Is Digital Economy Growth Profit-Led or Wage-Led?

Evidence from China's Structural Input-Output Tables

Jing YOU †

† Postdoctoral Researcher
Economics Department, School of Social and Sciences, Tsinghua University

Outline

1 **Theoretical Background**

Marxist Political Economics & Marx–Kalecki Framework

2 **Three Intellectual Bridges**

Marxist Political Economics ↔ Input-Output Analysis

3 **Data & Model**

Six-Sector Classification & Equations

4 **Empirical Results**

Profit-Led Growth or Wage-Led Growth

Marxist Political Economy: Key Theoretical Pillars

Tsinghua University

Theory of Reproduction

Marx's Vol. II of Capital: social capital reproduces through the circular flow of commodities, money, and productive capital. Expanded reproduction is the source of capital accumulation and growth.

Surplus Value & Profit Rate

Profit rate $r = S / (C + V)$. The division of value-added between wages (V) and profits (S) determines the accumulation capacity and growth potential of each department.

Kalecki's Effective Demand

Kalecki integrated Marx's reproduction schema with Keynesian effective demand: investment determines profits (saving adjusts to investment), connecting distribution to growth.

Profit-Led vs. Waged-Led Growth: The Core Question

Tsinghua University

WAGE-LED Channel

↑ **Wages**
→ ↑ Consumption demand
→ ↑ Output / Capacity utilization
→ ↑ **Investment & Growth (?)**

Key condition: demand-channel effect > cost-channel effect

PROFIT-LED Channel

↑ **Wages**
→ ↓ Profit share (m)
→ ↓ Investment demand
→ ↓ **Growth rate ✓**

Key condition: demand–distribution effect dominates structural & technological effects

In the digital era: Which mechanism dominates? Does digital embedding change the nature of growth?

The Marx-Kalecki Synthesis: Investment, Distribution & Growth

Three Wage-Growth Channels

1 Demand-Distribution Effect

↑ wages → ↓ profit share → ↓ investment (always negative)

2 Structural Effect

Wage changes reallocate demand across departments (sign indeterminate)

3 Technological Effect

Wage changes affect production technique choice & digital embedding (sign indeterminate)

Three Intellectual Bridges: Marxist Political Economy & Input-Output Analysis

I Circular Folw
循环流思想

Marx's reproduction schemas (Dept. I & II) depict the circular flow of commodities and value. IO analysis formalizes this as a matrix of inter-industry flows — capturing how money, goods, and capital circulate in the aggregate economy.

II Structural Thought
结构思想

The sector disaggregation in Marx's reproduction theory corresponds directly to the row-column structure of the IO table. Both frameworks treat the economy as a structured system where each sector's output becomes another's input.

III Linear Thought
线性思想

Under fixed technical coefficients, Marx's value and price equations are linear in production quantities. The Leontief inverse in IO analysis exploits this same linearity — enabling tractable equilibrium solutions and multiplier analysis.

Data: From I-O Table to Six-sector Table

Source: Digital supply, use, and input-output tables for China from 2000 to 2020. Tian et al. (2025),

Original Input-Output Table

		Intermediate Use			Final Use			Total Output
		Sector A	Sector B	Sector C	Consumption	Capital Formation	Net Export	
Intermedia-te Input	Sector A	AA	AB	AC	C_A	F_A	N_A	X_A
	Sector B	BA	BB	BC	C_B	F_B	N_B	X_B
	Sector C	CA	CB	CC	C_C	F_C	N_C	X_C
Value-added		V_A	V_B	V_C				
Total Input		X_A	X_B	X_C				

Digital Input-Output Table

		Intermediate Use				Final Use			Total Output
		Sector A (CON)	Sector B (CON)	Sector C	Digital Sector	Consumptiion	Capital Formation	Net Export	
Intermediate Input	Sector A (CON)	AA_1	AB_1	AC_1	$AA_2 + AB_2$	C_A^1	F_A^1	N_A^1	X_A^1
	Sector B (CON)	BA_1	BB_1	BC_1	$BA_2 + BB_2$	C_B^1	F_B^1	N_B^1	X_B^1
	Sector C	CA_1	CB_1	CC	$CA_2 + CB_2$	C_C	F_C	N_C	X_C
	Digital Sector	$AA_3 + BA_3$	$AB_3 + BB_3$	$AC_2 + BC_2$	$AA_4 + AB_4 + BA_4 + BB_4$	$C_A^2 + C_B^2$	$F_A^2 + F_B^2$	$N_A^2 + N_B^2$	$X_A^2 + X_B^2$
Value-added		V_A^1	V_B^1	V_C	$V_A^2 + V_B^2$				
Total Input		X_A^1	X_B^1	X_C	$X_A^2 + X_B^2$				

Data: From I-O Table to Six-sector Table

Tsinghua University

Based on the product destinations shown in each industry's row of the input–output table, we calculate the proportion of that industry's output used for different purposes. We then split the industry's intermediate inputs and value added in the column direction according to these proportions, aggregate the split data into input data for each department, and finally obtain the departmental table.

	Non-Digital Sector1	Non-Digital Sector2	Non-Digital Sector3	Digital Sector4	Digital Sector5	Digital Sector6	Final Demand	Net Export	error	Total Output
Non-Digital Sector1	D_1	D_2	D_3	D_4	D_5	D_6	F_1	NX_1	err_1	x_1
Non-Digital Sector2	A_1	A_2	A_3	A_4	A_5	A_6	F_2	NX_2	err_2	x_2
Non-Digital Sector3	0	0	0	0	0	0	F_3	NX_3	err_3	x_3
Digital Sector4	E_1	E_2	E_3	E_4	E_5	E_6	F_4	NX_4	err_4	x_4
Digital Sector5	G_1	G_2	G_3	G_4	G_5	G_6	F_5	NX_5	err_5	x_5
Digital Sector6	0	0	0	0	0	0	F_6	NX_6	err_6	x_6
Profit	Π_1	Π_2	Π_3	Π_4	Π_5	Π_6				
Wage	Ω_1	Ω_2	Ω_3	Ω_4	Ω_5	Ω_6				
Total input	x_1	x_2	x_3	x_4	x_5	x_6				

Data: From I-O Table to Six-sector Table

Sector 1

Non-Digital Fixed-Capital

Capital goods from non-digital sector

Sector 2

Non-Digital Circulating Capital

Intermediate inputs from non-digital sector

Sector 3

Non-Digital Consumption Goods

Consumer goods from non-digital sector

Sector 4

Digital Fixed-Capital

Capital goods from digital sector

Sector 5

Digital Circulating Capital

Intermediate inputs from digital sector

Sector 6

Digital Consumption Goods

Consumer goods from digital sector

Six-Sector Marx–Kalecki Model: Core Structure

Model 1
Investment & Growth

$$g = \alpha + \beta \cdot m + \gamma \cdot u$$

Department growth rate is driven by autonomous investment (α), profit share sensitivity (β·m), and demand/capacity utilization (γ·u). Captures both supply-side and demand-side determinants.

Model 2
Price & Profit Rate

$$p = p \cdot (K+A+W) \cdot R \cdot r^* + p \cdot (D+A+W)$$

Department prices reflect capital costs (fixed + circulating + wages) marked up by relative and general profit rates. Long-run equilibrium: r* = g* (Cambridge equation).

Model 3
Reproduction Condition

$$\lambda\_max(M \cdot diag(g)) = 1$$

The dominant eigenvalue of the augmented input-output matrix M (with differential growth rates) equals unity at balanced long-run equilibrium — a generalization of Marx's reproduction schema.

Growth Mechanism Analysis: Three Channels of Wage Effects

Tsinghua University

$$\partial g/\partial \omega = \textit{Demand–Distribution Effect} + \textit{Structural Effect} + \textit{Technological Effect}$$

① Demand–Distribution Effect

ALWAYS (−)

- ↑ wages → ↓ profit share (m)
- → ↓ investment demand
- → ↓ growth rate

• This is the fundamental profit-led channel. The demand–distribution effect dominates in all Chinese departments.

② Structural Effect

SIGN INDETERMINATE

- Wage changes alter demand allocation across departments
- ↑ wages → ↑ demand for digital consumer goods
- Strengthens inter-department linkages

• Partially offsets the negative demand–distribution effect in digital departments.

③ Technological Effect

SIGN INDETERMINATE

- Wage changes affect production technique selection
- ↑ wages → firms adopt digital technologies

• Changes the g→u transmission path

• Promotes digital technology adoption; long-run positive structural transformation.

Long-Run Equilibrium: Cambridge Equation & Reproduction Conditions

Cambridge Equation

$$r^* = g^*$$

General profit rate = potential growth rate; satisfied precisely in all sample years

Reproduction Confition

$$\lambda\_max = 1$$

Maximum eigenvalue of augmented M matrix = 1; balanced growth equilibrium confirmed

Growth Rate Range

20.9%–34.8%

Long-run potential growth rate g across 2000–2020; mean ≈ 26.2%*

Digital Profit Rate

Surpassed Non-Digital after 2010

Relative profit rates of digital departments gradually increased and exceeded non-digital departments post-2010

Wage–Profit Elasticity: All Departments Are Profit-Led

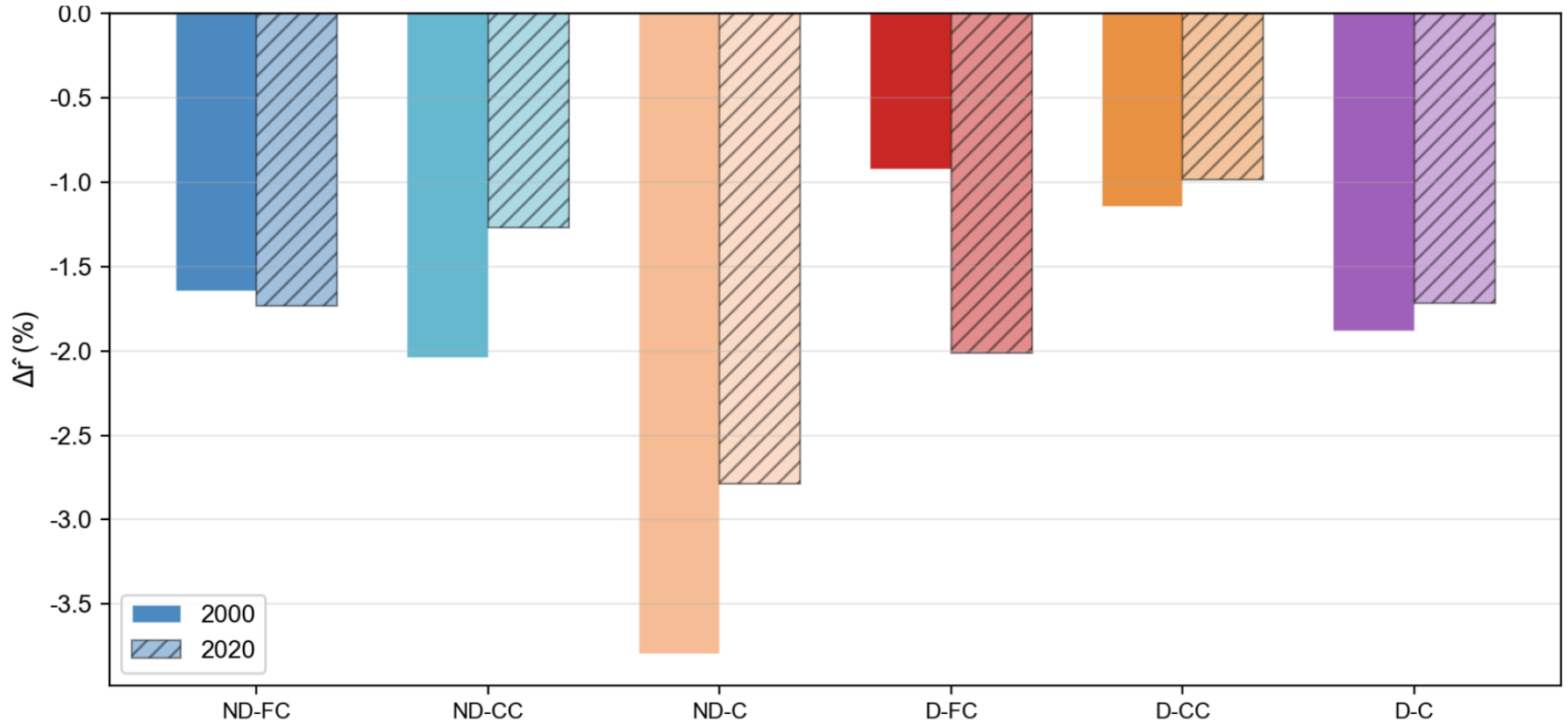

Figure 1. Effect of a 1% wage increase on the profit rate of each department

KEY RESULT: A 1% wage increase reduces departmental profit rates by 0.69%–3.79% | Digital departments: 0.69%–2.01% | Non-digital: 1.13%–3.79%

Wage–Profit Elasticity: All Departments Are Profit-Led

Why Digital Departments Have Lower Elasticity?

① Lower Wage Share

Digital depts: avg wage share 11.55% (2000) vs 21.52% (non-digital). After 2010, gap narrowed but persisted (19.79% vs 18.68% in 2020).

② Shorter Depreciation Cycles

Digital equipment depreciates faster → smaller fixed-capital stock coefficient k_q → profit rate less sensitive to cost shocks.

③ Structural Demand Shift

Rising incomes shift consumption toward digital goods. This structural reallocation partially offsets the negative demand–distribution effect.

Dual Mechanism: Profit Rate ↓ but Capacity Utilization ↑

"Hybrid Growth Pattern: Profit-Led at Profit-Rate Level × Wage-Led at Capacity-Utilization Level"

↓ Profit Rate Dimension (Profit-Led)

- A 1% wage increase reduces profit rate by 0.69%–3.79%
- Demand–distribution effect overwhelmingly dominant
- Higher fixed-capital intensity → lower wage elasticity
- Digital dept. wage elasticity consistently < non-digital

Conclusion: ALL sectors are PROFIT-LED in the profit-rate dimension regardless of digital status.

↑ Capacity Utilization Dimension (Wage-Led channel)

- A 1% wage increase raises capacity utilization by 0.001%–0.092%
- Consumption-demand channel dominates in the u-dimension
- Non-digital sectors: higher sensitivity than digital
- Digital sectors.: stronger resilience to wage shocks

Key: The 6-dept structure amplifies the demand channel through inter-departmental linkages (indirect demand multiplier).

Digital vs. Non-Digital: Structural Comparison & Evolution

Wage Share (2000)

21.52%	11.55%
Non-Digital	Digital

Higher organic composition of capital in digital sector

Wage Share (2020)

18.68%	19.79%
Non-Digital	Digital

Gap narrowed as digital economy matured post-2010

Capacity Utilization Peak(2000)

1.16-1.30	1.15-1.28
Non-Digital	Digital

All sectors peaked during China's rapid post-WTO growth

Capacity Utilization Peak(2020)

1.05-1.09	1.17-1.25
Non-Digital	Digital

Digital sector recovered faster

Conclusion

1 Profit-Led Growth is Universal

All six departments exhibit profit-led characteristics in every sample year. A 1% wage increase reduces the profit rate by 0.69%–3.79%, with the demand–distribution effect overwhelmingly dominant.

2 Digital Economy: Profit-Led but More Resilient

Digital departments are also profit-led, but their wage elasticity coefficients are significantly lower (0.69%–2.01% vs 1.13%–3.79%). Three mechanisms: lower wage share, shorter depreciation cycles, structural demand shift.

3 Dual-Dimension Growth Pattern

Wage increases depress profit rates (profit-led) but simultaneously raise capacity utilization via consumption demand (wage-led). This hybrid pattern holds for all departments in all years.

4 Post-2010 Structural Shift

Relative profit rates and capacity utilization of digital departments surpassed non-digital departments after 2010, consistent with the deepening embedding of digital technology in China's production system.

Is Digital Economy Growth Profit-Led or Wage-Led?

Evidence from China's Structural Input-Output Tables

Jing You †

† Postdoctoral Researcher
Economics Department, School of Social and Sciences, Tsinghua University