# The Rise and Fall of Productivity Growth in Three East Asian Countries

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**At the Plenary Session of the 8th World KLEMS Conference**

**Kyoji Fukao (RIETI and Hitotsubashi University)**
**Tsutomu Miyagawa (RIETI and Gakushuin University)**
**Hak Kil Pyo (Seoul National University)**
**Harry Wu (Peking University)**
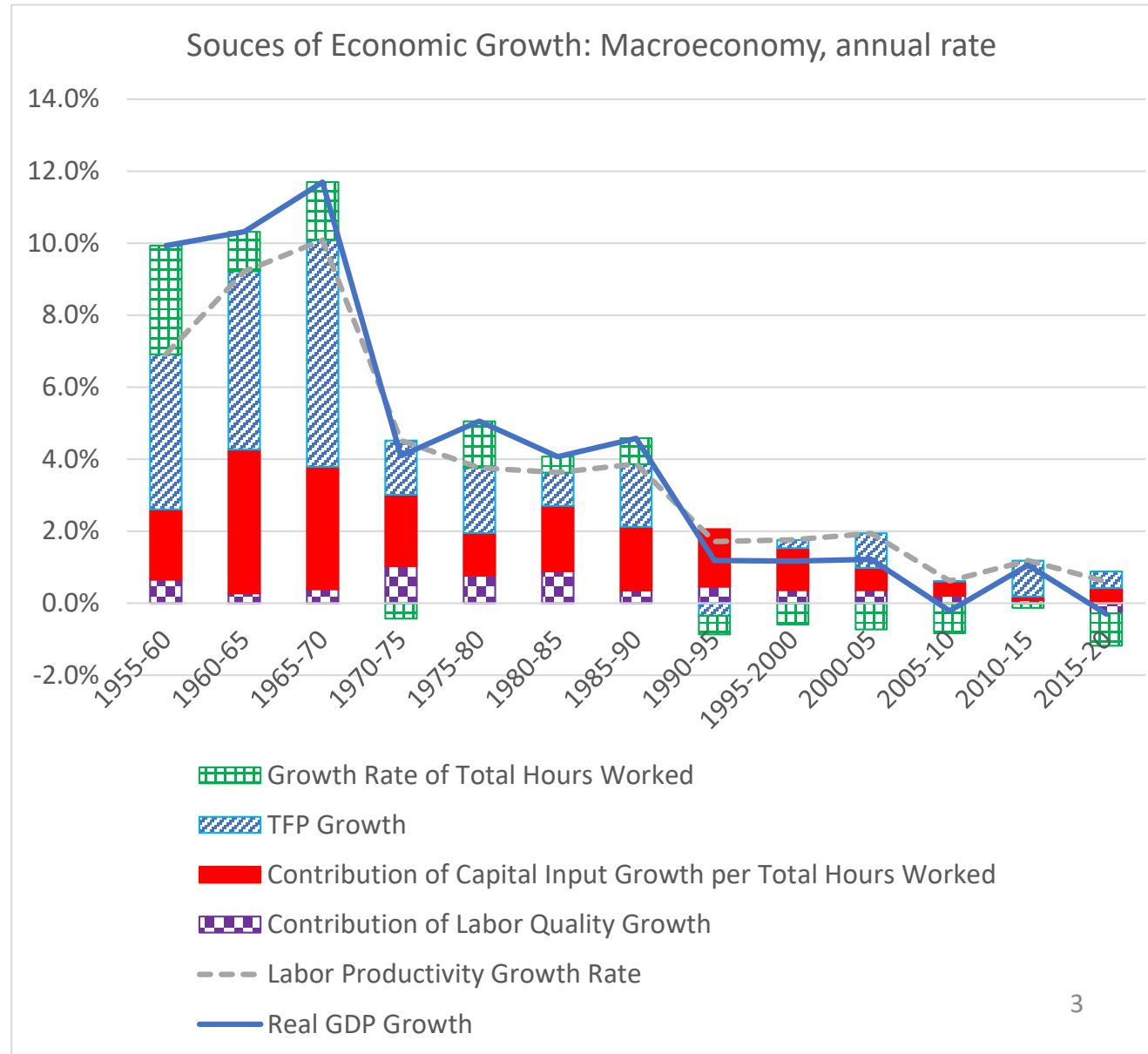
# 1. Aim of the Presentation

- **Three east Asian countries (Japan, Korea and China) recorded long-term high productivity growth which is not attained by every country.**

- **These three countries dominate the quarter of Word GDP.**

- **In this presentation, we examine drivers of high economic growth in these countries.**

**Productivity Growth in East asian Countries and the US**

(Source) Asian Productivity Organization

China — Korea — Japan — US
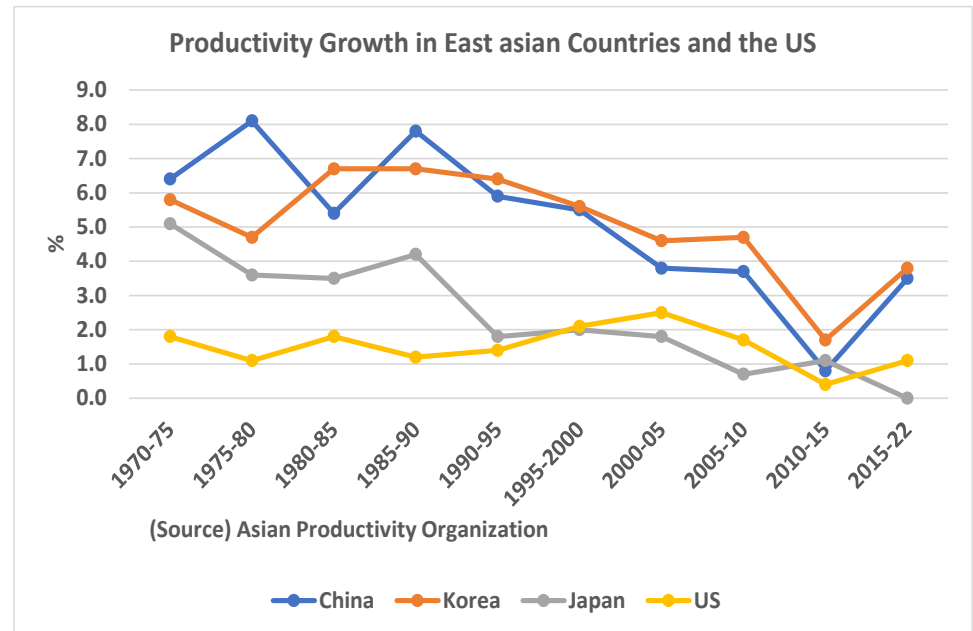
# 2-1 Japan's Rapid Economic Growth Era (1955- 1970) (1) Growth Accounting Results

Growth accounting indicates that TFP contributed more significantly to economic growth than capital accumulation or labor quality improvements during the rapid growth era.



Souces of Economic Growth: Macroeconomy, annual rate
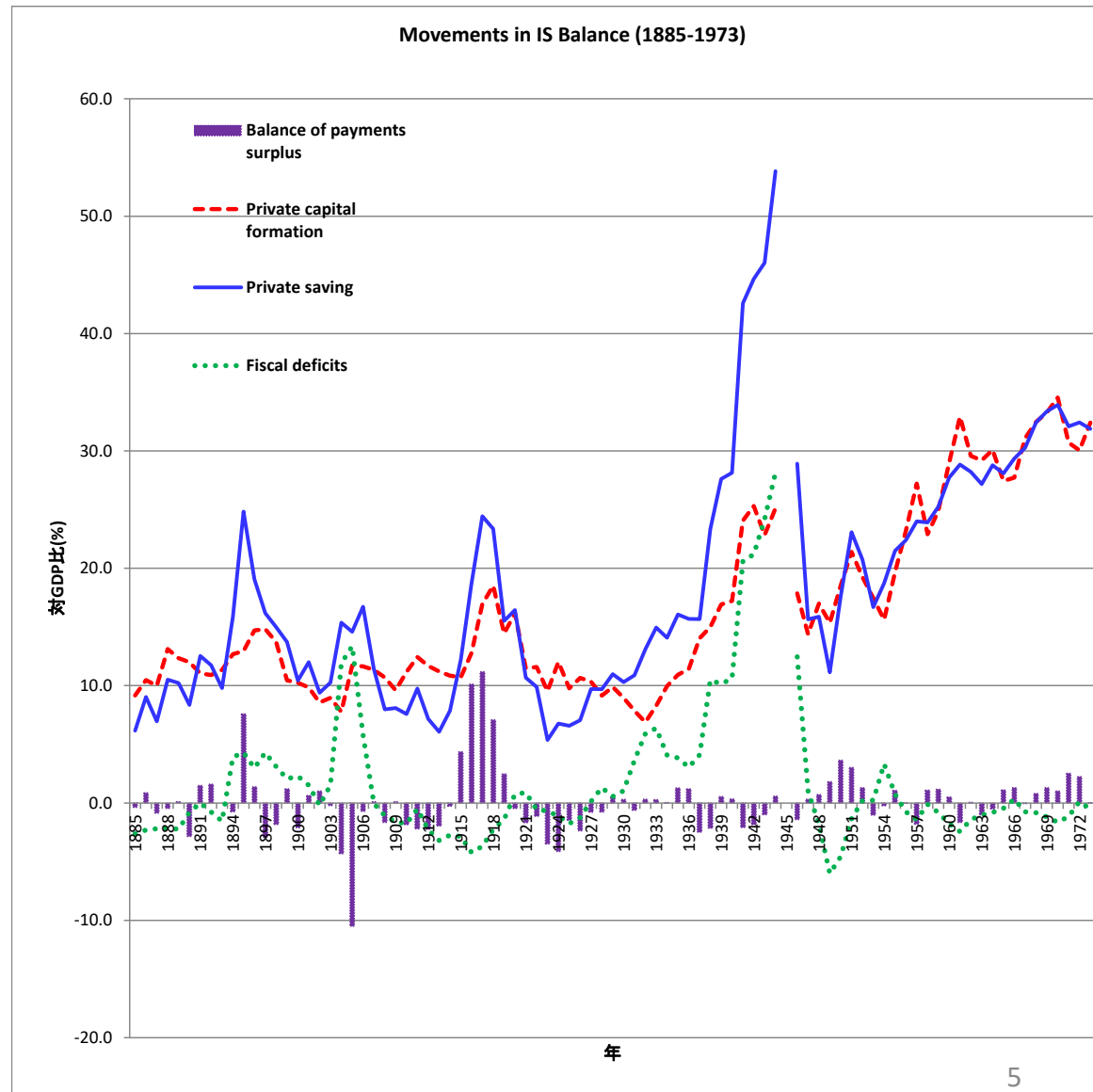
Legend:
- Growth Rate of Total Hours Worked
- TFP Growth
- Contribution of Capital Input Growth per Total Hours Worked
- Contribution of Labor Quality Growth
- Labor Productivity Growth Rate
- Real GDP Growth

3

# (2) Why Was TFP Growth So Rapid?

- As Figure 2.2 illustrates, the leading contributors to TFP growth included manufacturing and service sectors such as transportation, communication, and wholesale/retail trade.

- Key factors: Catch-up with advanced economies, licensing agreements, investment in infrastructures, and R&D.

**Figure 2.2: Which Industries Led TFP Growth During the High-Growth Period (1955–1970)?**



TFP growth rate（annual average rate、left)

Share in the aggregate economy（right)
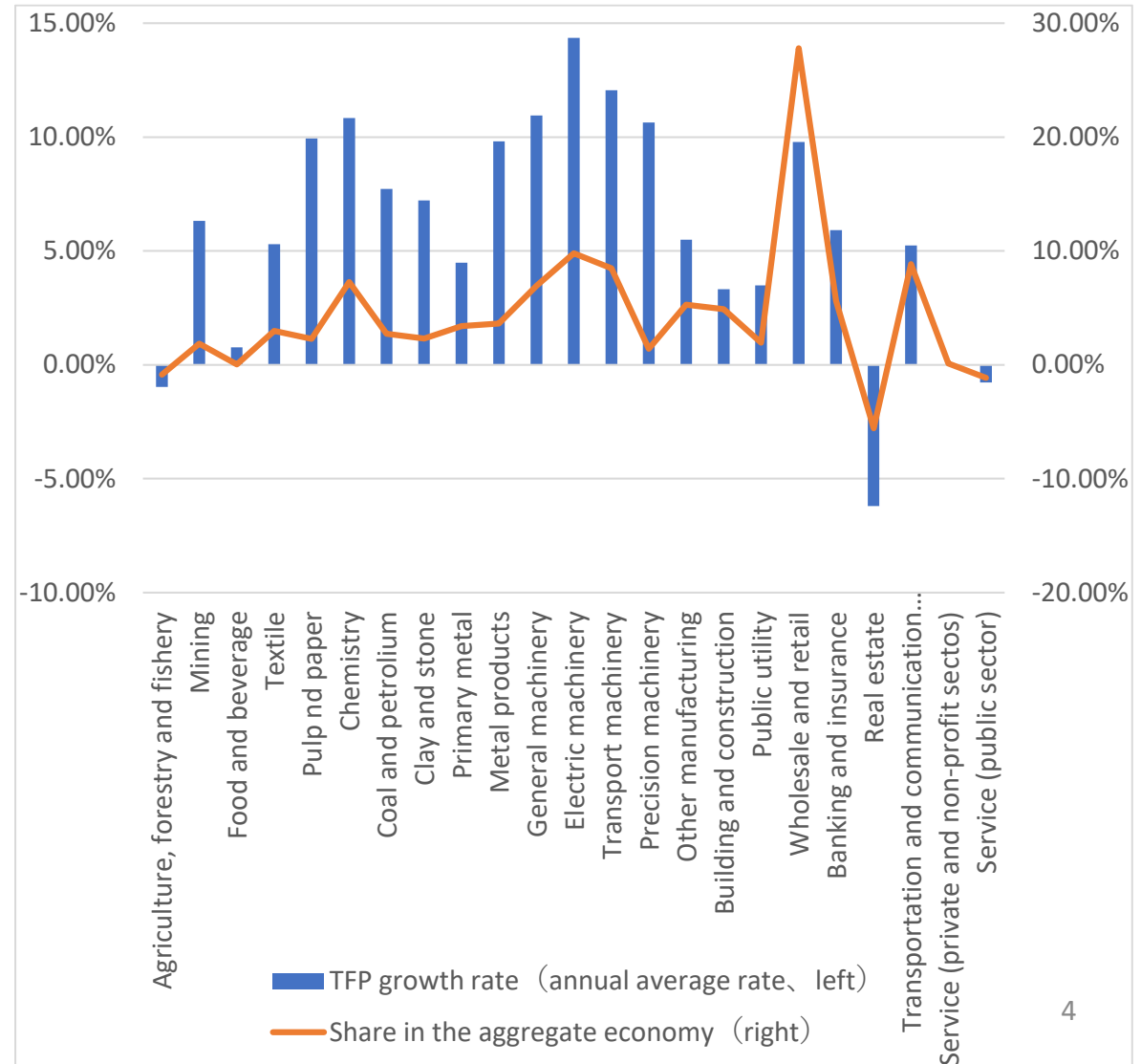
# (3) Fiscal Surplus and Savings Supporting Capital Accumulation

- Military expenditure/GDP ratio was much lower than in the pre-war period.

- Higher private savings supported capital formation, explained by:

- Life-cycle hypothesis: Rising household savings by baby boomers.

- Permanent income hypothesis: Households saved more due to unexpected income growth.

**Movements in IS Balance (1885-1973)**

Legend:
- Balance of payments surplus
- Private capital formation
- Private saving
- Fiscal deficits

Y-axis: 対GDP比(%)
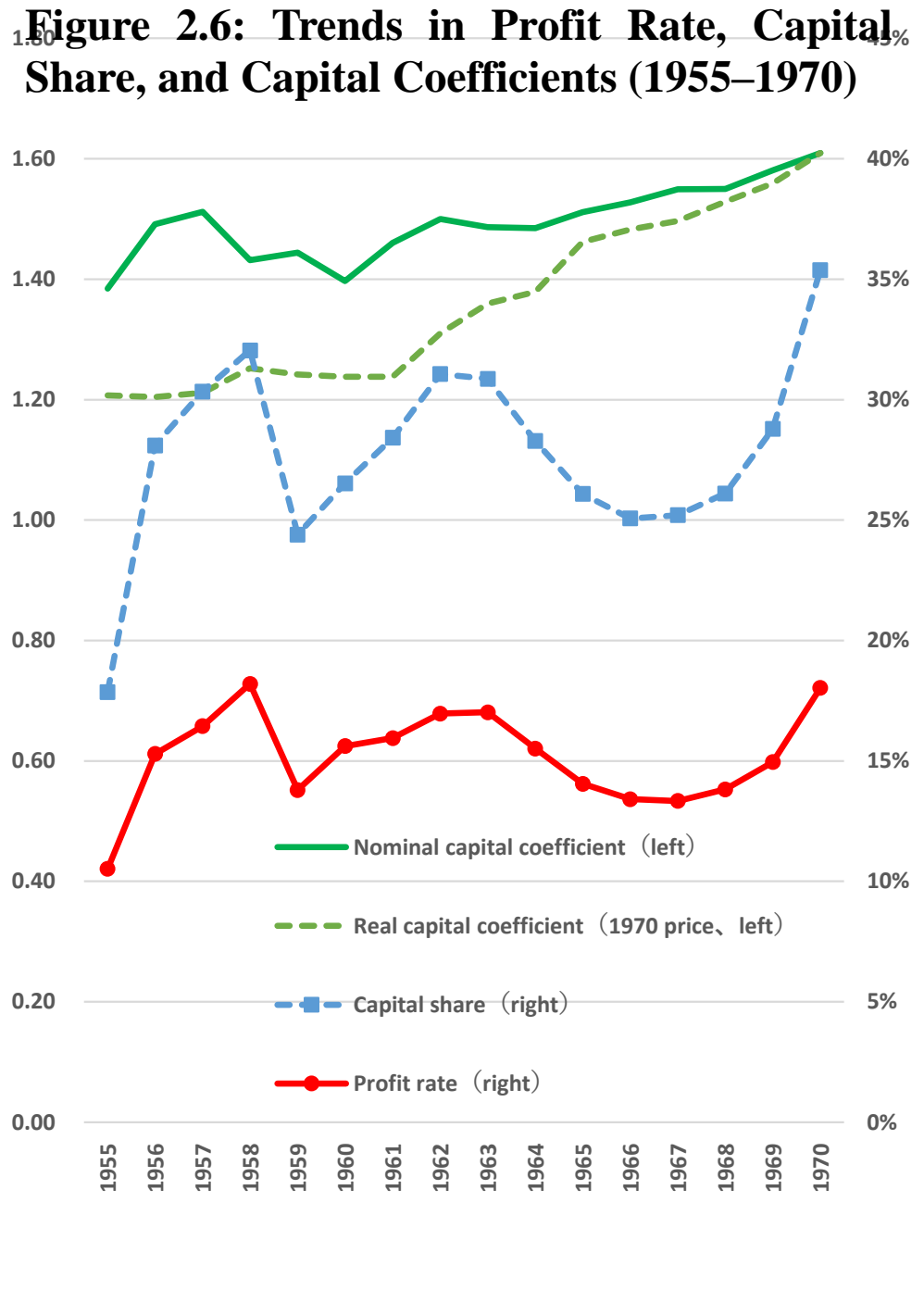X-axis: 年

# (4) Capital Accumulation Beyond Manufacturing

- Capital accumulation extended beyond manufacturing to infrastructure, housing, and utilities.

- Large-scale investments in transportation, public utilities, and real estate.

**Figure 2.5 Industries That Led Capital Accumulation During the High-Growth Period (1955–1970)**



Growth in capital input index annual average,)

Share of capital input by industry（right）
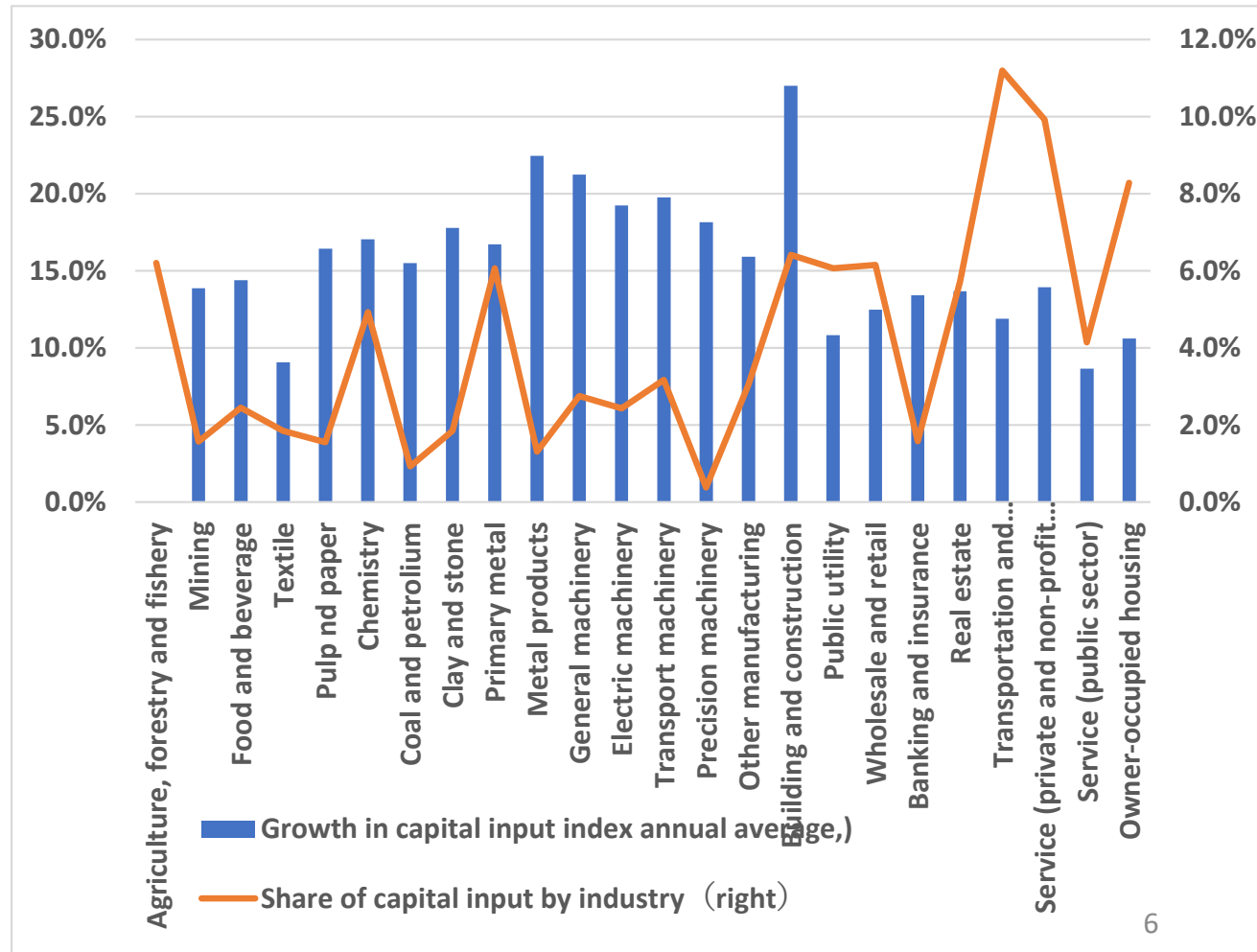
# (5) Stable Return on Capital and Investment Incentives

- Despite rapid capital accumulation, the return on capital did not decline (Figure 2.6).
- Key factors:
- - Rapid population growth maintained investment demand.
- - Rapid TFP growth improved investment efficiency.
- - Capital goods prices declined relative to GDP deflator.

**Figure 2.6: Trends in Profit Rate, Capital Share, and Capital Coefficients (1955–1970)**



Legend:
- Nominal capital coefficient（left）
- Real capital coefficient（1970 price、left）
- Capital share（right）
- Profit rate（right）

# (6) Initial Conditions: Cheap but Well-Educated Workers

- Since the early 20th century, Japan had one of the highest primary school enrollment rates globally.

- By 1955, its average schooling level was significantly higher than expected for its GDP, surpassing many other rapidly developing nations.
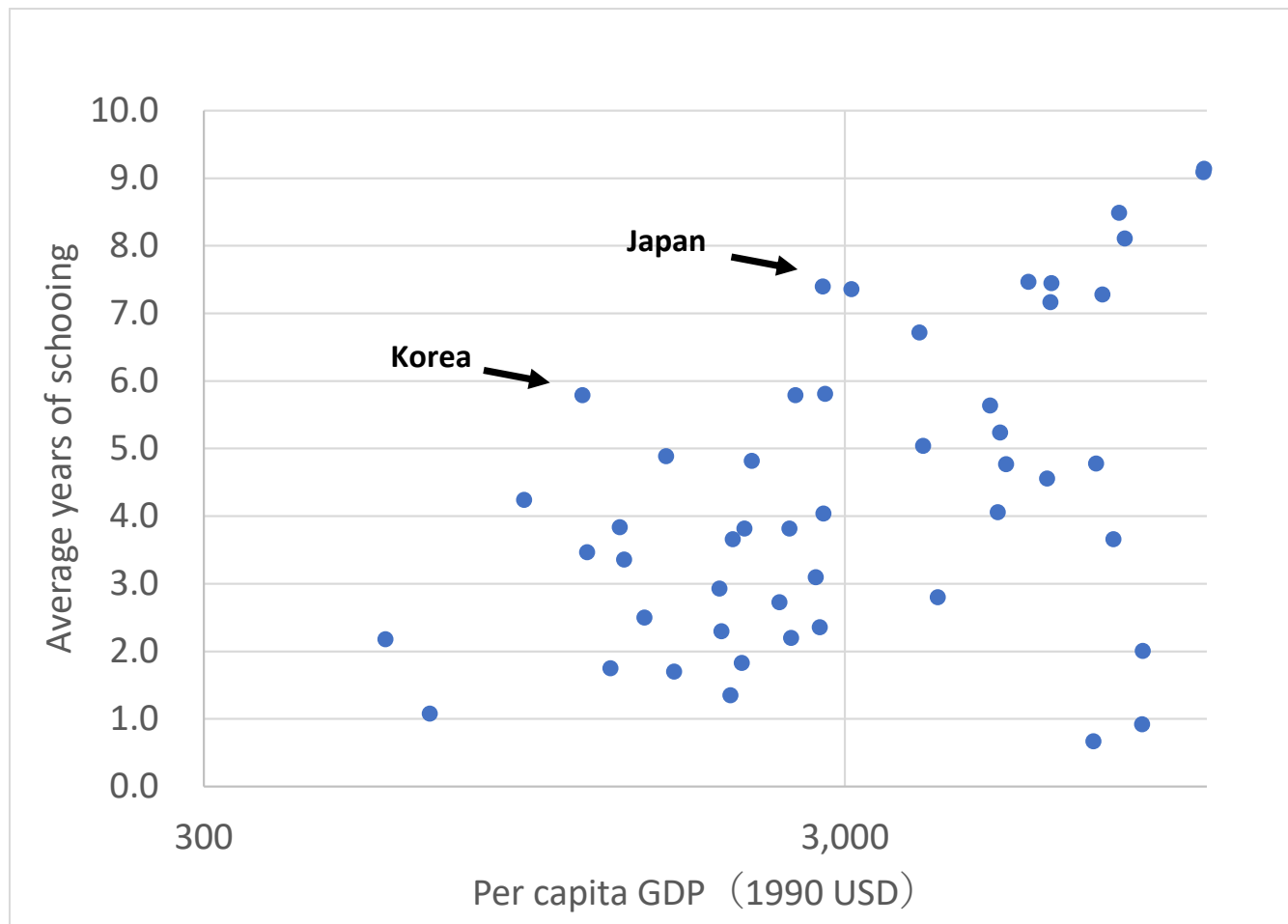
**The 8th World KLEMS Conference**

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**2-2. The Rise and Fall of Productivity Growth in Korea**

Hak K. Pyo

**Professor Emeritus,
The Faculty of Economics
Seoul National University**

# Miracle Growth Period (1960-2000)

For the period 1960-1999, the Korean economy has performed a *miracle* like performance by recording 8.52% average annual GDP growth rate with 4.34% capital input growth, 1.13% labor input growth and 3.04% TFP growth(Table 1). Input's relative contributions are capital (51.0%), labor (13.3%) and TFP (35.7%). Therefore, the high-growth period is characterized by capital-input led growth with significant TFP growth.

- During the *miracle* transformation period, sectoral decomposition illustrates Korean economy's structural transformation is typical capital-input led growth but relatively significant TFP. As shown in (Table 2) the primary sector's labor input growth – 1.02 % implying labor migration from farm sectors to the manufacturing sector.

- The secondary sector grew at an astonishing rate with GDP (10.50 %), Capital (4.82 %) Labor (1.90%) and TFP (3.77%)(Table 3). It is interesting to note a significantly high growth rate of TFP which implies during the Korea's fast industrialization, human capital growth and technological advancement had played important roles as Lucas (1993) conjectured.

- The service sector has performed with GDP (9.10%) Capital (4.17%) labor (2.21%) and TFP (2.71%)(Table 4). It is interesting to observe a significant TFP in capital-dominant service sector.

# Growth Accounting and Total Factor Productivity
## (Economy-wide, 1960-2024)

| Economy-wide | GDP | Capital | Labor | TFP |
|---|---|---|---|---|
| 1960-99 | 8.52 | 4.34 | 1.13 | 3.04 |
| 2000-24 | 3.67 | 3.37 | 0.16 | 0.14 |
| 1960-2024 | 6.65 | 3.97 | 0.76 | 1.92 |
| | **Contribution** | | | |
| 1960-99 | 100.0 | 51.0 | 13.3 | 35.7 |
| 2000-24 | 100.0 | 91.9 | 4.4 | 3.7 |
| 1960-2024 | 100.0 | 59.7 | 11.4 | 28.9 |

Source: KIP Database (2000-2023). Pyo (1988) (1998)

Figure 2.8 Contribution to GDP growth (Economy-wide, 1960-2024)

Contribution rates (%)
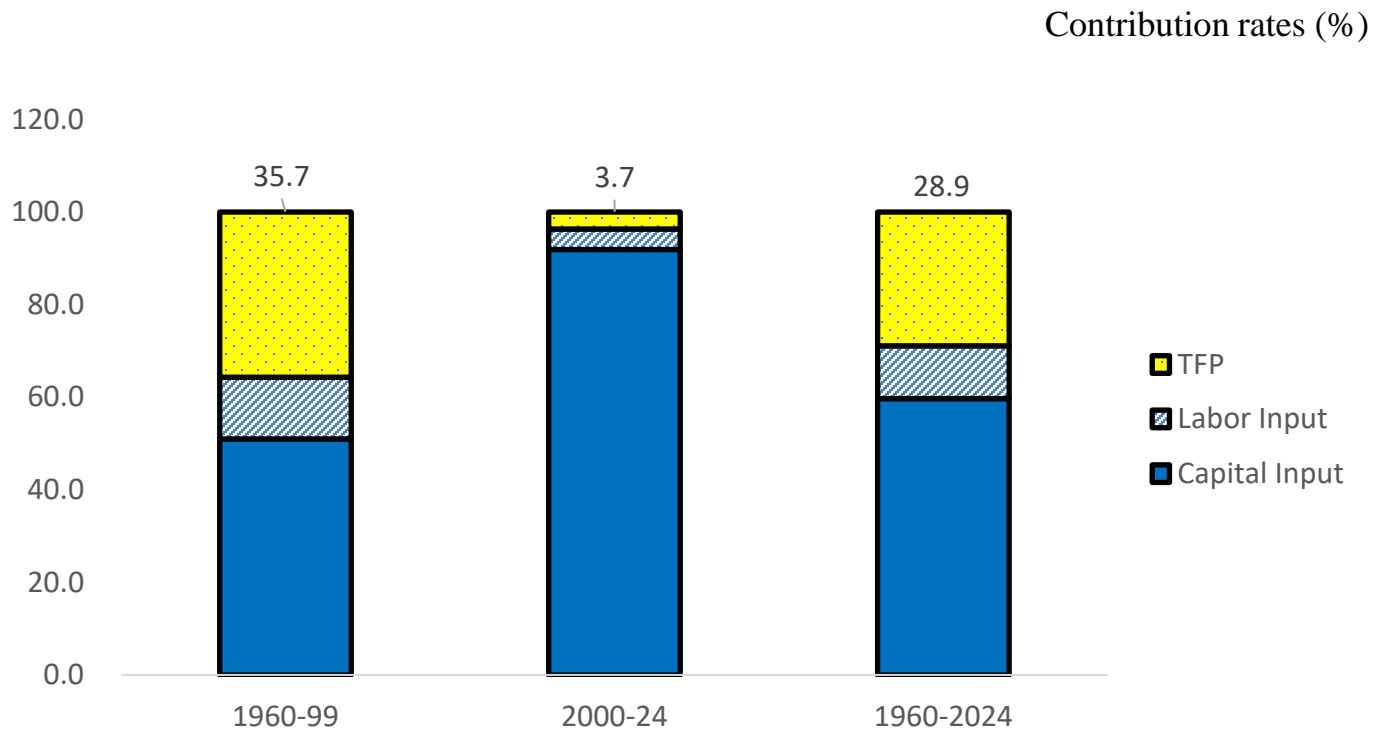


Source: KIP Database、Pyo (1988) (1998)

# From Miracle to Myth (2000-2024)

- The Korean Economy had met a fundamental crisis and break in 1997 as part of Asian Crisis (in Korea it is called IMF crisis). As I have documented in IMF (2003) Pyo (2000), (2012), the command economic system collapsed when there was shortage of foreign reserves and both domestic and foreign banking crisis occurred simultaneously. The Korean economy has made v-shaped recovery within a year or so helped by IMF conditionality programs and austerity measures. However, the momentum of capital-led input growth was not as usual.

# From Miracle to Myth (2000-2024)

- As shown in the second half period (2000-2024), the Korean economy has performed at drastically low growth rates: GDP (3.67 %), Capital (3.37 %) Labor (0.16 %) and TFP (0.14 %)(Table 2.5). First of all, the average GDP growth rate became more than halved from the first half period (1960-2000) with the reduction of capital input growth. In particular, the TFP growth rate has turned to 0.14 % signaling the Krugman syndrome.

- Of course, the latter period (2000-2024) had Global Financial Crisis in 2008 and the Pandemic crisis in 2020-2022 but what matters is trend after the 1997 crisis toward converging state in all inputs. In particular, the reduction in labor force created an environment for stagnant growth prospects. "The Lost Decades of Japan" set in Korean society and both Government and the private sector lost momentum to restore *miracle* again.

# From Miracle to Myth (2000-2024)

- As shown in Table 2.3, GDP growth rate during the second half (2000-2024) fell from 8.52 % during 1960-2000 to 3.67 %, capita input growth from 4.34 % to 3.37 %, labor input growth from 1.13 % to 0.16 % and TFP growth from 3.04 % to 0.14 %(Table 1). Finally, TFP Growth rate turns extremely low indicating a typical Krugman syndrome is settling in. Capital input slow-down seems to indicate a large scale diminishing returns are setting in.
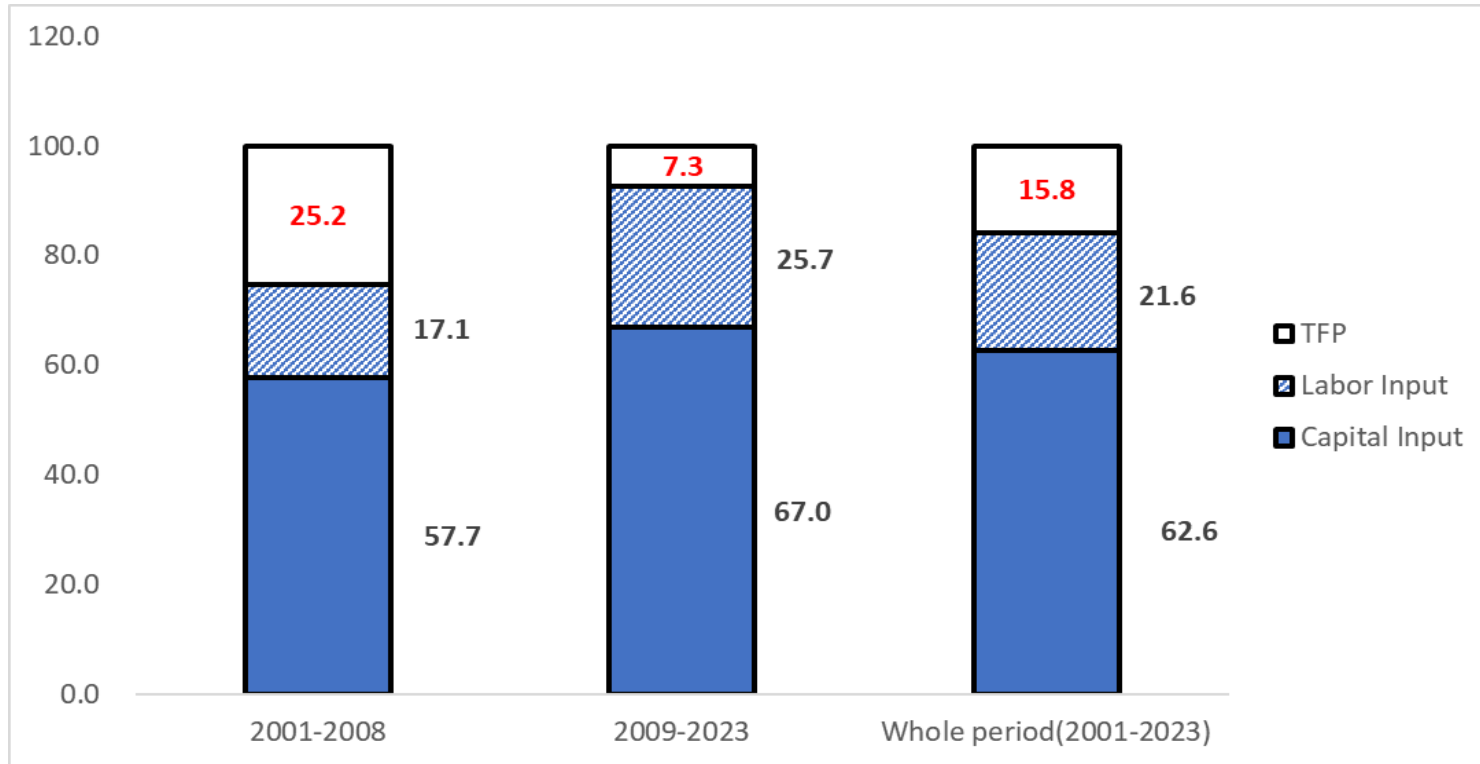
## Table 5. Growth Accounting and Total Factor Productivity (economy-wide, 2001-2023)

|  | GVA | Capital Input | Labor Input | TFP |
|---|---|---|---|---|
| 2001-2008 | 4.86 | 2.81 | 0.83 | 1.23 |
| 2009-2023 | 2.88 | 1.93 | 0.74 | 0.21 |
| Whole period | 3.57 | 2.23 | 0.77 | 0.56 |
|  | | Contribution | | |
| 2001-2008 | 100.0 | 57.7 | 17.1 | 25.2 |
| 2009-2023 | 100.0 | 67.0 | 25.7 | 7.3 |
| Whole period | 100.0 | 62.6 | 21.6 | 15.8 |

Source: KIP Database (2024)

Contribution to GDP growth (Economy-wide, 2001-2023, %)



120.0

100.0

80.0

60.0

40.0

20.0

0.0

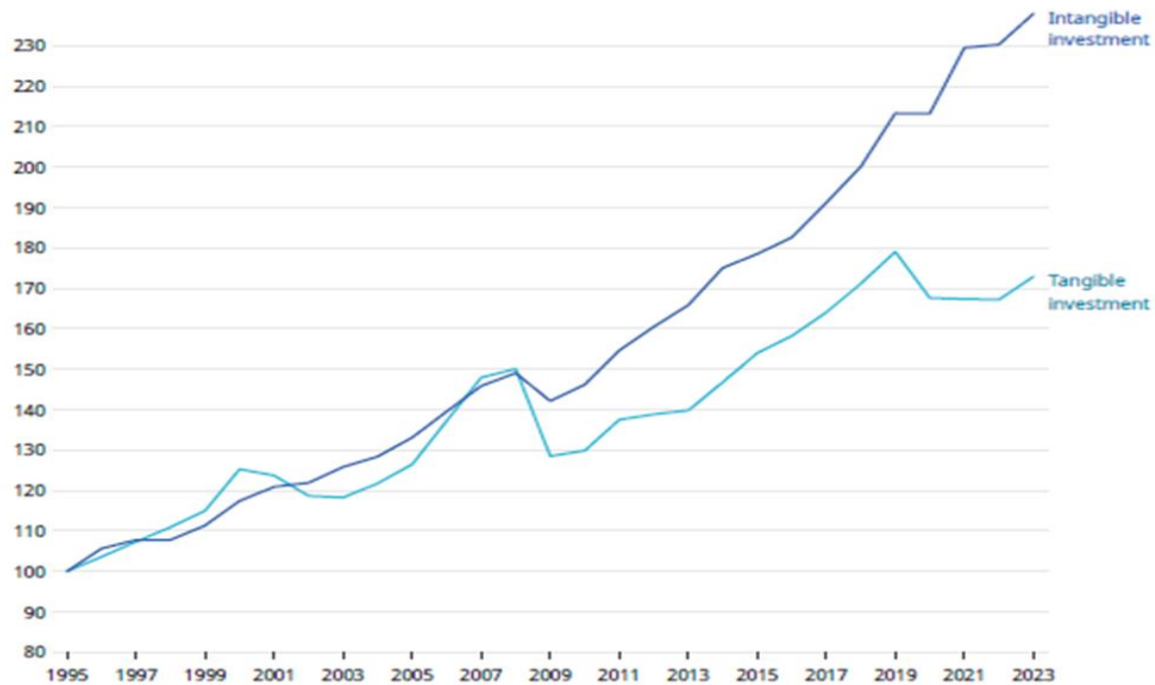| | 2001-2008 | 2009-2023 | Whole period(2001-2023) |
|---|---|---|---|
| TFP | 25.2 | 7.3 | 15.8 |
| Labor Input | 17.1 | 25.7 | 21.6 |
| Capital Input | 57.7 | 67.0 | 62.6 |

□ TFP
▨ Labor Input
■ Capital Input

Main reason for Heading Myth :Capital Input and R&D Wasted by Public Sector and Large Conglomerates ultimately inviting Efficiency Loss (Krugman syndrome)

The leading sector which has led the long-range slow-down of the economy started from the Secondary sector. Its GDP growth rate was reduced from 10.50 % from miracle period to 3.93 % to myth period. It is surprising to note that the capital input growth rate had increased from miracle period (4.82 %) to myth period (5.44 %). During the myth period we can hardly understand while capital input increased by 12.8 % point, GDP decreased by 40 % point. In addition, the reduction of TFP growth rate from 3.77 % to -1.57 % implies there was a large-scale efficiency loss and R&D wastes. I conjecture there was large-scale capital waste or low capital productivity in particular in some conglomerate and public enterprises.

Figure 2.12 introduces a recent trend that intangible investment has grown three times faster than tangible investment between 2008-2023. As shown in Figure 2.13, the Korean economy lags behind IT advanced nations in intangible investment. The Gross Value Added (GVA) of ICT capital investment in G7 and Korea shows that Korea lags behind top G7 nations even though it has picked up the speed since 2017.

However, the overall trend of Tangible and Intangible Asset in Korea in Figure 2.14 shows intangible asset outpaces tangible asset which is a good sign of exit from myth toward enhanced intangible investment era.

Figure 2.12 Total intangible and tangible investment, 1995-2023, indexed (19956=100)

# Figure 13 GVA Share of ICT Capital Investment in G7 and Korea (1995=100)
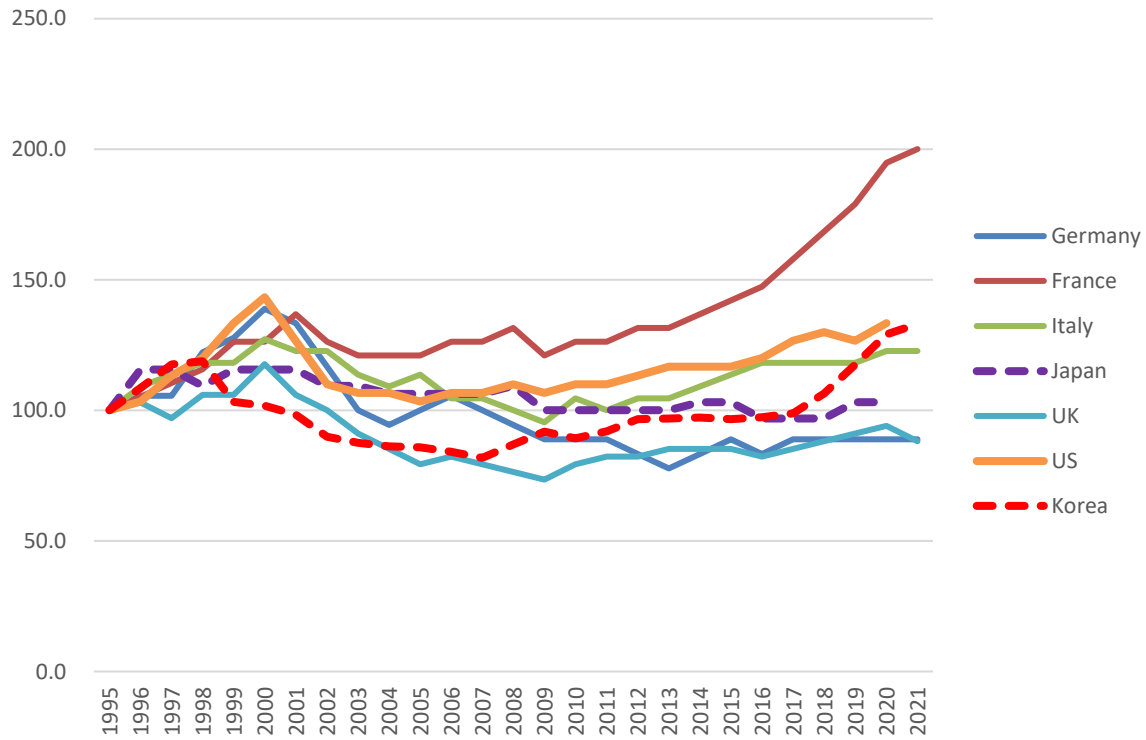
Figure 2.14 Trend of Tangible and Intangible Asset in Korea (2000=100)
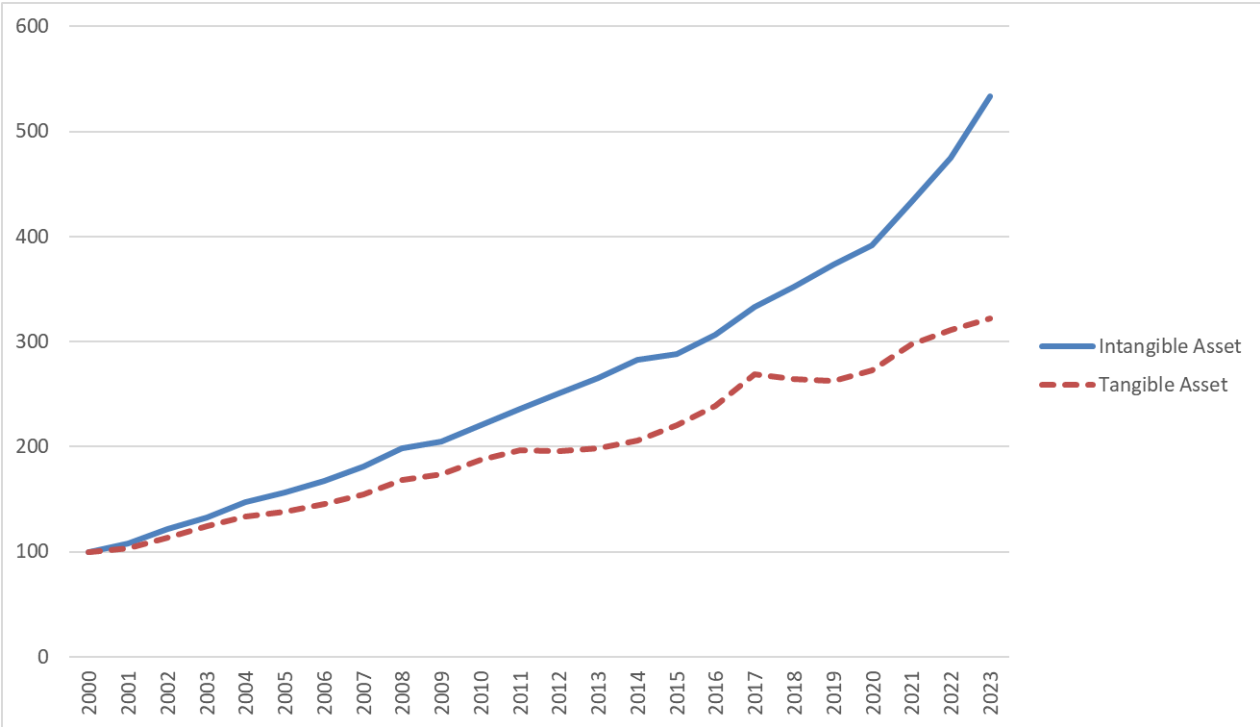


Source: KIP(Korea Industrial Productivity) Database(2024), Korea Productivity Center

## Concluding Remarks in the Case of Korea

We started off if Korea's long-run-data validates the Krugman proposition. It seems yes because after 64 years since 1960, the Korean economy has made a miracle-like performance with high GDP and TFP growth rates. However, after the Asian Financial Crisis, the Korean economy has lost capital productivity and efficiency and have not yet fully restored its growth momentum. The average growth rate of GDP at the level of 6-8 % is now reduced below 2 % range, making miracle into myth. In this regard, the long-run Korean data validates the Krugman proposition.

## The Only Exit from Myth is to Enhance Intangible Investment

## and Restore Sustainable Growth Path

The Korean economy's path toward myth reminds us Piketty's (2014) remark that toward the end of capitalist society the only exit from avoiding falling into Marx's infinite accumulation of capital and Capitalists' dooms day is to maintain GDP growth rate ($g$) is greater than technology growth rate($v$) plus population growth rate ($n$) and depreciation rate ($\delta$). Since in the long run depreciation rate becomes zero, to maintain GDP growth rate 3 %, given population growth rate remains 1 %, the Korean economy needs to maintain TFP growth rate at minimum 2 %. The only solution seems to revitalize intangible investments including AI and find new sources of growth.

# 2-3. China's Growth and Productivity Performance from an East Adia Perspective
## (key points only, incomplete)

## Harry X. Wu
## As of March 2025

# Agenda

1. **China from the perspective of East Asia**

2. **The China model of growth revisited**

3. **Methodology (Jorgenson model) (skipped)**

4. **Data 1: Construction (skipped)**

5. **Data 2: Grouping and policy regime shifts, prepared for an East Asia policy comparison**

6. **Growth accounting results with discussion**

7. **Concluding remarks**

# 2-3-1. China from the perspective of East Asia

## Time and Speed Used for Each of the "Income-Doubling" Phases in China and Other East Asian Economies
### (Including Predictions for China）

| Income-Doubling Phases (PPP$ 1990 price)[1] | China[2] | | Japan | | South Korea | | Taiwan | |
|---|---|---|---|---|---|---|---|---|
| | Time used (period) | % p.a. [3] | Time used (period) | % p.a. [3] | Time used (period) | % p.a. [3] | Time used (period) | % p.a. [3] |
| "Taking off": | | | | | | | | |
| Phase I: "Starting" PPP$1,000-$2,000 | 13 (1982-1995) | 5.4 | 44 (1890-1934) | 1.6 | 16 (1953-1969) | 4.1 | 15 (1952-1967) | 4.8 |
| Phase II: "Propelling" PPP$2,000-$4,000 | 11 (1995-2006) | 6.6 | 27 (1934-1961) | 2.6 | 9 (1969-1978) | 8.0 | 9 (1967-1976) | 7.3 |
| Phase III: "Finishing" PPP$4,000-$8,000 | 12 (2006-2018) | 5.7 | 8 (1961-1969) | 9.1 | 11 (1978-1989) | 6.4 | 11 (1976-1987) | 7.1 |
| "Towards Maturity": | | | | | | | | |
| The First Half PPP$8,000-$12,000 | 10[4] (2018-2028) | 4.7[4] | 8 (1969-1977) | 5.2 | 6 (1989-1995) | 7.1 | 7 (1987-1994) | 5.8 |
| The Second Half PPP$12,000-$16,000 | 9[4] (2028-2037) | 3.0[4] | 10 (1977-1987) | 2.9 | 7 (1995-2002) | 5.7 | 7 (1994-2001) | 4.7 |

- The somewhat compatible period for all these four East Asian economies is the stage from PPP$2000 to PPP$8000 (at constant 1990 prices, Maddison), only if we can ignore the war shock in Japan. Otherwise, the most compatible period for all the economies is only the stage from PPP$4000 to PPP$8000.

- By the time achieving PPP$8000 (approximate $15000 current), an economy had successfully completed the so-call "take off".

- For China, by PPP$8000, it was the time before the economy was hit by Covid-19 and had suffered from growth slowdown and TFP recession for about a decade since the GFC.

- It is more importantly to know that in addition to the unprecedented 4 trillion-yuan injection enhancing infrastructural construction to counteract the GFC, the Chinese government enhanced industrial policies substantially intervening resource allocation, which explains not only the TFP recession in general but the misallocation of capital in particular (Table 6d, p.19).

# 2-3-2. The China Model of Growth Revisited

- **The China model of growth in a nutshell: Under the conditions of <span style="color:red">controlled market opening</span>, in an institutional framework of "<span style="color:red">political centralization and economic decentralization</span>" (Xu, 2011), governments/officials at all levels <span style="color:blue">maximize their political objective functions by influencing resource allocation</span>, according to both rules and "hidden rules", <span style="color:blue">to win growth competitions with their peers</span>.**

- **They influence (promote/hinder) market clearing process through direct or indirect interventions based on <span style="color:blue">the centralized judgement of the nature and degree of "current problems"</span>.**

- **The "<span style="color:red">gradualist reform</span>" that created this model, hinging on the pressure of political legitimacy of the ruling CCP and the game of economic interests between the central and local governments, inevitably makes the reform tend to "<span style="color:red">avoid the important and focus on the trivial</span>" and rather ironically, …**

- **<span style="color:blue">…the unsolved problems that create new problems encourage or invite the government to intervene</span>, which is contrary to the original intention of Deng's reform (at least on the surface).**

- The "**growth competition**" between local governments induces ambitious investment promotions through various development projects with land as a **fiscal resource** and further as **financial leverage**, resulting a fast-rising debt.
- However, this growth competition based on the supply side and resource mobilization may be able to solve the growth problem for a period, but **it cannot solve the efficiency problem, nor can it make demand adapt to supply**.
- Therefore, **this model inevitably endogenizes two paradoxes…**
- The "**growth-efficiency paradox**": Such growth-motivated resource mobilization means that the government must intervene in the use of resources, which will inevitably **change the behavior of manufacturers, forcing them to collude with officials in power to replace their pursuit of efficiency with "arbitrage" behaviors, hence relaxing efficiency constraints and thereby inhibiting real innovation and ultimately limiting growth**.
- The "**production-consumption paradox**": Such growth competition implicitly assumes that the external market can be expanded indefinitely. To win the growth competition, local governments tend to reduce factor costs – all borne by labor. **The so-suppressed labor costs have enabled China to "competitively" create global production capacity in a very short period, but it has been unable to build a matching consumption capacity. This ultimate demand constraint also ultimately limits the growth**.
- I argue that China's rise and fall can be explained by the same logic.

# A Cross-Subsidization Hypothesis for the China Model of Growth

- **Government interventions are carried out directly or indirectly, through administrative controls and subsidies in different forms. The interventions and the ways of the intervention are industry-selective, determined by the industry's distance from the final demand or from the government.**

- **One of the biggest lessons the government learned from the planning period is that downstream industries that produce final products, especially those facing the export market, must be "competitive" enough so that it can make money.**

- **Thus, the closer the industry to the end market, the less direct interventions and more indirect subsidies. By contrast, upstream industries are of "strategic importance" and closer to the government, so they are subject to administrative controls and direct subsidies.**

- **While direct subsidies come from the public resources or fiscal budget, indirect subsidies are usually implemented in the form of suppressed factor costs (land, labor, energy, environment, capital). Not only does this affect the efficiency of resource allocation, but it also distorts the behavior of enterprises, hence reducing the efficiency of the economy.**

- **In addition, interventions, subsidies, and distortions create "negative externalities" that raise the transaction costs of the economy, hence reducing productivity.**

# 2-3-3. Methodology (Skipped)
# 2-3-4. Data (Skipped)

## 2-3-5. Data 2: Grouping of Industries: Market vs. Government

- **The 37 CIP industries are grouped roughly according to their respective market competition levels, by their "distance" from the final market, or vice versa, from the government.**

- The entire industrial sector including 24 industries is placed at the core in the grouping considering its importance to economic growth in the "take-off" stage and categorized into six groups.

- … of which, the finished and semi-finished product manufacturing at the bottom of the industrial chain is closest to the final market, which can be divided into three groups: "consumer goods", "producer goods I (more capital-intensive)" and "producer goods II (less capital-intensive)";

- … there is the "intermediate material manufacturing sector" in the middle, which can be divided into the "light material group" corresponding to "consumer goods" and "producer goods II", and the "heavy material group" corresponding to "producer goods I";

- … finally, there is the "(broad) energy production sector" at the upstream of the industrial chain, hence closest to the government.

- **The separately listed <span style="color:red">agriculture</span> and <span style="color:red">construction</span> industries are both policy-sensitive sectors and enjoy subsidies. The former is related to basic people's livelihood, while the latter is not only closely related to the investment activities of the real economy, but more importantly, it usually serves as a policy instrument to maintain growth and moderate business cycles.**

- **Finally, all service industries can be divided into two: "market service industry" and "non-market service industry". The former can be further divided into "<span style="color:red">market service industry I</span>" composed of government-monopolized finance and insurance, transportation and warehousing, and postal and telecommunications, and the rest are more competitive "<span style="color:red">market service industry II</span>".**

- **"<span style="color:red">Non-market service industry</span>" usually has the nature of public goods, mainly including government administrative management, education and medical services.**

# CIP/China KLEMS Industrial Classification & Grouping

| CIP | EU-KLEMS | Grouping | Industry | |
|-----|----------|----------|----------|------|
| 01 | AtB | Agriculture | Agriculture* | AGR |
| 02 | 10 | Energy | Coal mining | CLM |
| 03 | 11 | Energy | Oil and gas extraction | PTM |
| 04 | 13 | Materials I | Metal mining | MEM |
| 05 | 14 | Materials I | Non-metallic minerals mining | NMM |
| 06 | 15 | Consumer | Food and kindred products | F&B |
| 07 | 16 | Consumer | Tobacco products | TBC |
| 08 | 17 | Materials II | Textile mill products | TEX |
| 09 | 18 | Consumer | Apparel and other textile products | WEA |
| 10 | 19 | Consumer | Leather and leather products | LEA |
| 11 | 20 | Non-ICT-M | Sawmill products, furniture, fixtures | W&F |
| 12 | 21t22 | Materials II | Paper products, printing & publishing | P&P |
| 13 | 23 | Energy | Petroleum and coal products | PET |
| 14 | 24 | Materials I | Chemicals and allied products | CHE |
| 15 | 25 | Materials II | Rubber and plastics products | R&P |
| 16 | 26 | Materials I | Stone, clay, and glass products | BUI |
| 17 | 27t28 | Materials I | Primary & fabricated metal industries | MET |
| 18 | 27t28 | Producer I | Metal products (excl. rolling products) | MEP |
| 19 | 29 | Producer I | Industrial machinery and equipment | MCH |

| 20 | 31 | Producer I | Electric equipment | ELE |
|----|------|------------|--------------------|-----|
| 21 | 32 | Producer II | Electronic and telecommunication equipment | ICT |
| 22 | 30t33 | Producer II | Instruments and office equipment | INS |
| 23 | 34t35 | Producer I | Motor vehicles & other transportation equipment | TRS |
| 24 | 36t37 | Consumer | Miscellaneous manufacturing industries | OTH |
| 25 | E | Energy | Power, steam, gas and tap water supply | UTL |
| 26 | F | Construction | Construction | CON |
| 27 | G | Market Service II | Wholesale and Retail Trades | SAL |
| 28 | H | Market Service II | Hotels and Restaurants | HOT |
| 29 | I | Market Service I | Transport and Storage | T&S |
| 30 | 64 | Market Service I | Information Services | P&T |
| 31 | J | Market Service I | Financial Intermediation | FIN |
| 32 | K | Market Service II | Real Estate Activities | REA |
| 33 | 71t74 | Market Service II | Leasing, Technical, Science & Business Services | BUS |
| 34 | L | Non-market Service | Public Administration and Defense | ADM |
| 35 | M | Non-market Service | Education | EDU |
| 36 | N | Non-market Service | Health and Social Security | HEA |
| 37 | O&P | Market Service II | Other Services | SER |

*Source*: See Wu and Ito (2015) for CIP classification.
*Notes*: * Including Crop farming, forestry, animal husbandry and fishery

# 2-3-5. Data 2: Examination of Policy Regime Shifts

- Furthermore, we place the so grouped industries in different time windows reflecting major policy regime shifts or external (political/economic) shocks to observe in depth the growth and productivity performance of different industry groups.

- Based on some important landmark policy events/institutional changes, we divide the entire period from 1978 to 2018 into eight sub-periods or time windows, namely 1978-1984, 1984-1991, 1991-1996, 1996-2001, 2001-2007, 2007-2012, 2012-2018, 2018-2023. Each contains one or two landmark events that had a significant impact on investment, production, and consumption:
    - 1978: The agricultural reform that eventually ended agricultural collectivization.
    - 1984: The "dual-track price system" began and fully implemented from 1985.
    - 1989: The political shock of the "Tiananmen Incident".
    - 1992: Deng Xiaoping's "Southern China Trip" to call for bolder reforms; the CCP's first acceptance of the "socialist market economy" model; and the subsequent reforms of state-owned enterprises.
    - 1997-1998: The market shock caused by the Asian financial crisis.
    - 2001: The World Trade Organization (WTO) granted China with a membership.
    - 2008-2009: The global financial crisis.
    - 2011-2012: The global market shock caused by the European debt crisis; a major policy retreat in name of the "new normal".
    - 2020-2022: The impact of the COVID-19 pandemic.

# 2-3-6a. Industry Contribution to GDP Growth
## (Total GDP growth obtained by Törnqvist index aggregation)
### (Figures in the table are in additive ppts)

China's **industrialization-driven restructuring** is entering its final stage: agriculture dropped from the highest 20% to 5%; the industrial sector declined from the 70% peak to 50%, with fluctuations; services rose from 25% to 35%, and construction peaked at 8% but now 2%

| | 1978-1984 | 1984-1992 | 1992-1996 | 1996-2001 | 2001-2007 | 2007-2012 | 2012-2018 | 2018-2023 | 1978-2023 |
|---|---|---|---|---|---|---|---|---|---|
| **GDP growth (% p.a.)** | **9.92** | **7.66** | **9.40** | **7.48** | **10.72** | **7.38** | **4.96** | **3.72** | **7.68** |
| Agriculture | 1.81 | 1.12 | 0.76 | 0.51 | 0.38 | 0.38 | 0.26 | 0.24 | 0.72 |
| Construction | 0.29 | 0.70 | 0.26 | 0.17 | 0.59 | 0.17 | 0.20 | 0.30 | 0.36 |
| Energy | -0.70 | 0.13 | -0.14 | 0.51 | 0.72 | 0.31 | 0.39 | -0.05 | 0.15 |
| Input materials I | 0.40 | 0.81 | 1.42 | 1.49 | 1.30 | 1.90 | 0.78 | 0.49 | 1.03 |
| Input materials II | 1.12 | 0.58 | 1.11 | 0.55 | 0.62 | 0.41 | 0.14 | 0.22 | 0.58 |
| Consumer goods | 1.55 | 0.76 | 1.64 | 1.05 | 1.16 | 1.00 | 0.41 | 0.55 | 0.98 |
| Producer goods I | 2.42 | 1.33 | 1.94 | 0.91 | 1.77 | 1.44 | 0.62 | 0.50 | 1.37 |
| Producer goods II | 0.59 | 0.34 | 0.61 | 0.66 | 0.88 | 0.62 | 0.31 | 0.21 | 0.52 |
| Market services I | 0.98 | 0.71 | 0.70 | 0.28 | 1.84 | 0.45 | 0.44 | 1.37 | 0.86 |
| Market services II | 1.21 | 0.80 | 0.99 | 1.27 | 2.44 | 1.90 | 1.88 | 0.47 | 1.37 |
| Nonmarket services | 0.27 | 0.37 | 0.09 | 0.09 | -0.98 | -1.18 | -0.47 | -0.59 | -0.27 |

# 2-3-6b. Factor Contribution to GDP Growth

**(Figures in the table are in additive ppts)**

**China's growth has become increasingly capital input-driven at the expense of efficiency: From the peak to the recent decade, while the economy was slowing down rapidly, capital input increased from 62% to over 100%, labor input decreased from 18% to 10%, and TFP decreased from 20% to -10%, suggesting that the decline in efficiency indeed hurt the growth (the growth-efficiency paradox!)**

| | 1978-1984 | 1984-1992 | 1992-1996 | 1996-2001 | 2001-2007 | 2007-2012 | 2012-2018 | 2018-2023 | 1978-2023 |
|---|---|---|---|---|---|---|---|---|---|
| **GDP growth (% p.a.)** | **9.92** | **7.66** | **9.40** | **7.48** | **10.72** | **7.38** | **4.96** | **3.72** | **7.68** |
| **1. Capital input** | **6.18** | **4.76** | **5.57** | **5.30** | **7.32** | **8.16** | **5.42** | **3.49** | **5.75** |
| Stock | 6.13 | 4.70 | 6.10 | 5.77 | 7.10 | 7.35 | 5.02 | 3.51 | 5.66 |
| Capital quality | 0.04 | 0.06 | -0.53 | -0.47 | 0.23 | 0.81 | 0.41 | -0.02 | 0.09 |
| **2. Labor input (ppt)** | **1.76** | **1.96** | **2.17** | **0.65** | **1.17** | **1.16** | **0.43** | **0.47** | **1.24** |
| Hours (LC weighted) | 1.55 | 1.46 | 1.18 | 0.34 | 0.85 | -0.93 | -0.39 | -0.07 | 0.56 |
| Labor quality | 0.21 | 0.50 | 0.99 | 0.32 | 0.33 | 2.09 | 0.82 | 0.54 | 0.68 |
| **3. Aggregate TFP (ppt)** | **1.98** | **0.94** | **1.66** | **1.53** | **2.22** | **-1.94** | **-0.89** | **-0.24** | **0.68** |

**6b… Of the capital input, the contribution of non-residential structures (including infrastructure) fluctuated from its high 50%, then dropped to 25%, and now rose back to 40% -- driving down efficiency due to low returns, whereas the contribution of equipment currently maintains at 60%, indicating its significant role; of the labor input, with the decline of natural hours, the low skilled labor declined, followed by the medium skilled, but more than compensated by the rise of the high skilled.**

| | 1978-1984 | 1984-1992 | 1992-1996 | 1996-2001 | 2001-2007 | 2007-2012 | 2012-2018 | 2018-2023 | 1978-2023 |
|---|---|---|---|---|---|---|---|---|---|
| GDP growth (% p.a.) | 9.92 | 7.66 | 9.40 | 7.48 | 10.72 | 7.38 | 4.96 | 3.72 | 7.68 |
| 1. Capital input (ppt) | 6.18 | 4.76 | 5.57 | 5.30 | 7.32 | 8.16 | 5.42 | 3.49 | 5.75 |
| Non-residential Structure | 3.13 | 1.85 | 2.23 | 2.08 | 1.95 | 2.36 | 2.05 | 1.33 | 2.12 |
| Equipment | 3.02 | 2.83 | 3.09 | 2.99 | 5.16 | 5.65 | 3.30 | 2.09 | 3.50 |
| Residential Structure | 0.03 | 0.08 | 0.24 | 0.23 | 0.21 | 0.15 | 0.07 | 0.07 | 0.13 |
| 2. Labor input (ppt) | 1.76 | 1.96 | 2.17 | 0.65 | 1.17 | 1.16 | 0.43 | 0.47 | 1.24 |
| Low skilled | 1.24 | 1.23 | 1.02 | 0.09 | 0.35 | -0.74 | -0.54 | -0.78 | 0.29 |
| Medium skilled | 0.44 | 0.47 | 0.59 | 0.42 | 0.70 | -0.25 | 0.23 | -0.35 | 0.30 |
| High skilled | 0.08 | 0.26 | 0.56 | 0.14 | 0.12 | 2.16 | 0.74 | 1.60 | 0.65 |
| 3. Aggregate TFP (ppt) | 1.98 | 0.94 | 1.66 | 1.53 | 2.22 | -1.94 | -0.89 | -0.24 | 0.68 |

- The contribution of capital input to GDP growth rose from about 60% in the early reform days to around 70% through the WTO-entry golden period. It jumped to 110% in the decade following GFC as the most important policy tool for "maintaining growth". During the Covid-lockdown period, capital input fell to 94%, suggesting that the epidemic gave the government a reason to somewhat tolerate growth slowdown.

- On the breakdown of the quantity and quality of capital input, we don't observe any trend of quality improvement, that is, the shift of investment from low to high returns, likely due to capital misallocations caused by industrial policies and growth maintaining policies (see Tables 6c and 6e).

- The contribution of labor input to the aggregate GDP growth has been on a long downward trend, from more than 20-25% in the 1980s to an average of about 10% in the recent decade. It even rose slightly during the Covid-lockdown period.

- On the breakdown of the quantity and quality of labor input, the contribution of labor quantity (hours, cost-weighted) began to decline in absolute terms since the financial crisis; it is the improvement of labor quality (the increase in high-skilled labor) that has compensated the decline of the quantity (see Table 6c).

- The agricultural reform period and the post-WTO entry period were the two golden periods with the fastest TFP growth, contributing about 20% to the aggregate GDP growth. Besides, the SOE reform promoted by "Deng's Southern Tour" also had an obvious TFP effect, lending support to my institutional interpretation of TFP performance.

- However, since the global financial crisis, TFP has been showing negative growth, from -26% in the early stage of the crisis, -18% in the later stage, to -7% during the Covid. Efficiency loss has obviously become a huge price to pay for "maintaining growth", as well as the Covid control.

# 2-3-6c. Sources of Labor Productivity Growth

**The contribution of capital deepening to labor productivity increased from 66% in the early reform period to 72% before joining the WTO, and further increased to 100% in the decade after the GFC, and recently fell back to 92%.**
**The continuous decline in TFP over the past 15 years has negated the efficiency of the capital deepening process and has also raised questions about whether this process is a competitive choice of the market** (see the next page for observations in detail).

| | 1978-1984 | 1984-1992 | 1992-1996 | 1996-2001 | 2001-2007 | 2007-2012 | 2012-2018 | 2018-2023 | 1978-2023 |
|---|---|---|---|---|---|---|---|---|---|
| **GDP growth (% p.a.)** | **9.92** | **7.66** | **9.40** | **7.48** | **10.72** | **7.38** | **4.96** | **3.72** | **7.68** |
| GDP per hour worked | 6.46 | 4.66 | 7.03 | 6.73 | 8.97 | 9.42 | 5.74 | 3.85 | 6.50 |
| Hours | 3.46 | 3.01 | 2.37 | 0.75 | 1.75 | -2.04 | -0.77 | -0.13 | 1.18 |
| | | | | | | | | | |
| **GDP per hour worked** | **6.46** | **4.66** | **7.03** | **6.73** | **8.97** | **9.42** | **5.74** | **3.85** | **6.50** |
| Capital deepening | 4.27 | 3.22 | 4.38 | 4.89 | 6.42 | 9.27 | 5.81 | 3.56 | 5.13 |
| Labor quality | 0.21 | 0.50 | 0.99 | 0.32 | 0.33 | 2.09 | 0.82 | 0.54 | 0.68 |
| TFP growth | 1.98 | 0.94 | 1.66 | 1.53 | 2.22 | -1.94 | -0.89 | -0.24 | 0.68 |

- The 7.7% GDP growth over the 45 years can be decomposed into 15% from natural labor hours (non-cost weighted) and 85% from the growth of average hourly output (labor productivity). Yet, the natural labor hour has dropped from 35% in the early stage of the reform to -4% in 2018-2023.

- With the absolute decline in hours, the era when China's economy enjoyed the "demographic dividend" is long gone, suggesting only a faster increase in labor productivity (in terms of the production function, not driven by capital deepening alone) can make up for the decline.

- The contribution of capital deepening to labor productivity obtained by decomposition has increased from 66% in the early stage of reform to 72% in the mid-1990s until joining the WTO, and around 100% in the 10 years after the economic crisis, and only recently fell back to 92%.

- The contribution of labor quality jumped to 22% following GFC and is currently stable at about 14%, indicating that the demand for labor quality has increased rapidly due to the substitution of capital for labor quantity (capital deepening) in structural transformation. With the rising labor costs, we can then expect that the unemployment of the low- and medium-skilled labor will continue.

- Only the performance of TFP can evaluate whether the changes in labor productivity, thus capital deepening, is efficient. However, the continuous decline in TFP in the past 15 years gives a negative answer, which also answers whether this process is a competitive choice of the market.

- To sum up, the efforts of the macroeconomic policies to maintain GDP growth rate with (relatively) more capital investment have not only failed to achieve their goals but have also paid the price of inefficiency.

# 2-3-6d. Decomposition of China's TFP Growth:

**The downstream "finished/semi-finished" manufacturing, closest to the final market, was most efficient (recall the "cross subsidization hypothesis") in which the "capital goods manufacturing" was most prominent (why so?). In essence, the efficiency improvement of the "finished/semi-finished" industries paid for the productivity losses of all other sectors — "cross-subsidization", as well as policy-induced misallocation.**

| | 1978-1984 | 1984-1992 | 1992-1996 | 1996-2001 | 2001-2007 | 2007-2012 | 2012-2018 | 2018-2023 | 1978-2023 |
|---|---|---|---|---|---|---|---|---|---|
| **Aggregate TFP growth % p.a.** | **1.98** | **0.94** | **1.66** | **1.53** | **2.22** | **-1.94** | **-0.89** | **-0.24** | **0.68** |
| **1. Domar-wtd TFP growth (ppt)** | **0.28** | **0.55** | **1.25** | **1.61** | **2.27** | **-1.59** | **-0.19** | **0.60** | **0.59** |
| Agriculture | -0.71 | 0.22 | 0.33 | 0.24 | 0.43 | 0.70 | 0.53 | 0.32 | 0.24 |
| Construction | -0.18 | 0.38 | -0.41 | -0.24 | 0.27 | -0.43 | -0.32 | 0.57 | -0.01 |
| Energy | -1.50 | -0.64 | -0.75 | 0.12 | -0.23 | -0.37 | 0.17 | -0.30 | -0.45 |
| Input materials I | -0.58 | -0.08 | 0.39 | 1.50 | 0.35 | 0.66 | 0.64 | 0.30 | 0.35 |
| Input materials II | 0.06 | 0.16 | 0.83 | 0.40 | 0.20 | 0.24 | 0.15 | 0.20 | 0.25 |
| Consumer goods | 0.26 | 0.01 | 0.67 | 0.49 | 0.49 | 0.33 | 0.30 | 0.58 | 0.36 |
| Producer goods I | 1.94 | 0.79 | 1.43 | 0.83 | 0.90 | 0.53 | 0.35 | 0.30 | 0.88 |
| Producer goods II | 0.52 | 0.24 | 0.43 | 0.41 | 0.44 | 0.36 | 0.21 | 0.09 | 0.33 |
| Market services I | 0.11 | -0.25 | -0.82 | -1.05 | 0.97 | -0.91 | -0.64 | 0.31 | -0.24 |
| Market services II | 0.28 | -0.39 | -0.52 | -0.87 | 0.17 | -0.98 | -0.74 | -0.91 | -0.46 |
| Nonmarket services | 0.07 | 0.11 | -0.34 | -0.22 | -1.72 | -1.72 | -0.84 | -0.86 | -0.65 |
| **2. Reallocation of K (ppt)** | **1.21** | **0.26** | **0.01** | **0.07** | **-0.70** | **-0.20** | **-0.71** | **-0.70** | **-0.07** |
| **3. Reallocation of L (ppt)** | **0.50** | **0.14** | **0.41** | **-0.15** | **0.64** | **-0.15** | **0.01** | **-0.14** | **0.16** |

- On the TFP contribution of each sector over the 45 years, the "finished/semi-finished" sector, which is closest to the final market, is the most efficient sector (1.6 percentage points), and among which the "capital goods" manufacturing industry seems to be most prominent.

- One may argue that we should not ignore the heavy industry priority strategy during the planned economy period, which heavily subsidized this sector through the "price scissors gap". The decomposition for the period 1978 to 1984 indeed shows that the TFP performance of agriculture (-0.71 ppts), which was oppressed during the planned economy period, was exactly the opposite of that of the capital goods sector (2.45 ppts).

- Therefore, compared to the view of "the contribution of the planned economy", I am more inclined to the view of "the distortion of the planned economy".

- If adding the "intermediate materials" sector (0.6 ppts) to the "finished/semi-finished", the contribution of total manufacturing is 2.2 ppts, which is about three times the average annual TFP growth of 0.7% for the overall economy (the gap indicates a loss).

- Clearly, the efficiency improvement of the "finished/semi-finished" sector is equivalent to paying for the efficiency losses of all other sectors as well as misallocations
  - It must be noted that the existence of subsidies may exaggerate the GDP growth of some industries, therefore bringing in implicit markups in the estimated TFP growth, including agriculture, energy, construction, etc..

**6d… The Resource Reallocation Effect on TFP**
**Labor: An overly flexible labor market without an independent bargaining mechanism;**
**Capital: A capital market that has been heavily intervened by government policies since the 2000s.**
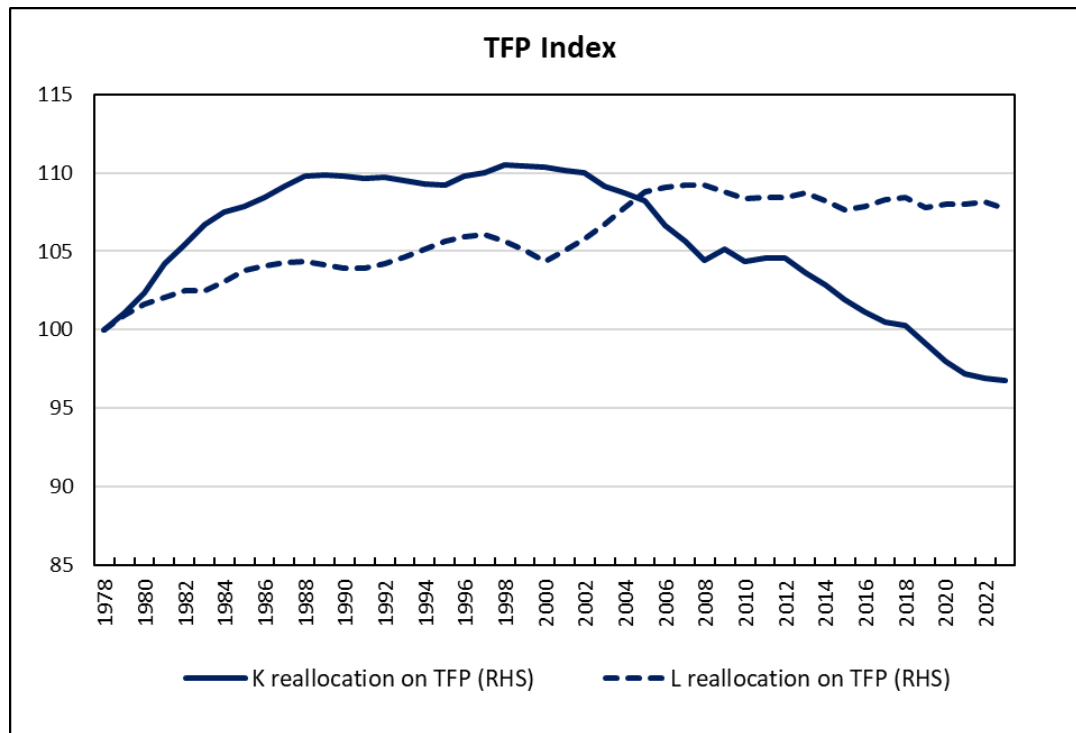
## 6d… China's TFP Indices (1978=100; non-additive)
## Exploring an institutional explanation of China's TFP growth by observing the major positive shocks by the industrial reform, the SOE reform, and WTO, and also the negative ones…



### TFP Index

Legend:
- Aggregate TFP
- Industry TFP_Domar
- K reallocation on TFP (RHS)
- L reallocation on TFP (RHS)

Annotations on chart: Agricultural Reform; Price Double-Track Industrial Reform; TAM; Deng's South Trip; SOE Reform; AFC; WTO; GFC; CCP 18th; New Normal; Covid-19
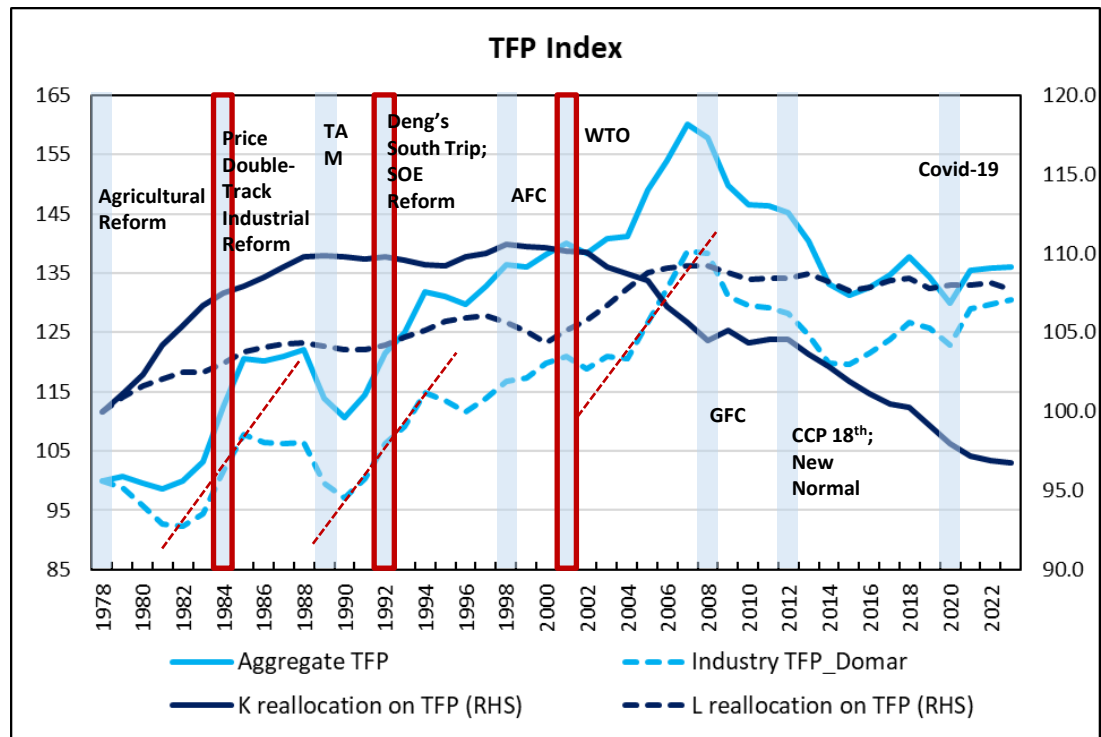
**1)** **Since GFC, the industries' TFP deteriorated due to the crowding-out effect of the "growth-maintaining" policy; 2) Capital misallocation since WTO and worsened since 2012; 3) A good sign: the survived firms were forced to repair their productivity from 2015 as the government was constrained by its rising debt, causing a "scissors effect" suggesting that as more efficient firms crowded out inefficient ones that were likely state-owned or selected, the government was forced to support the latter and then enhancing the misallocation and productivity loss.**



TFP Index

Legend:
- Aggregate TFP
- Industry TFP_Domar
- K reallocation on TFP (RHS)
- L reallocation on TFP (RHS)
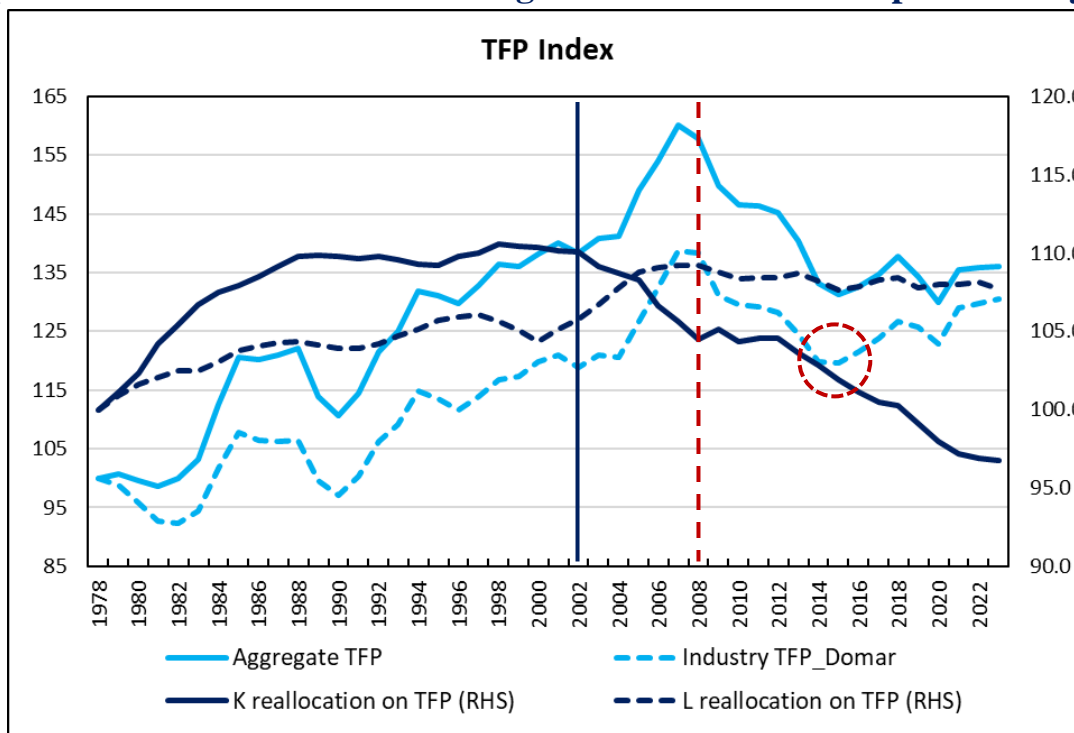
# 2-3-7. Concluding Remarks

- In this study, applying a Jorgensonian growth accounting model to a newly revised and updated CIP/China KLEMS dataset, I show that the substantial and premature slowdown of the Chinese economy is very likely caused by its productivity decline that is inherent in its own growth model.

- China's unprecedented rapid growth of 7.7% p.a. since the reform (1978-2023), which had made China the world second largest economy by 2010, or thirty years after its departure from the central planning, and has maintained the position ever since, is nevertheless accompanied by a rather slow TFP growth of 0.7% p.a., or only 10 percent of the annual growth on average.

- I also show that China's growth has been increasingly relying on capital input albeit rapidly decline of returns on capital.

- Observations appear to support my institutional interpretation of TFP. China's productivity gains were indeed associated with major reforms, such as the early industrial reform benefitted from the agricultural reform, the SOE reform promoted by Deng's "Southern Tour" under the banner of "socialist market economy", and joining the WTO, but also the improvement of resource allocation before China's WTO entry.

- However, China's deteriorating misallocation of capital since the WTO entry suggests that both the central government's industrial policies and local governments' competitions for growth seem to be able to drive the growth for a period of time but at the increasing expense of TFP growth. Besides, the government's growth-maintaining policies to offset the impact of external shocks have neither sustain the growth nor the productivity.

- **Capital misallocation in the overall economy means that chronically inefficient firms take up too many resources, squeezing out more efficient firms, including a large number of small private enterprises; while capital market distortions caused by policy interventions increase the "transaction costs" of economic activities, including the most dynamic sectors.**

- **Resource misallocation also affects the economy through a government's "cross subsidization" arrangement. In a sense, the most productive downstream industries, though subsidized by the upperstream industries and the government policies to lower factor costs, compensated for productive losses made by non-productive industries and resource misallocation caused by government policies.**

- **The government's "growth maintenance" policies also limit an important function of the market related to improving efficiency and innovation, that is, the learning function it gives to participants. Investors, including the government deeply involved, should and must pay the price for their investment mistakes. The current severe overcapacity may be the best diagnosis of this mistake (see Annex).**

- **China's poor productivity performance has exposed institutional problems inherent in the system, which calls for genuine market-oriented reforms.**

# 3. Summary of Presentation

- The main driver of high-economic growth era was rapid capital accumulation. This generated high TFP growth rate.

- However, excess capital accumulation led to the fall in rate of return to capital. In addition to the slowdown of capital accumulation, large crisis such as the collapse of the bubble economy (Japan), the Asian Economic Crisis (Korea) and the GFC (China) led to the end of high growth era in three East-Asian Countries ended

# 4. Future Research Agenda

- Although our presentation shows crucial factors of high economic growth by using growth accounting, we have not referred the roles of government on economic growth in three countries.

- In particular, the role of government in the period when the structural reforms are required should be studied for future research.