint mechanism – are integrated into *IV* regressions, food pricing intervention (rf_{it}^{pr}) appears intermittently activate wage income and pushes residential savings up ($rf_{it}^{pr} \cdot FOD_{it}$) (Columns 4, 6 and 8). While the effect of monopolistic intervention in savings is weak, there are reasons to believe that policymakers are aware of the indirect effect of food price control on accumulating domestic capital.

The finding of *IV* analysis implies practical significance. The residential savings were not developed or caused by a single factor but by a combination of situations: (1) in the short term, an increase in income brings about a relative price decline in wage goods (in particular food prices); (2) in the long term, a steady growth of wages leads to higher household disposal income and hence more domestic savings. Both are compatible with our hypothesis.

Further, we apply unrestricted food prices from concurrent reforming Russia FOD_{it}^{ru} (1992-2018)⁴¹ to a reduced form of Equation (16) in order to simulate marketisation of the whole economy *pari passu* without food price-fixing by default. To use the Russian food prices here is justifiable for two

⁴¹ Russia's food prices uncontrolled by the state in 1992-2018 are used to replace China's food prices for a counterfactual analysis. For detailed data for Russian prices, see, Federal State Statistics Service, 'Federal Reserve Economic Data, various years', *vide*: <<https://eng.rosstat.gov.ru/Publications/document/13967>>, available on 15 August 2023.

reasons: (1) it was the Soviet Union that tutored China everything communistic since as early as 1919,⁴² and (2) both countries began de-communist reforms during the same historical period. Table 5 shows the results.

⁴² E.g. Kent Deng, *China's Political Economy in Modern Times: Changes and Economic Consequences, 1800-2000* (London: Routledge, 2012), ch. 6. See also, Li Ying (ed.), *Cong Yida Dao Shiliu Da (Memoirs of Participants of the First to Sixteenth Congress of the Chinese Communist Party)* (Beijing: Central Documents Press, 2003), vol. 1, pp. 58, 73-4, 124-9, 132-3, 165, 257-8, 268, 274-5, 308, 317, 325, 362, 376-7, 383, 394; Otto Braun, *A Comintern Agent in China, 1932-39*, translated from German by J. Moore (London: C. Hurst, 1982); Jung Chang and Jon Halliday, *Mao, the Unknown Story* (London: Vintage Books, 2005), p. 197; Li Rui, *Li Rui Tan Mao Zedong (Li Rui's Memoir on Mao Zedong)* (Hong Kong: Time International, 2005), p. 101.

Table 5. Controlled vs Uncontrolled Food Prices, China's Data vs Russian Data

	<i>Private savings</i>				
	<i>Wage income</i>	<i>Food prices</i>		<i>Food prices + Wage income</i>	
	<i>China's prices</i>	<i>China's prices</i>	<i>Russian prices</i>	<i>China's prices</i>	<i>Russian prices</i>
	(1)	(2)	(3)	(4)	(5)
<i>Food prices _China</i>		−0.006*** (0.002)		−0.005** (0.002)	
<i>Food prices _Russia</i>			0.000 (0.000)		0.000*** (0.000)
<i>Wage income</i>	0.003** (0.001)			0.002 (0.001)	0.005*** (0.001)
<i>Macroeconomic controls</i>					
<i>Economic growth</i>	1.298*** (0.437)	2.200*** (0.428)	1.266* (0.637)	1.926*** (0.481)	0.030 (0.552)
<i>Interest rate</i>	−0.018 (0.027)	0.001 (0.023)	0.022 (0.031)	−0.011 (0.025)	−0.002 (0.023)
<i>Socio-economic controls</i>					
<i>Population growth</i>	−0.116 (0.271)	0.086 (0.222)	0.255 (0.276)	−0.051 (0.248)	−0.194 (0.229)
<i>Engel's coefficient</i>	−0.015 (0.029)	0.038 (0.029)	−0.007 (0.033)	0.024 (0.031)	−0.034 (0.245)
<i>Food output</i>	1.314* (0.739)	1.261* (0.673)	2.015** (0.861)	1.137 (0.674)	1.760** (0.636)
<i>Constant</i>	−29.173** (11.331)	−36.101*** (9.579)	−43.421*** (12.098)	−31.249*** (10.313)	−29.328*** (9.503)

<i>Observations</i>	27	27	27	27	27
<i>R</i> ²	0.993	0.994	0.991	0.995	0.995

Notes: Standard errors are reported in parentheses, while p-value is reported in square brackets; *** p < 0.01, significant at 1%; ** p < 0.05, significant at 5%; * p < 0.1, significant at 10%.

The results in Table 5 confirm that China's food price-fixing changes the financial environment of households in China (Columns 2 and 4), showing a unilateral significance in increasing income for savings in a linear framework. This means that the hypothesis of a 'controlled' inelastic food price indeed works in China's case, and both economic sectors depend on household savings above wage goods expenditures (Columns 2 and 4) to determine the final income level (Column 1). However, when food price becomes liberated as in the Russian case, the rising subsistent cost helps little with household savings (Column 3). Instead, an increasing living cost significantly eats up the wage (Column 5).

Now, all empirical evidence indicates that the key to the remarkable growth dynamics in post-Mao China was domestic capital accumulation and investment coming mainly from an ocean of domestic savers. The government played the role of putting a lid on the food price but by default. This was an 'unmovable part' of the deal.

IV.4 What Drove Labour Productivity Growth

Finally, to robust above findings, we use the principal component analysis to reveal what was behind the said labour productivity-cum-wage growth which was the 'movable part' for domestic sayings to be made. To determine the contribution factor index, a pooled factor model is constructed and expressed as follows:

$$X = \Lambda V + \varepsilon \quad (19)$$

And,

$$V = \sum_{i=1}^p \lambda_i v_i v_i' , \quad v_i v_i' = 0 .$$

$$\Lambda = \text{diag}(\lambda_1, \lambda_2, \dots, \lambda_p), \lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_p.$$

Here, Λ is a loading matrix λ_{ij} , each λ_{ij} representing the loading of the i th factor; V , a score matrix; and ε , an error term.

Given that indicators with largest variances tend to dominate in the first component, this method reduces indicators to a small number. Empirically, we then use ΛV to capture the principal components that approximate the latent major contributing factors to China's growth.

Back to Table 2 Panel *c*, data are used to form a $(p \times 1)$ random vector of observed economic indicators X . Each observed indicators contains some information on the economic outcomes and some noise. Results are shown in Table 6 where the loading of the first Principal Component Factor (PCF) dominates in absolute terms: First of all, among 16 principal components, the first two explain 88.6% of the total sample variance.⁴³ Secondly, the explanatory fraction decreases quickly: as the first component explains 82.2%; the second, merely 6.4%. In addition, Factors 1 and 2 show an eigenvalue higher than one (13.155 for Factor 1, see Appendix, Table B). This means the first principal component captures the most important information in China's growth.

Table 6. Factor Loadings on the First Principal Component

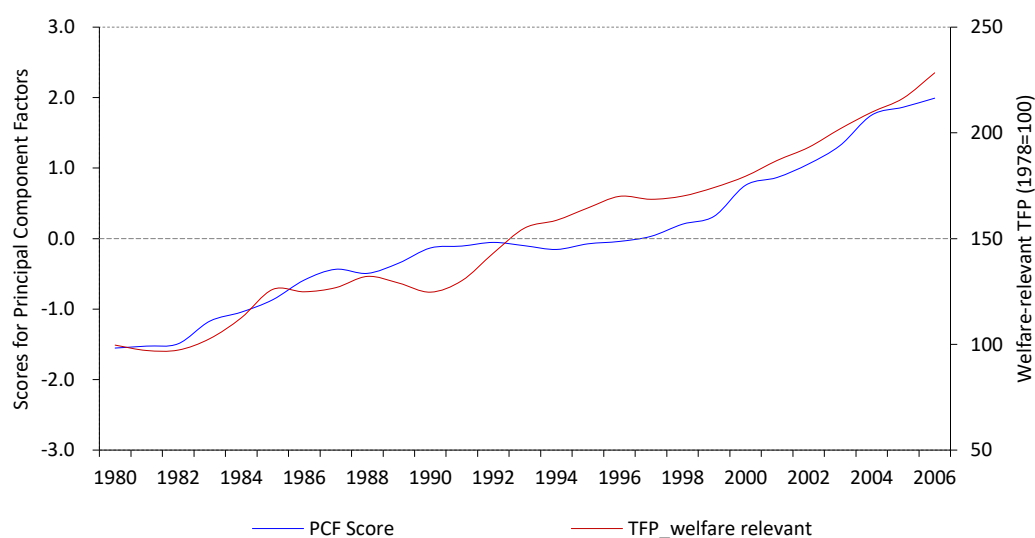
	Loading (1)		Loading (2)
Higher education	1.025	Exports	0.783
Fiscal expenditure	0.972	Freight turnover	0.773
Working-age ratio	0.952	Capital investment	0.748
Consumer goods sales	0.949	Passenger turnover	0.536
Urbanisation	0.924	CPI	0.519
Energy consumption	0.888	FDI influx	-0.195
Per capita disposable income	0.822	Population growth	-0.675
Industry output	0.797	Primary education	-0.957

Source: compiled by the authors.

⁴³ See Appendix, Table B.

Thirdly, the first principal component has high loadings on human capital such as higher education, working-age ratio, consumer goods sales, and per capita disposal income. Fourthly, the role of government is factored in; and so is urbanisation. Both show rather high loadings. Fifthly, the significance of industrialisation (i.e. industry output and energy consumption) is lower than human capital. Finally, exports and capital investment appear less important; and FDI is simply negative. Thus, China's growth had to be internally generated.⁴⁴ Figure 5 highlights what behind China's TFP growth.

Figure 5 Scores of First Principal Component Factor vs China's TFP Growth



Source: Appendix, Table C.

V Concluding Remarks

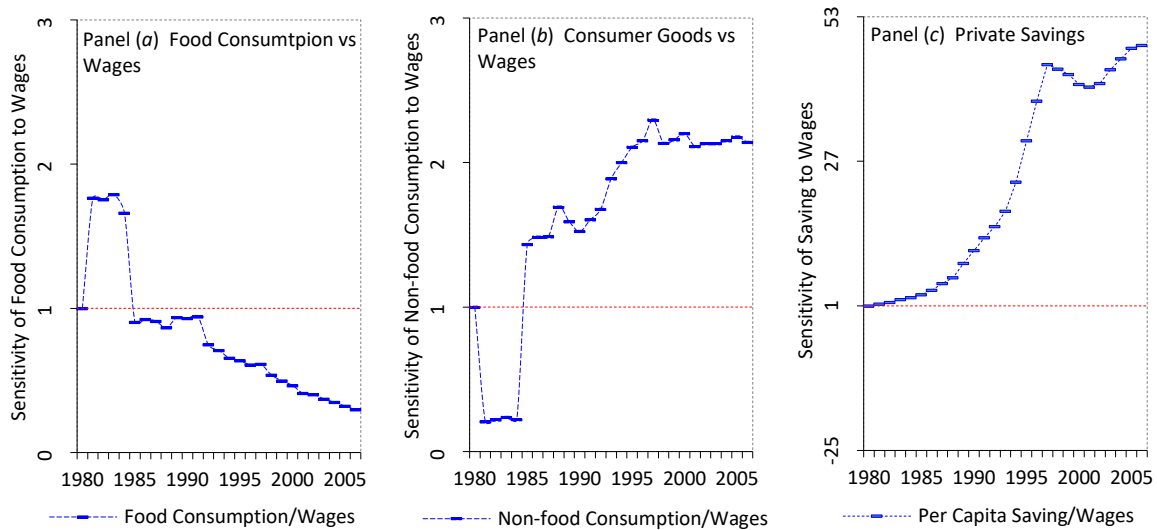
To conclude, this project unveils the real engine of China's recent economic take-off: household savings thanks to an arising wag level and a strictly controlled price of food. Figure 6 illustrates this point. When reforms began, public consumption was sensitive to food prices, approximating 2.0 (Figure 6, Panel a).⁴⁵ As the state control over food continued, the sensitivity decreases.

⁴⁴ In contrast to PCF1, PCF2 reflects an outward-oriented growth model based merely on FDI inflows.

⁴⁵ Also see Figure 3, Panel b.

Wages moved in the opposite direction of food (Figure 6, Panel *a*). In contrast, non-food consumption went hand in hand with wage increase (Figure 6, Panel *b*). Finally, with a growth in household disposal income, private savings began to play a role in capital formation (Figure 6, Panel *c*).

Figure 6 Sensitivity of Wage Goods, Consumer Goods and Private Savings to Wages



Notes: (1) Panel *a*: sensitivity of quantity of food consumption to individual wage income. (2) Panel *b*: sensitivity of non-food consumption to wage level. (3) Panel *c*: rise in private savings.

Sources: National Bureau of Statistics, *China's Statistical Yearbook of Price and Urban Household Survey* (Beijing: China's Statistics Press; National Bureau of Statistics, various years); *China's Statistical Abstract* (Beijing: China's Statistics Press; National Bureau of Statistics, various years); *China's Compendium of Statistics 1949-2008* (Beijing: China's Statistics Press, 2010).

In this regard, the unique state intervention during China's reforms was an 'unintended consequence' of the *status quo ante* of outdated Maoism which was the target for market-oriented reforms. This mismatch however created a gap between arising labour productivity (or TFP) and a sticky food price from a bygone era. It was this gap that facilitated China's domestic savings, China's capital formation and China's record-breaking economic growth since 1980.

Thus, the roles of inward FDI and export earnings commonly endorsed by the conventional wisdom should not be overplayed.

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Appendix

Table A. Unit Root Tests for Threshold Cointegration and Causalities

		Private savings (SAV_t)	Food prices (FOD_t)	Wage income (WAG_t)
		(1)	(2)	(3)
Augmented Dickey-Fuller				
Level with	constant	−3.253**	−1.332	−2.117
	constant and trend	−2.707	−3.746**	−1.690
	no constant or tend	−8.845	−0.907	−0.047
First differences with	constant	−3.185**	−3.266**	−2.738*
	constant and trend	−3.773**	−3.213	−3.120
	no constant or tend	−1.291	−3.229***	−2.762***
Phillips-Perron				
Level with	constant	−10.475***	−1.026	−1.923
	constant and trend	−4.870***	−2.045	−1.673
	no constant or tend	5.623	−0.640	−0.062
First differences with	constant	−3.210**	−3.283**	−2.738*
	constant and trend	−5.543***	−3.234	−3.120
	no constant or tend	−1.239	−3.229***	−2.762***

Notes: Phillips-Perron unit root tests (Phillips and Perron 1988) are applied, in addition to Augmented Dickey-Fuller tests (Dickey and Fuller 1981), to ensure the robustness of serial correlation. The optimal lag lengths are chosen based on Schwartz Criterion (SC).

*** $p < 0.01$, significant at 1%; ** $p < 0.05$, significant at 5%; * $p < 0.1$, significant at 10%.

Sources: Phillips, Peter C. B., and Pierre Perron. 1988. ‘Testing for a Unit Root in Time Series Regression’, *Biometrika* 75(2): 335-346; Dickey, David A., and Wayne A. Fuller. 1981. ‘Distribution of the Estimators for Autoregressive Time Series with a Unit Root’, *Econometrica* 49: 1057-1072; Penn World Table. 2021. Groningen Growth and Development Centre Version 10.0. Available at <www.rug.nl/ggdc/productivity/pwt/pwt-releases/pwt100>, accessed on 15 August 2023.

Table B. Principal Component Analysis with 16 Major Economic Indicators

	Eigenvalue	Cumulative Proportion		Eigenvalue	Cumulative Proportion
	(1)	(2)		(3)	(4)
PCF 01	13.155	0.822	PCF 09	0.075	0.993
PCF 02	1.024	0.886	PCF 10	0.041	0.995
PCF 03	0.545	0.920	PCF 11	0.033	0.997
PCF 04	0.504	0.952	PCF 12	0.025	0.999
PCF 05	0.230	0.966	PCF 13	0.012	0.999
PCF 06	0.133	0.974	PCF 14	0.007	1.000
PCF 07	0.123	0.982	PCF 15	0.002	1.000
PCF 08	0.092	0.988	PCF 16	0.001	1.000

Source: Compiled by the authors.

Table C. Scores for the First PCF after Rotation

	PCF scores		PCF scores		PCF scores
	(1)		(2)		(3)
1980	-1.552	1989	-0.347	1998	0.205
1981	-1.524	1990	-0.133	1999	0.316
1982	-1.492	1991	-0.105	2000	0.757
1983	-1.171	1992	-0.054	2001	0.867
1984	-1.043	1993	-0.101	2002	1.060
1985	-0.867	1994	-0.153	2003	1.323
1986	-0.587	1995	-0.074	2004	1.753
1987	-0.435	1996	-0.040	2005	1.865
1988	-0.493	1997	0.033	2006	1.993

Source: Compiled by the authors.