PRODUCTIVITY GROWTH AND EFFICIENCY DYNAMICS OF KOREA'S STRUCTURAL TRANSFORMATION

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3. Growth Accounting Results for Korea's Structural Transformation
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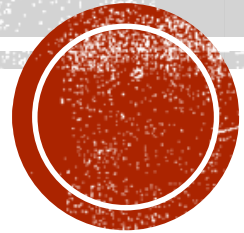
INTRODUCTION



MOTIVATION

- Emphasis on structural transformation for Modern Economic Growth:

1. Chenery (1960), Kuznets (1966, 1971), Syrquin (1988)
2. Rodrik (2013)

- Mechanisms of structural transformation

1. Industry or modern sector productivity growth: Kongsamut, Rebelo, and Xie (2001), Hansen and Prescott (2002), Ngai and Pissarides (2007), and Jeong and Kim (2015)
2. Non-homothetic preferences and agricultural productivity growth: Gollin, Parente, Rogerson (2002) and Alvarez-Cuadrado and Poschke (2011)
3. Synthetic models: Herendorf, Rogerson, and Valentinyi (2015), Cheremukhin, Golosov, Guriev and Tsyvinsky (2017), This paper

KEY FEATURES OF KOREA'S STRUCTURAL TRANSFORMATION

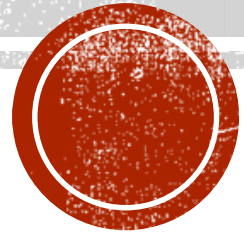
- Sample period: 1970~2016
- Featuring Korea's Structural Transformation

1. Real GDP per capita grew by 14 times at(from $2,609 in 1970 to $36,714 in 2016 in 2011 real value term) at 5.9% per year
2. Urban population share increased from 41% to 82%
3. Working population share (employment rate) increased from 31% to 53%
4. Agricultural employment share declined from 48% to 5%
5. Labor productivity grew at 4.7% per year

KEY QUESTIONS

- What were the main engines of such sustained rapid growth during Korea's structural transformation?
- Was the process of Korea's massive structural transformation efficient?

GROWTH ACCOUNTING FRAMEWORK FOR TWO-SECTOR GROWTH MODEL



TWO-SECTOR GROWTH MODEL (1)

- Technology

Sectoral production function: $\boldsymbol{Y_{it} = T_{it} K_{it}^{\alpha_i^K} (N_{it} h_{it} \nu_{it})^{\alpha_i^N} L_{it}^{\alpha_i^L}}$,

Sector index $i = a$ for agriculture, b for industry

Y_{it}: output, K_{it}: capital, N_{it}: number of workers (employment)

h_{it}: human capital per worker, ν_{it}: hours of work per worker,

L_{it}: land, T_{it}: total factor productivity (TFP),

α_i^K: capital share, α_i^N: labor share, and α_i^L: land share

$(\alpha_i^K + \alpha_i^N + \alpha_i^L = 1)$

TWO-SECTOR GROWTH MODEL (2)

- Preferences

- Lifetime utility: $U = \sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-1/\sigma}}{1-1/\sigma}$

- Composite consumption $c_t = \left[\eta_a^{\frac{1}{\epsilon}}\left(c_{a,t} - \zeta_a\right)^{\frac{\epsilon-1}{\epsilon}} + \eta_b^{\frac{1}{\epsilon}}\left(c_{b,t} + \zeta_b\right)^{\frac{\epsilon-1}{\epsilon}}\right]^{\frac{\epsilon}{\epsilon-1}}$

$c_{a,t}$: agricultural goods consumption per capita

: industry sector goods consumption per capita

β: time discount factor

σ: intertemporal elasticity of substitution of consumption,

ϵ: pseudo elasticity of substitution between agricultural and industrial goods

η_i: weight for the sector i goods consumption such that $\eta_a + \eta_b = 1$

$\zeta_a > 0, \zeta_b \geq 0$: non-homothetic income-elasticity parameters

TWO-SECTOR GROWTH MODEL (3)

- Inter-sectoral allocation of production factors

1. $K_t = K_{a,t} + K_{b,t}$
2. $N_t = N_{a,t} + N_{b,t}$
3. $L_t = L_{a,t} + L_{b,t}$

- Intertemporal allocation of capital goods

Law of motion: $K_{i,t+1} = I_{it} + (1 - \delta_i)K_{i,t}$

I_{it}: investment (exogenously or optimally determined)

δ_i: depreciation rate

GDP PER CAPITA DECOMPOSITION (1)

- GDP per capita decomposition

$$y_t \equiv \frac{Y_t}{\Xi_t} = \lambda_t y_t^N$$

Y_t : aggregate output (GDP), Ξ_t : total population,

$\lambda_t = \frac{N_t}{\Xi_t}$: aggregate employment rate,

$y_t^N = \frac{Y_t}{N_t}$: aggregate labor productivity (output per worker)

- Employment rate decomposition

$$\lambda_t = \varphi_{at}\lambda_{at} + \varphi_{bt}\lambda_{bt}$$

$\varphi_{it} = \frac{\Xi_{it}}{\Xi_t}$: population share of sector i

$\lambda_{it} = \frac{N_{it}}{\Xi_{it}}$: employment rate of sector i

GDP PER CAPITA DECOMPOSITION (2)

- Labor productivity decomposition

1. $y_t^N = s_{at}^N y_{at}^N + s_{bt}^N y_{bt}^N$

   $s_{it}^N = \frac{N_{it}}{N_t}$: employment share of sector i,

   $y_{it}^N = \frac{Y_{it}}{N_{it}}$: labor productivity of sector i

2. $y_{it}^N = T_{it} k_{it}^{\alpha_i^K} (h_{it} v_{it})^{\alpha_i^N} l_{it}^{\alpha_i^L}$

   $k_{it} = \frac{K_{it}}{N_{it}}$: capital per worker, $l_{it} = \frac{L_{it}}{N_{it}}$: land per worker of sector i.

GROWTH ACCOUNTING FORMULA

- Growth rate of GDP per capita decomposition

(1) $g_{y_t} = WS\_y^N + IND + WER + URB$

where the growth components are given as

(2) $WS\_y^N = \sum_{i=a,b}\left[s_{it}^Y\left(g_{T_{it}} + \alpha_i^K g_{k_{it}} + \alpha_i^N\left(g_{h_{it}} + g_{v_{it}}\right) + \alpha_i^L g_{l_{it}}\right)\right]$,

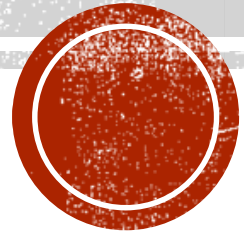
(3) $IND = \sum_{i=a,b} s_{it}^Y g_{s_{it}^N}$,

(4) $WER = \sum_{i=a,b} s_{it}^\lambda g_{\lambda_{it}}$,

(5) $URB = \sum_{i=a,b} s_{it}^\lambda g_{\varphi_{it}}$,

$s_{it}^Y = \frac{Y_{it}}{Y_t}$: sector i's output share, $s_{it}^\lambda = \varphi_{it}\lambda_{it}/\lambda_t$: sector i's employment rate share

GROWTH ACCOUNTING RESULTS FOR KOREA'S STRUCTURAL TRANSFORMATION



DATA (1)

- Output: *Economic Statistics System (ECOS)* of Bank of Korea
- Population: *Population Census* by Statistics Korea
- Employment and Hours of work per worker: *Economically Active Population Survey* by Statistics Korea
- Human capital per worker: *Population Census* for demographic composition of age, education level, and community type from Statistics Korea, Penn World Table 9.0
- Capital stock: *Economic Statistics System (ECOS)* of Bank of Korea
- Land: *Cadastral Statistics Annual Report* issued by Ministry of Land, Infrastructure and Transport

DATA (2)

- Agricultural factor shares: *Agricultural Household Survey*, Hwang (2015, 2017), *Business Management Analysis* of Bank of Korea
- Industrial factor shares: *National Income Account* and *Business Management Analysis* from Bank of Korea
- Sectoral and aggregate TFP: Growth accounting

$$T_t = \frac{Y_t}{Q_t}$$

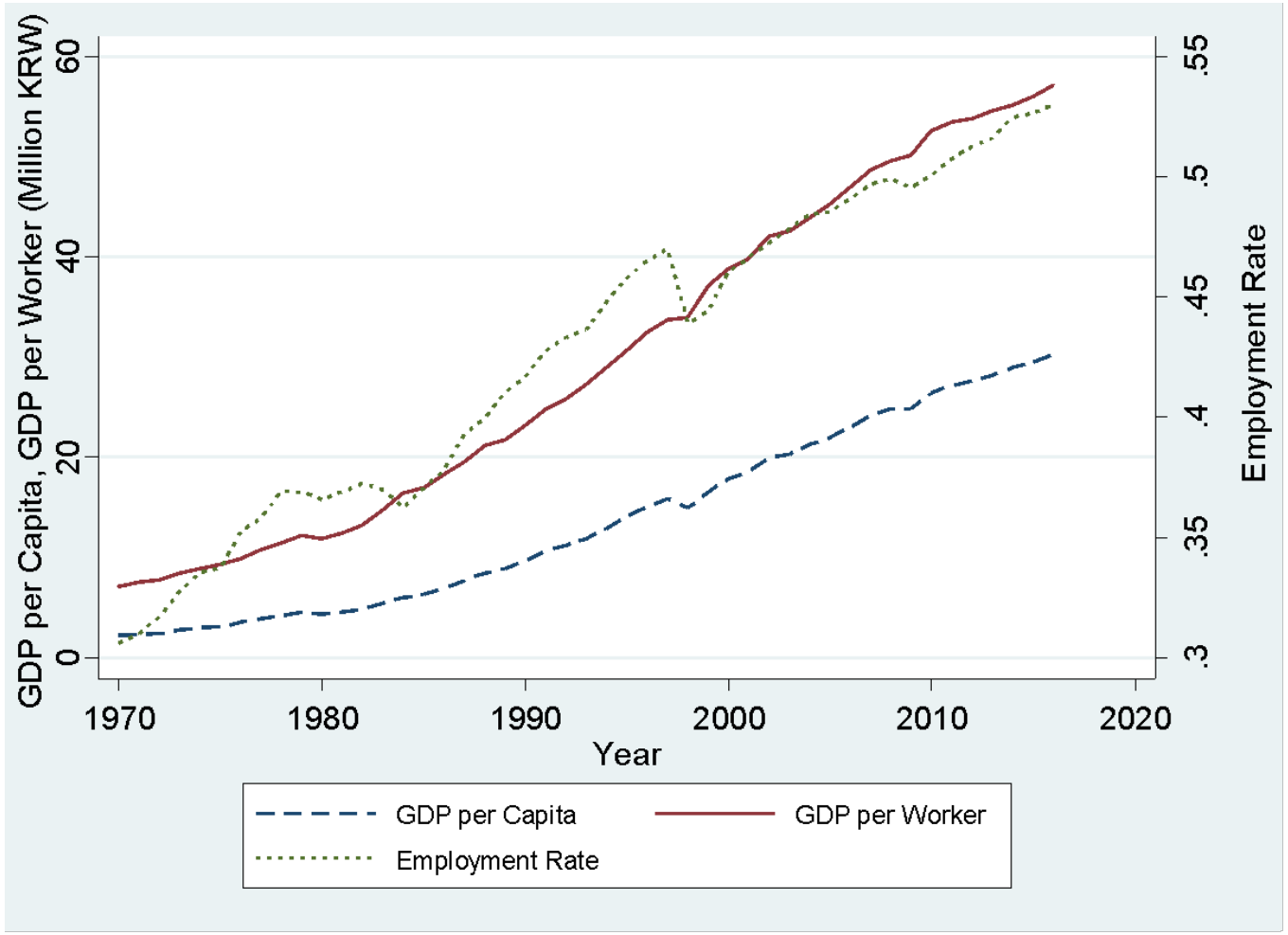
$$T_{it} = \frac{Y_{it}}{Q_{it}}, \ for\ i = a, b,$$

where the aggregate and sectoral composite inputs Q_t and Q_{it} are defined as

$$Q_t = K_t^{\alpha^K} (N_t h_t v_t)^{\alpha^N} L_t^{\alpha^L},$$

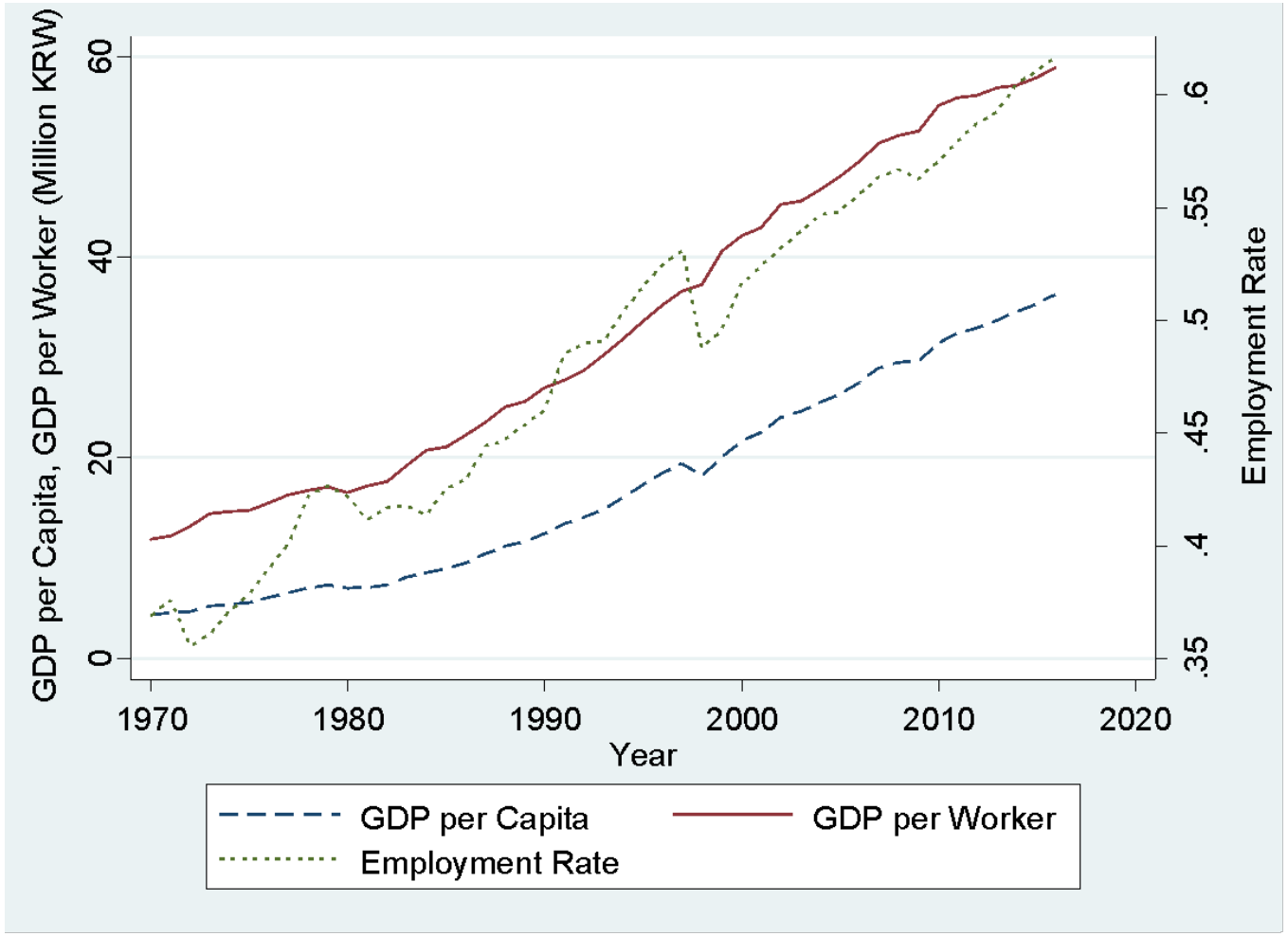
$$Q_{it} = K_{it}^{\alpha_i^K} (N_{it} h_{it} v_{it})^{\alpha_i^N} L_{it}^{\alpha_i^L}.$$

AGGREGATE GROWTH



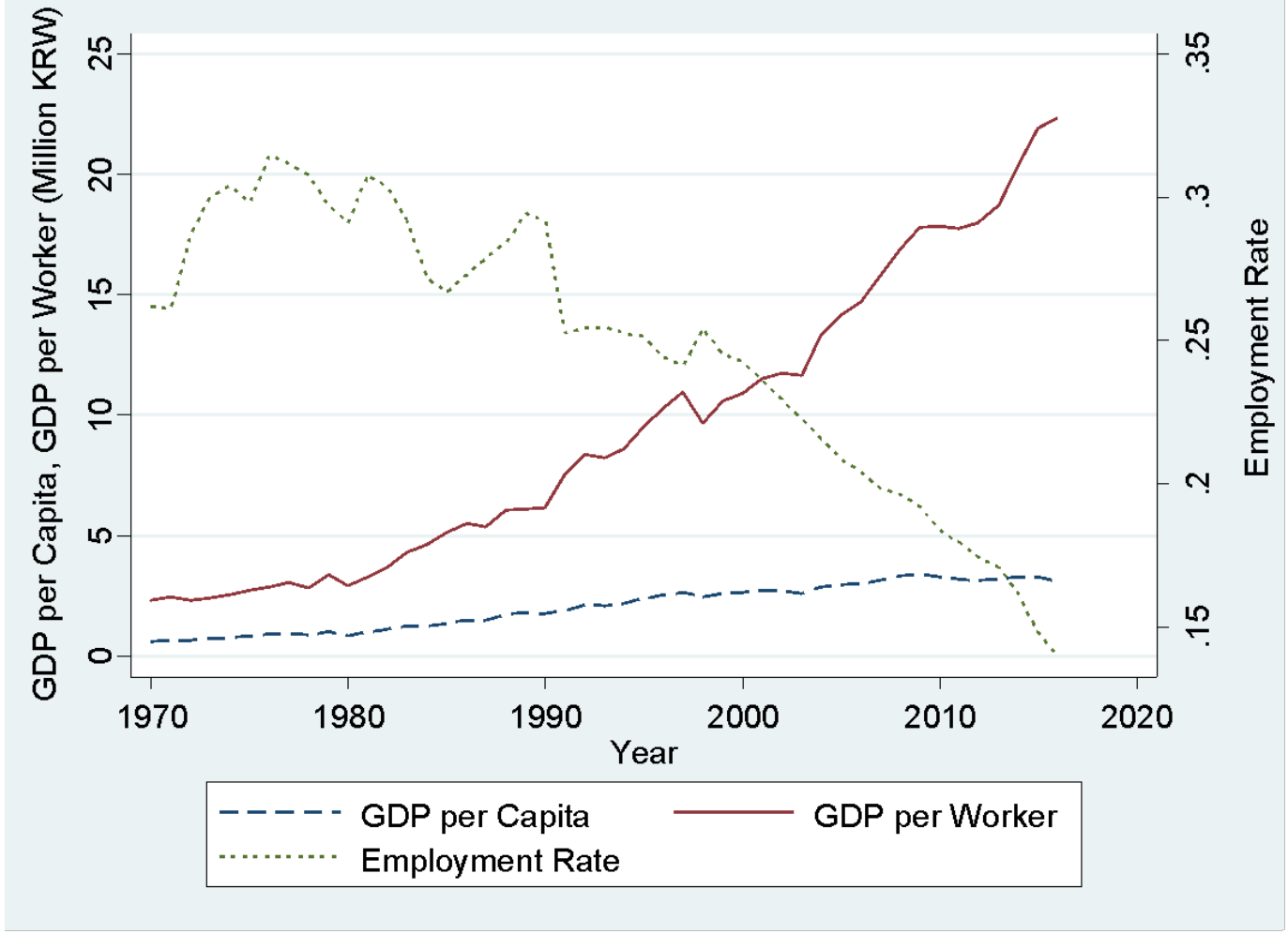
- GDP per capita: 5.9%
- Employment rate: 1.2%
- Labor productivity: 4.7%

INDUSTRY SECTOR GROWTH



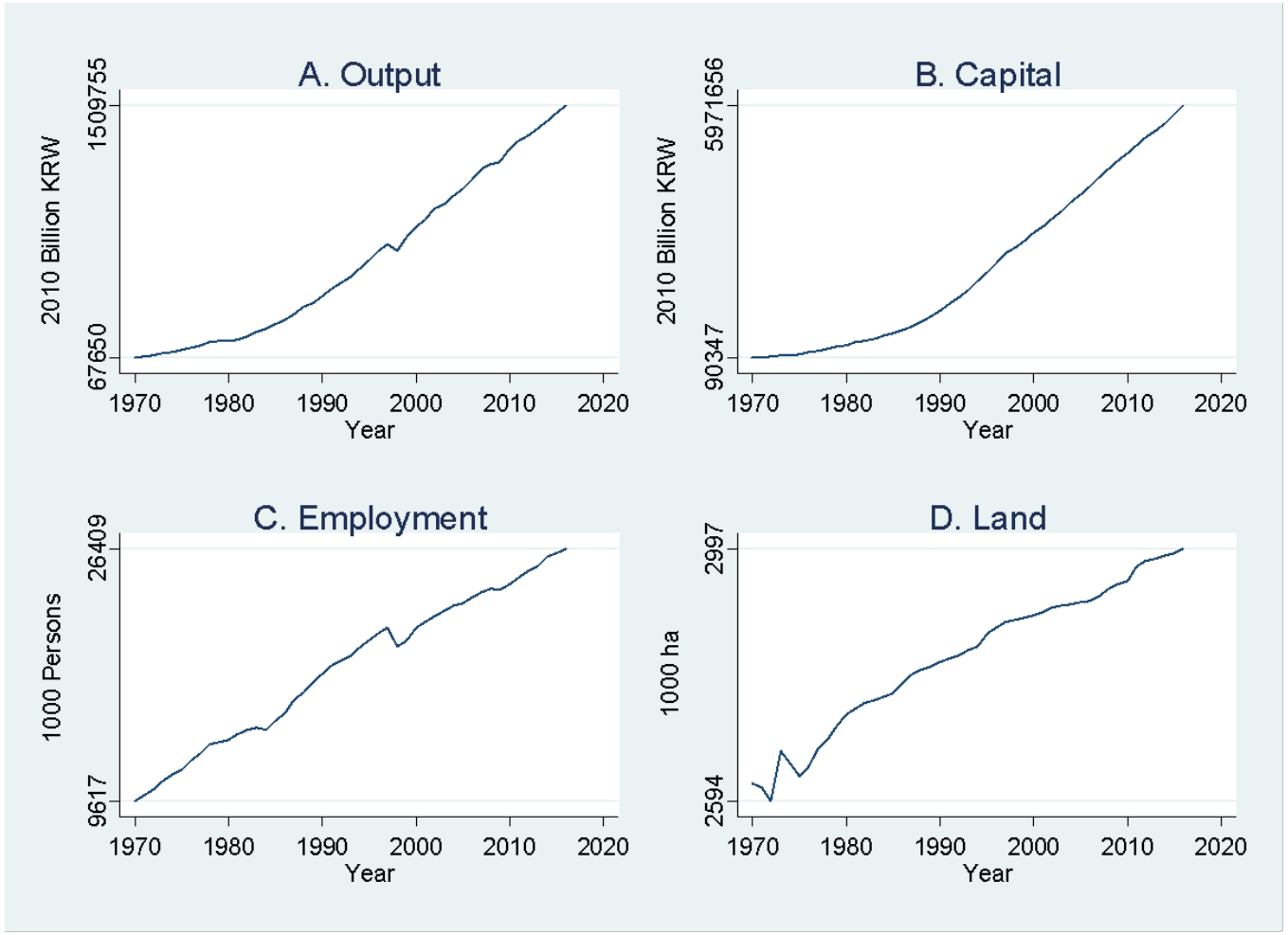
- GDP per capita: 4.7%
- Employment rate: 1.1%
- Labor productivity: 3.6%

AGRICULTURE SECTOR GROWTH

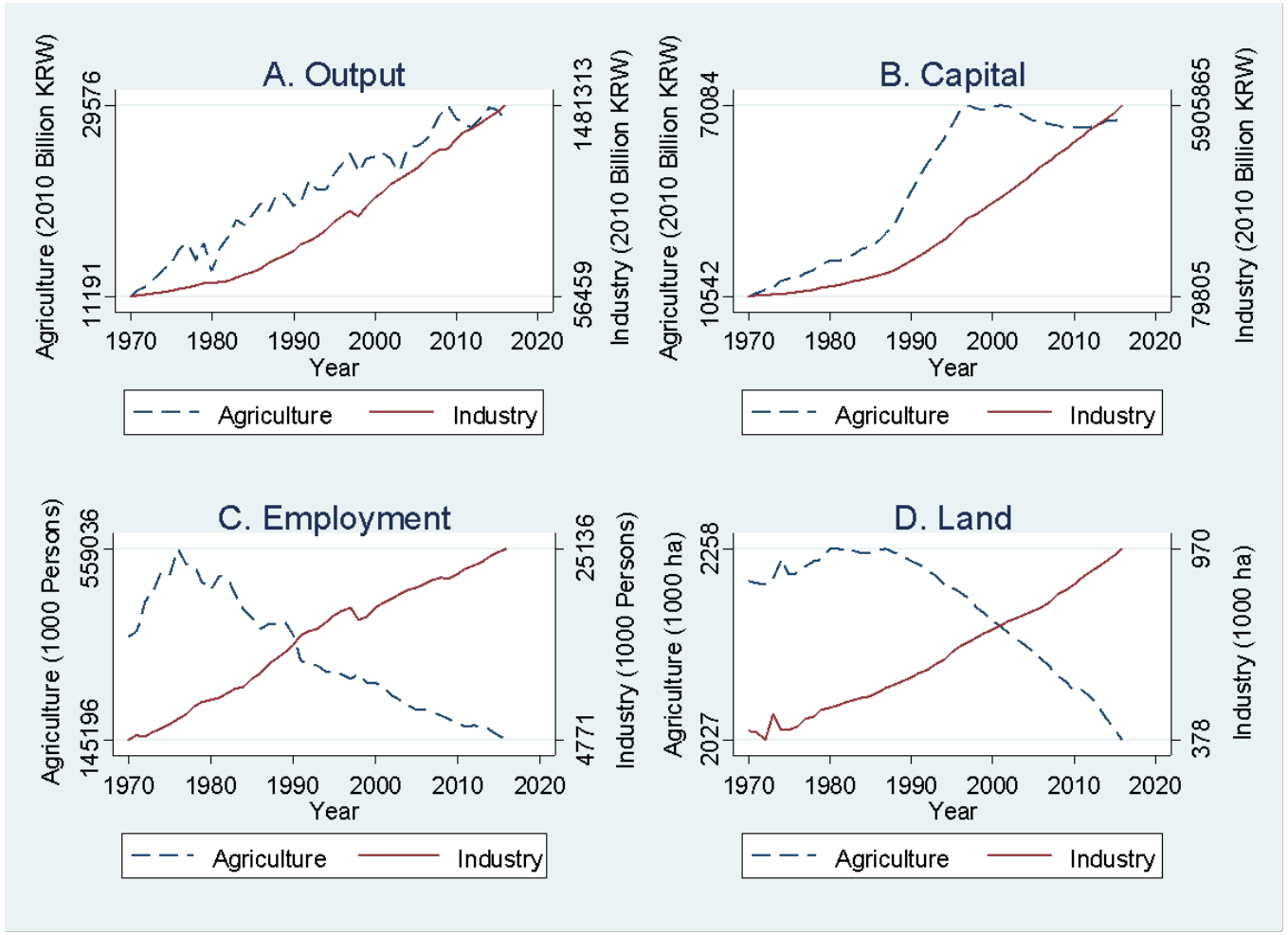


- GDP per capita: 3.6%
- Employment rate: -1.4%
- Labor productivity: 5.1% (higher than the industry sector labor productivity growth rate)

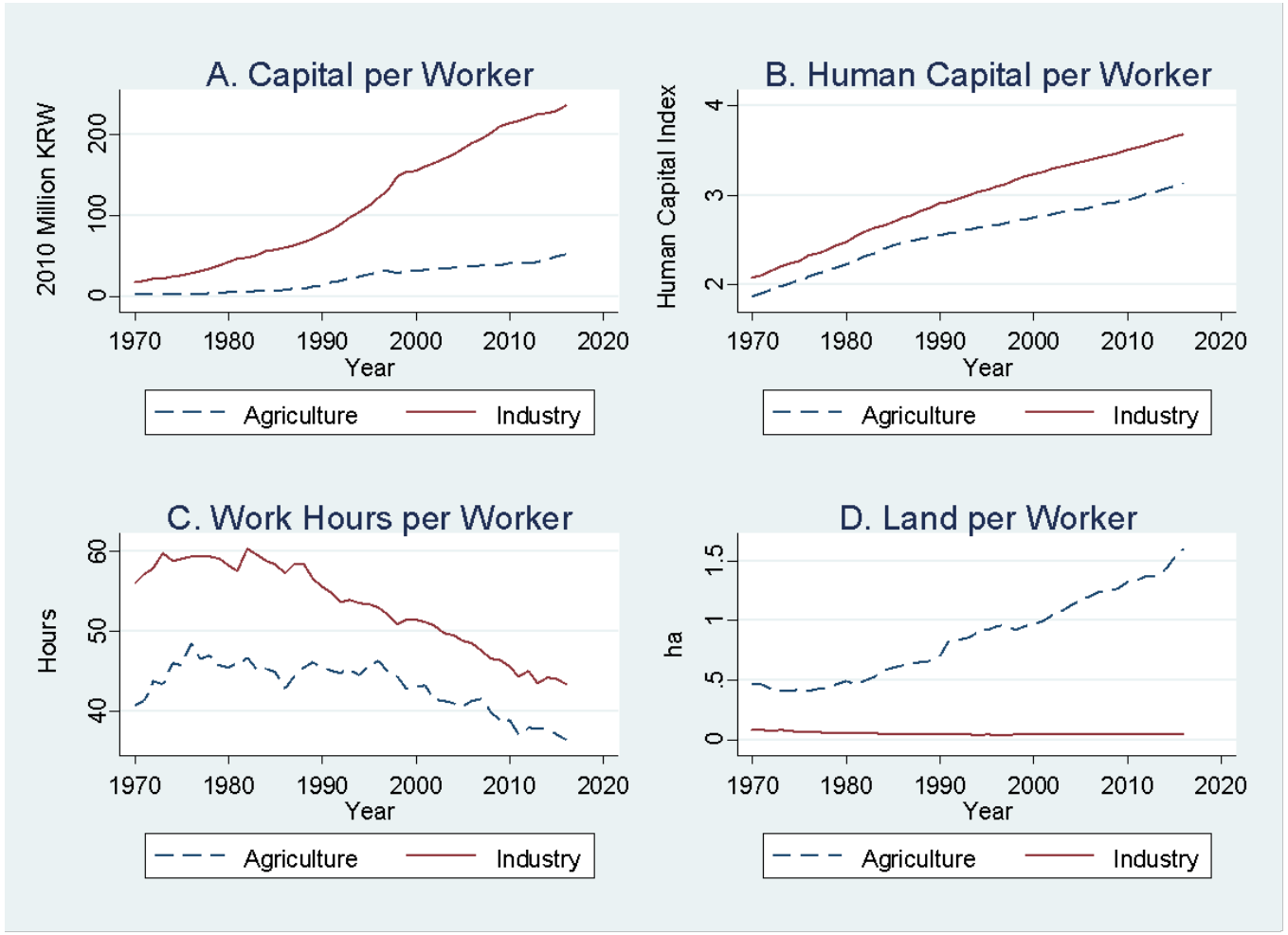
AGGREGATE INPUT GROWTH



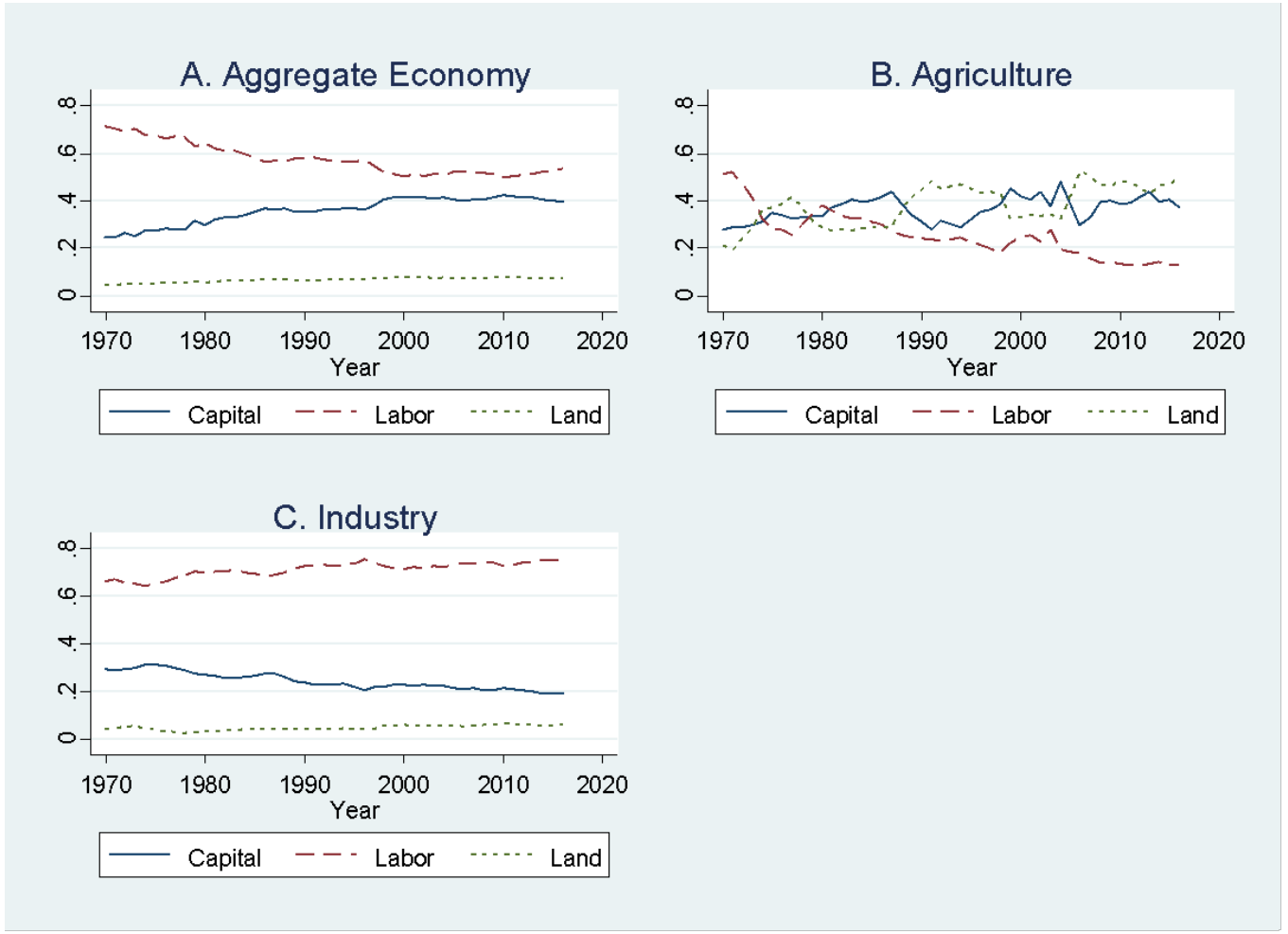
SECTORAL INPUT GROWTH



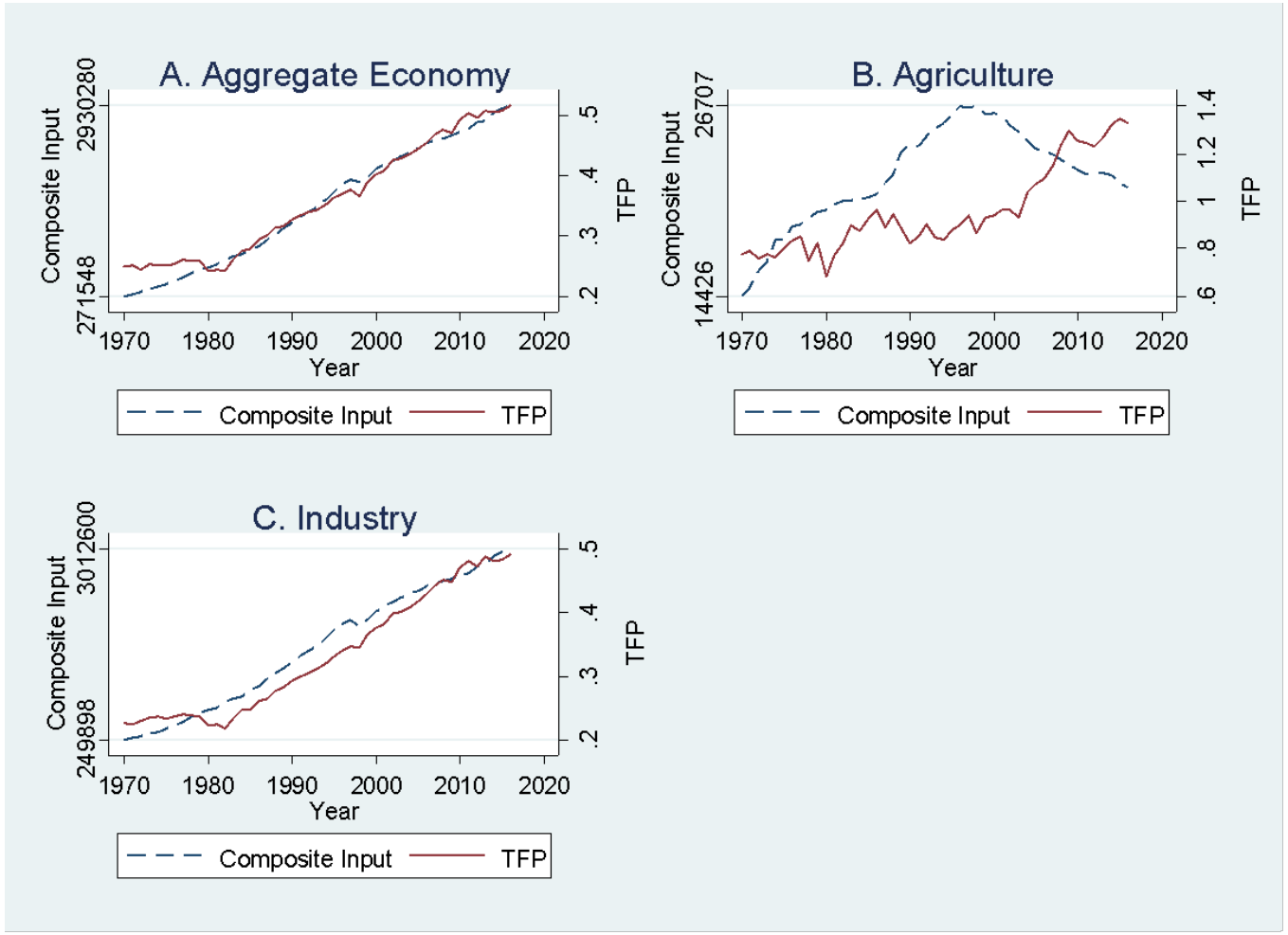
SECTORAL PER WORKER INPUT GROWTH



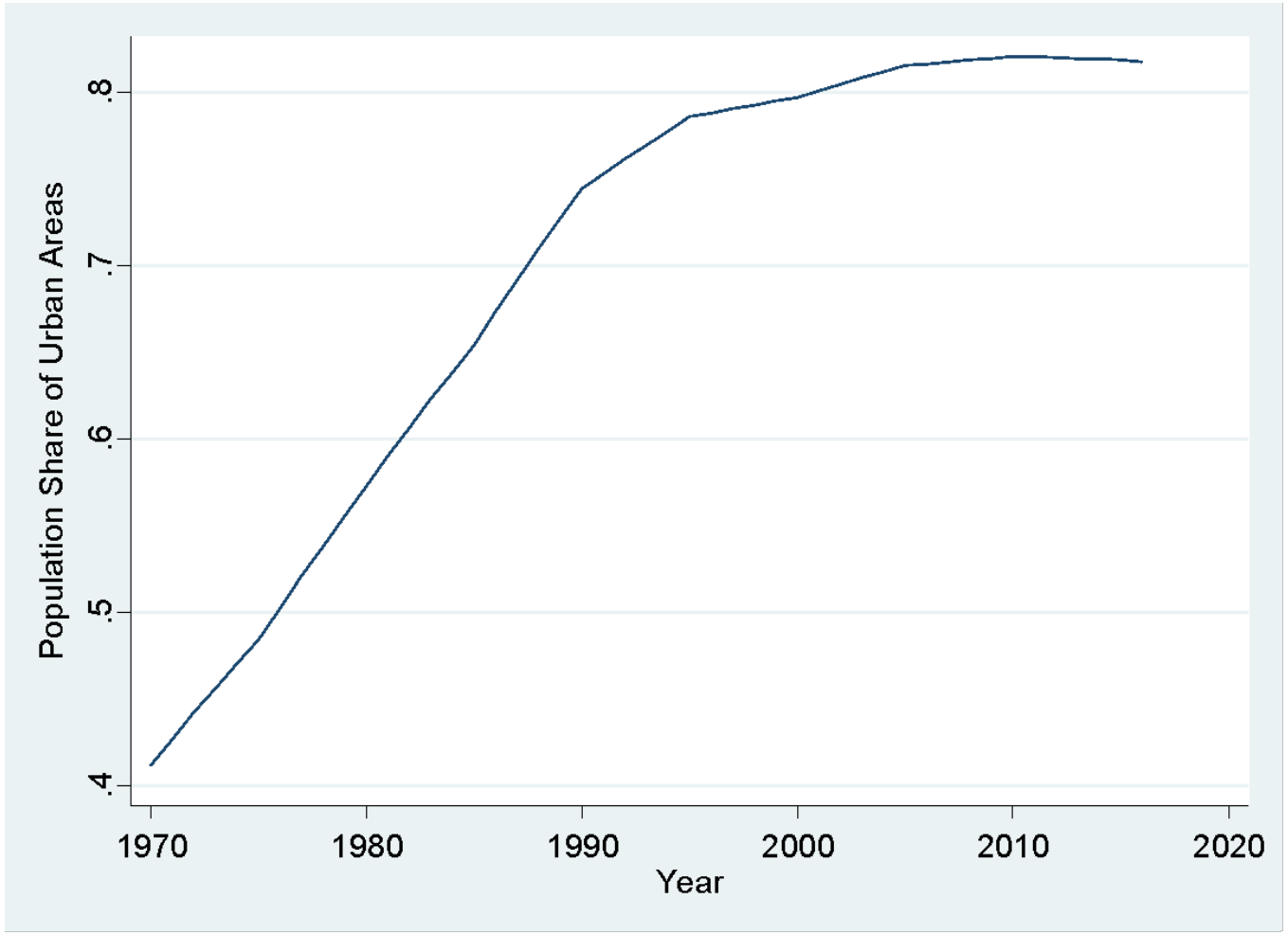
FACTOR SHARES



TFP GROWTH

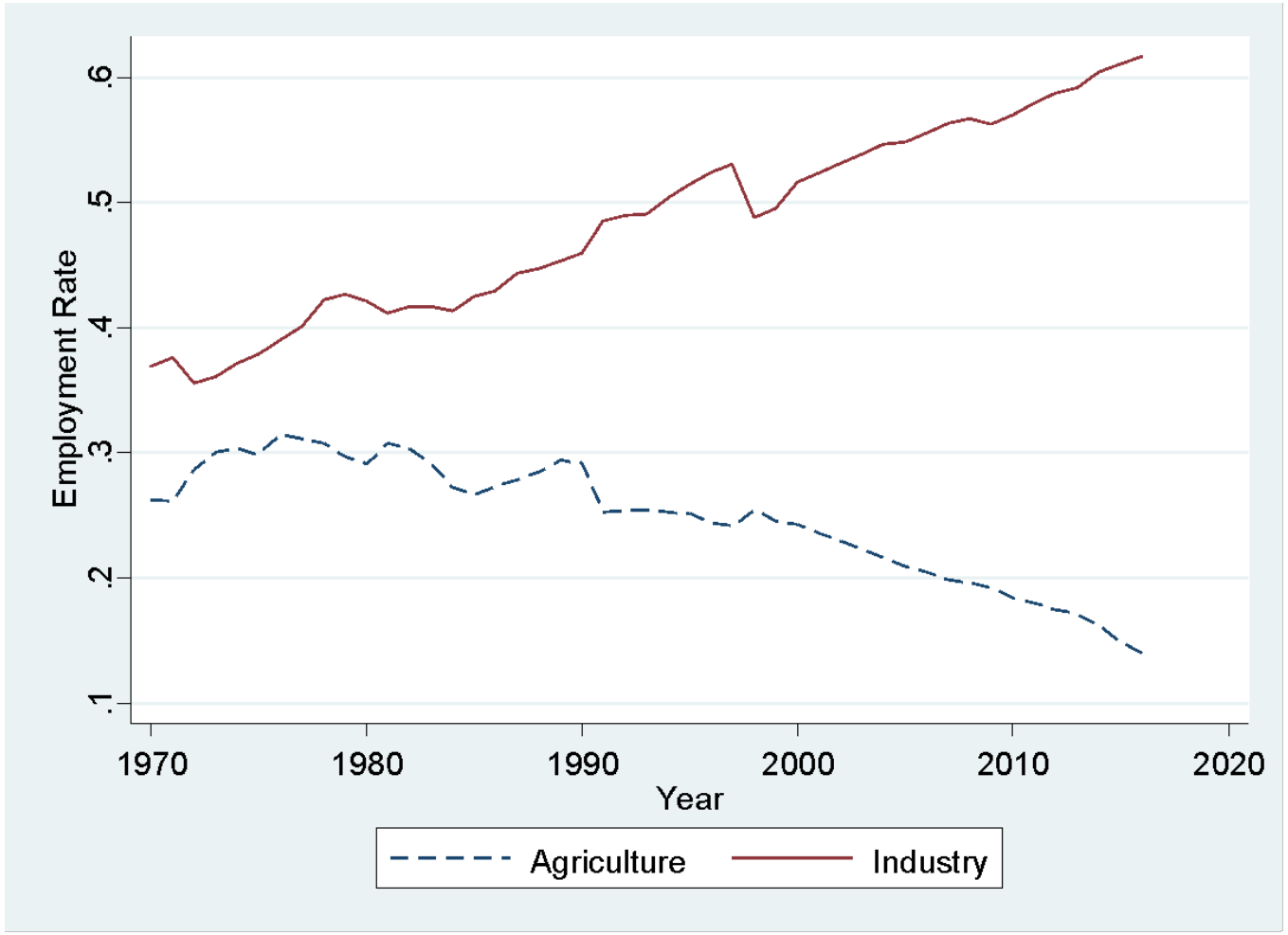

A. Aggregate Economy
Composite Input
271548
2930280
TFP
.2
.3
.4
.5
1970
1980
1990
2000
2010
2020
Year
Composite Input
TFP
B. Agriculture
Composite Input
14426
26707
TFP
.6
.8
1
1.2
1.4
1970
1980
1990
2000
2010
2020
Year
Composite Input
TFP
C. Industry
Composite Input
249898
3012600
TFP
.2
.3
.4
.5
1970
1980
1990
2000
2010
2020
Year
Composite Input
TFP

URBANIZATION

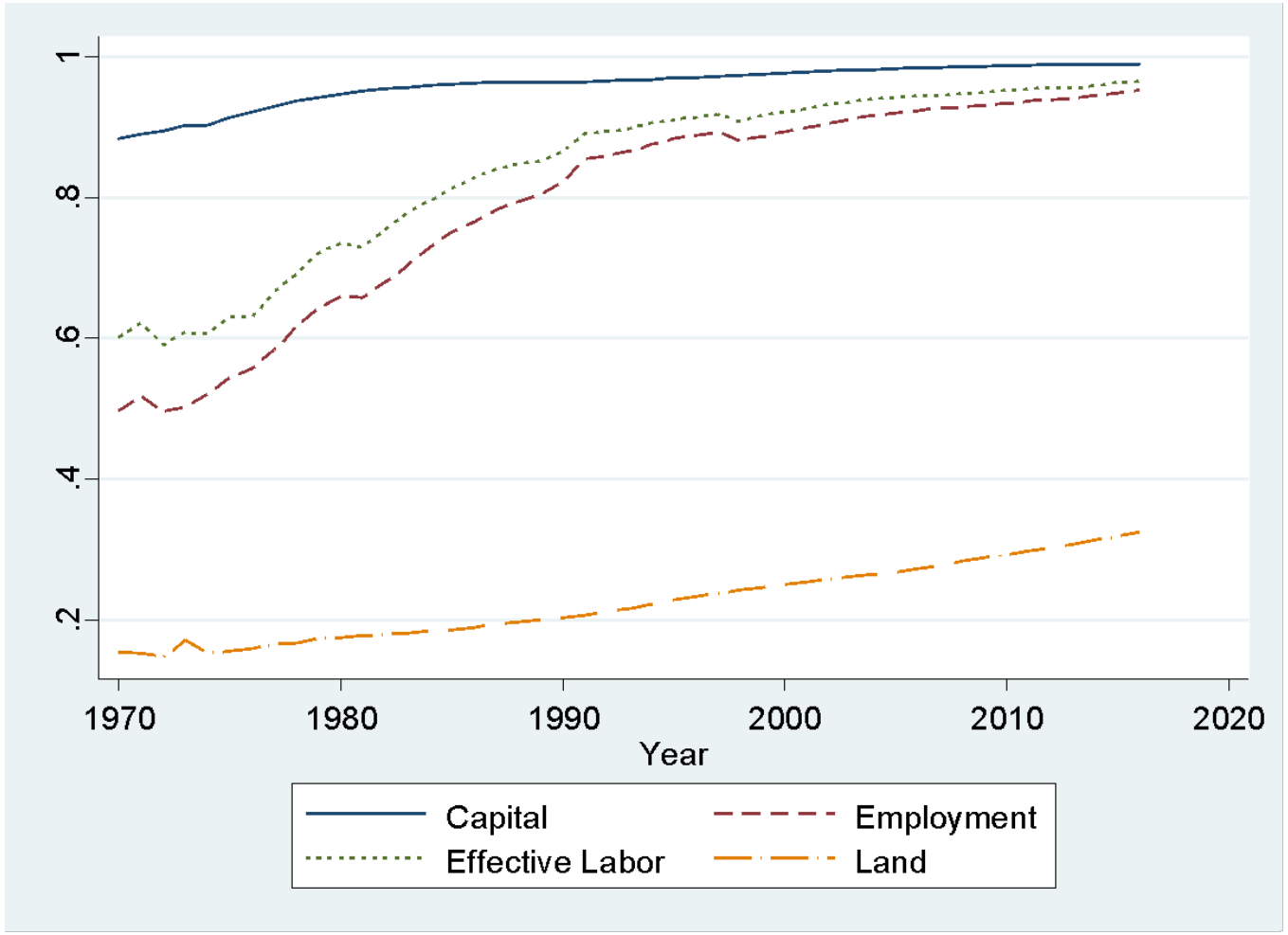


Korea's Structural Transformation, Hyeok Jeong

WITHIN-SECTOR EMPLOYMENT RATES



INDUSTRIALIZATION



Korea's Structural Transformation, Hyeok Jeong

OUTPUT GROWTH BY PERIOD

Period	y	y_a	y_b	y^N	y_a^N	y_b^N
’70~’16	5.92	3.63	4.71	4.66	5.06	3.55
’70~’80	7.31	3.45	4.80	5.41	2.37	3.41
’80~’90	8.29	7.75	5.89	6.89	7.72	4.98
’90~’00	6.32	3.96	5.79	5.27	5.89	4.58
’00~’10	3.98	2.19	3.76	3.11	5.06	2.73
’10~’16	2.34	-0.81	2.46	1.38	3.82	1.12

INPUTS GROWTH

Period	λ_a	λ_b	φ_b	s_b^N	T_a	k_a	h_a	ν_a	l_a	T_b	k_b	h_b	ν_b	l_b
’70~’16	-1.35	1.12	1.50	1.43	1.18	7.13	1.12	-0.24	2.75	1.70	5.91	1.25	-0.56	-1.69
’70~’80	1.06	1.34	3.36	2.89	-1.30	7.74	1.74	1.10	0.57	-0.18	9.59	1.78	0.40	-4.62
’80~’90	0.02	0.87	2.66	2.21	1.89	11.20	1.38	-0.02	3.63	2.79	6.22	1.61	-0.48	-3.09
’90~’00	-1.83	1.16	0.69	0.84	1.37	8.82	0.75	-0.52	3.29	2.57	7.28	1.09	-0.75	-0.11
’00~’10	-2.73	1.00	0.29	0.45	2.92	2.62	0.70	-1.02	3.22	2.25	3.32	0.77	-1.22	0.06
’10~’16	-4.46	1.32	-0.06	0.31	1.00	4.38	0.99	-1.06	3.23	0.73	1.57	0.85	-0.83	0.11

DECOMPOSITION BY COUNTERFACTUALS

- Issues of the two-sector growth model decomposition for long-term period

1. Target to decompose is the weighted sum of nonlinear functions.
2. The weight variables change over time due to the ST, generating approximation errors, which becomes larger as the sample period is longer.

- Counterfactual decomposition method

- Counterfactual income path due to industrial TFP growth:

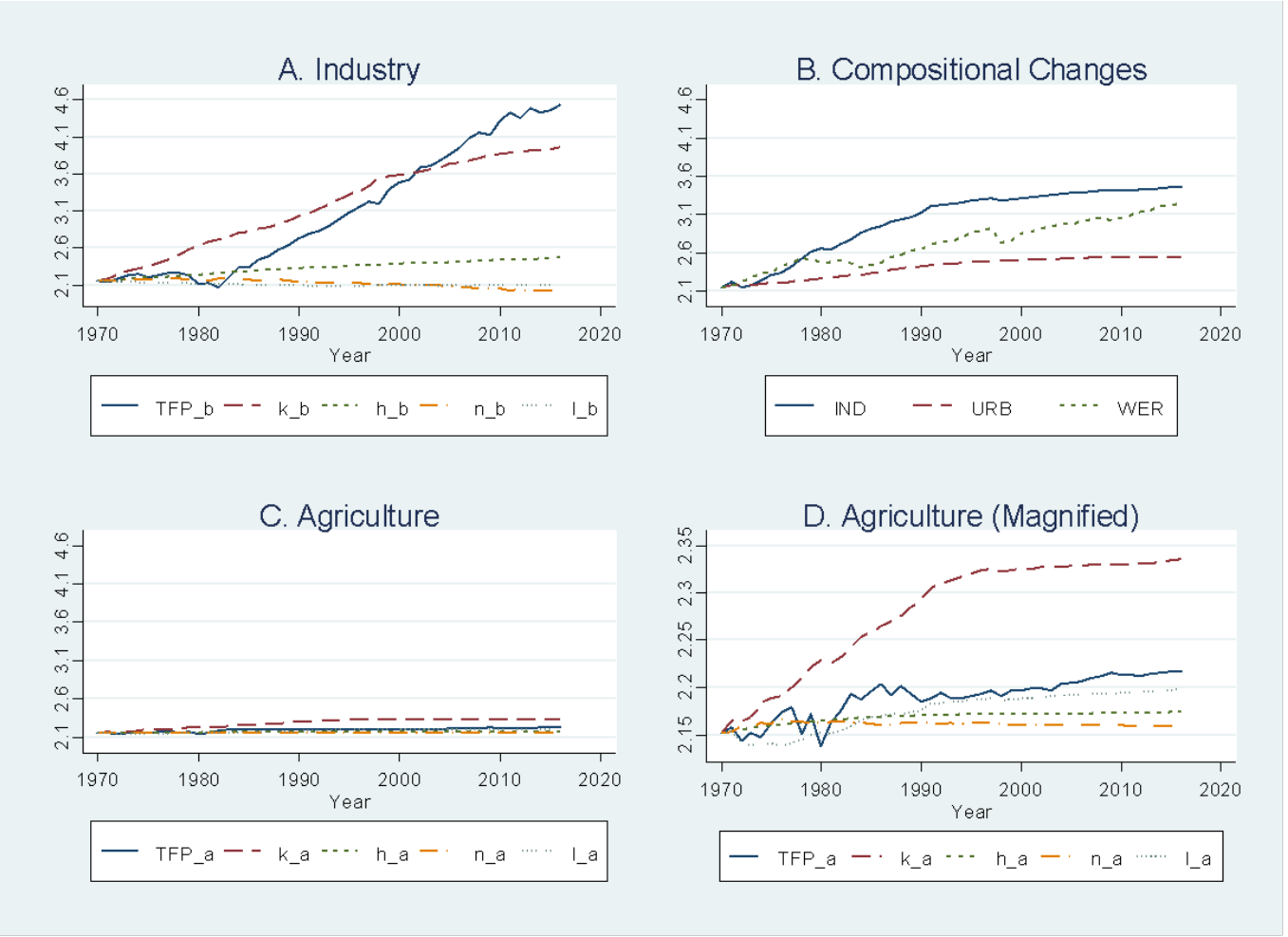
$$y_{1970+s}^{CF\_T_b} = \prod_{j=1}^{s}\left(1+\bar{s}_{b,1970+j}^{Y} g_{T_{b,1970+j}}\right) y_{1970}, \text{ for } s = 1,\cdots,46,$$

- Counterfactual income path due to industrialization:

$$y_{1970+s}^{CF\_IND} = \prod_{j=1}^{s}\left(1+\sum_{i=a,b}\bar{s}_{i,1970+j}^{Y} g_{s_{i,1970+j}^{N}}\right) y_{1970}, \text{ for } s = 1,\cdots,46,$$

where $\bar{s}_{b,1970+j}^{Y} = \frac{1}{2}\left(s_{i,1970+j}^{Y} + s_{i,1970+j-1}^{Y}\right)$.

COUNTERFACTUAL GROWTH PATHS



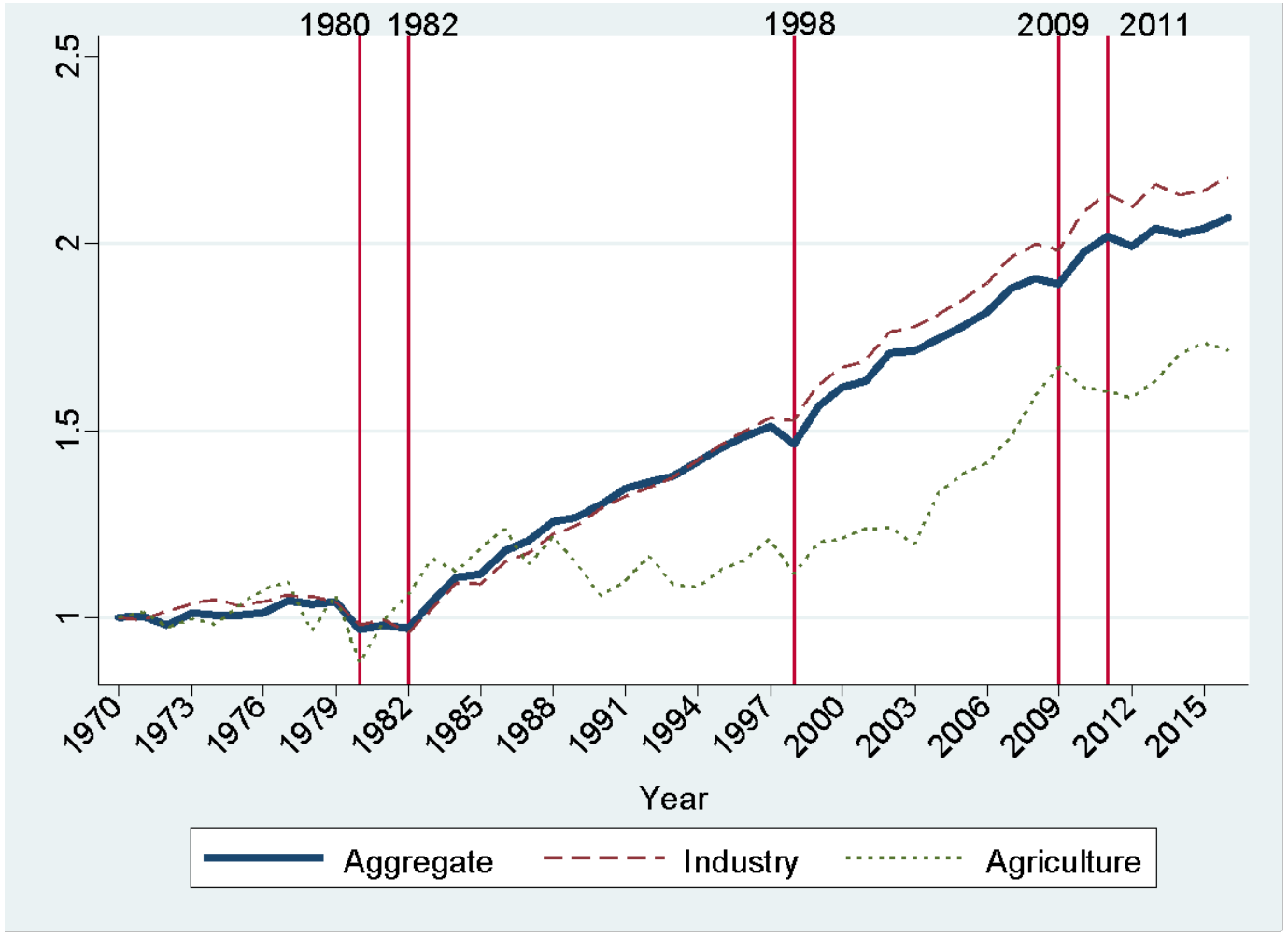
DECOMPOSITION RESULTS

Period	URB	WER	IND	T_a	k_a	h_a	ν_a	l_a	T_b	k_b	h_b	ν_b	l_b
'70~'16	**0.35**	**0.89**	**1.04**	**0.06**	**0.18**	**0.02**	**0.01**	**0.05**	**1.63**	**1.33**	**0.30**	**-0.14**	**-0.07**
'70~'80	0.49	1.40	**2.12**	-0.07	0.35	0.06	0.05	0.00	-0.19	2.03	0.40	0.08	-0.17
'80~'90	0.71	0.68	1.61	0.22	0.29	0.03	0.00	0.10	**2.60**	1.40	0.38	-0.11	-0.13
'90~'00	0.29	0.75	0.62	0.06	0.14	0.01	0.00	0.06	**2.48**	1.70	0.27	-0.18	0.00
'00~'10	0.16	0.69	0.32	0.07	0.02	0.00	-0.01	0.03	**2.20**	0.78	0.19	-0.30	0.00
'10~'16	-0.04	**0.99**	0.20	0.02	0.03	0.01	-0.01	0.03	0.72	0.37	0.21	-0.20	0.00

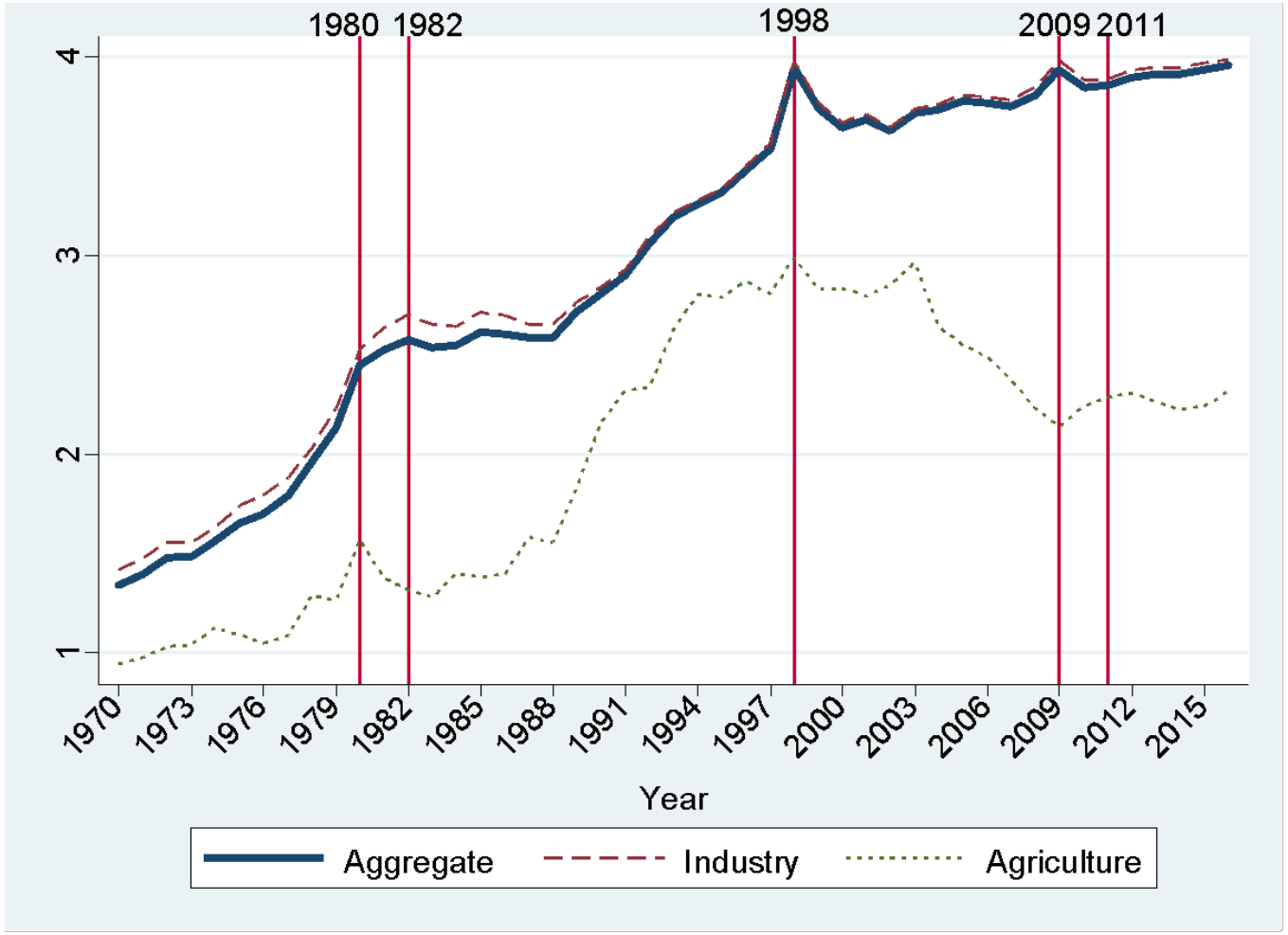
DECOMPOSITION BY BROAD CATEGORIES

Period	’70~’16	’70~’80	’80~’90	’90~’00	’00~’10	’10~’16
GDP per Capita	5.92	7.31	8.29	6.32	3.98	2.34
Compositional Changes	1.39	2.61	2.31	0.91	0.48	0.16
Within-sector Employment Rate	0.89	1.40	0.68	0.75	0.69	0.99
Within-sector TFP	**1.69**	-0.26	2.82	2.53	2.27	0.74
Within-sector Inputs per Worker	**1.68**	2.79	1.95	1.98	0.73	0.44

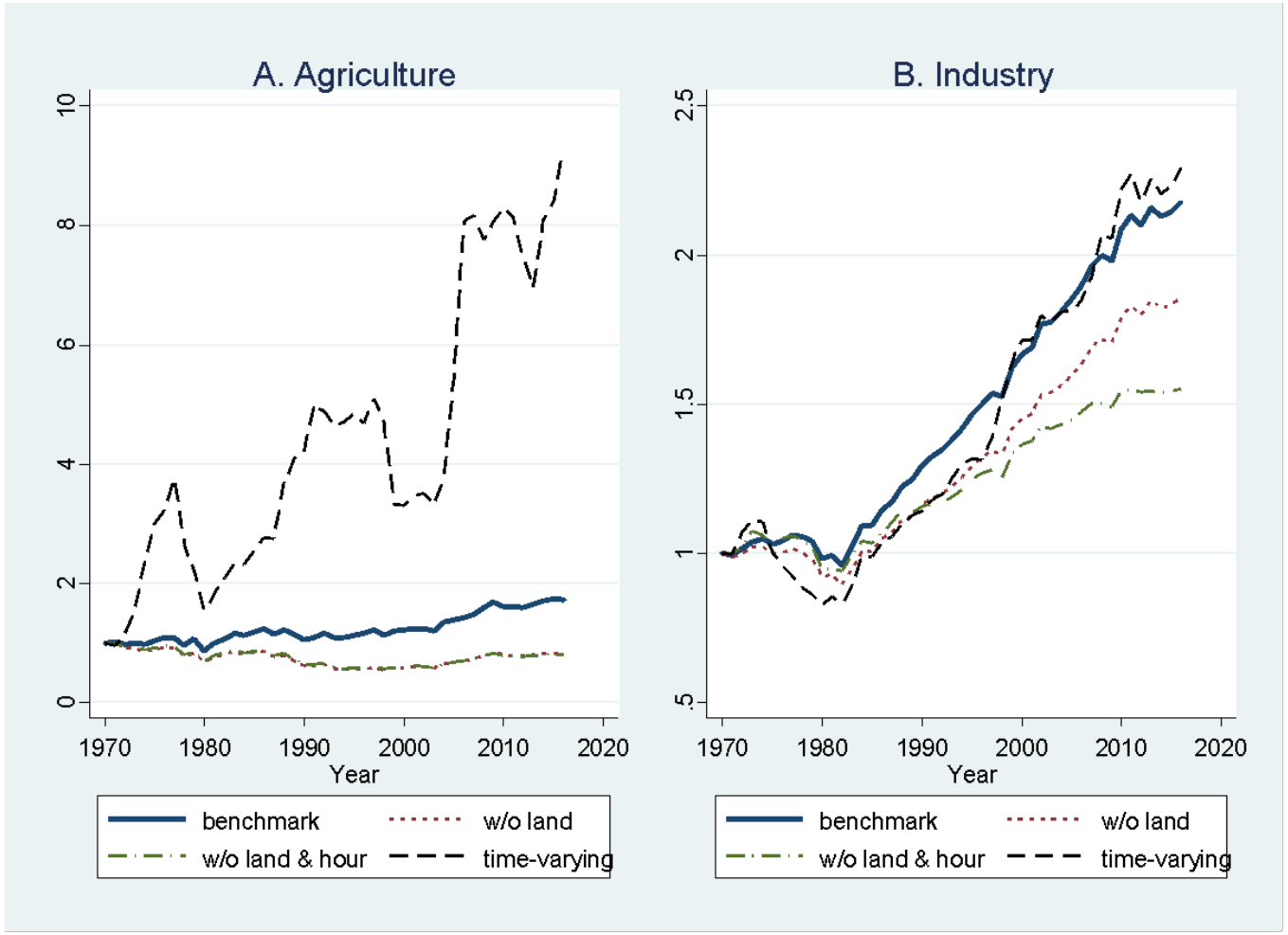
TURNING POINTS OF TFP



CAPITAL/OUTPUT RATIO



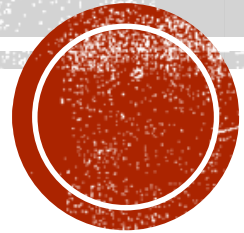
SENSITIVITY ANALYSIS FOR TFP ESTIMATES



TFP CONTRIBUTIONS ACROSS SPECIFICATIONS

Period	Agriculture				Industry			
	benchmark	w/o land	w/o land & hours	time-vayring FS	benchmark	w/o land	w/o land & hours	time-vayring FS
’70~’16	0.06	-0.07	-0.06	0.52	1.63	1.31	0.91	1.77
’70~’80	-0.07	-0.41	-0.36	1.35	-0.19	-0.74	-0.51	-1.68
’80~’90	0.22	0.04	0.04	0.80	2.6	2.20	1.86	3.03
’90~’00	0.06	-0.03	-0.03	-0.04	2.48	2.16	1.63	4.02
’00~’10	0.07	0.08	0.07	0.27	2.2	2.05	1.18	2.55
’10~’16	0.02	0.01	0.01	0.04	0.72	0.65	0.07	0.52

FRAMEWORK OF WEDGE ANALYSIS



MEASURES OF WEDGES

- Inter-sectoral factor allocation

  (6) Employment wedge: $\tau_t^N = \frac{F_{b,t}^N}{F_{a,t}^N}\frac{u_{b,t}}{u_{a,t}}$

  (7) Capital wedge: $\tau_t^K = \frac{F_{b,t}^K}{F_{a,t}^K}\frac{u_{b,t}}{u_{a,t}}$

  (8) Land wedge: $\tau_t^L = \frac{F_{b,t}^L}{F_{a,t}^L}\frac{u_{b,t}}{u_{a,t}}$

- Intertemporal consumption allocation

  (9) Investment wedge: $\tau_t^I = \beta\frac{u_{b,t+1}}{u_{b,t}}\left(1 + F_{b,t+1}^K - \delta\right)$

INTERPRETATION OF WEDGES

- At optimal allocation, all wedges are equal to unity.
- The degree and changing directions deviated from unity measure the size and changing direction of allocation efficiency

1. Employment wedge $\tau_t^N > 1 \Rightarrow$ Excessive allocation of labor employment in agriculture relative to industry
2. Capital wedge $\tau_t^K > 1 \Rightarrow$ Excessive allocation of capital in agriculture relative to industry
3. Land wedge $\tau_t^L > 1 \Rightarrow$ Excessive allocation of land in agriculture relative to industry
4. Investment wedge $\tau_t^I > 1 \Rightarrow$ Under-investment

DECOMPOSITION OF EMPLOYMENT WEDGE

(10) $\tau_t^N = W\_MP_t^N * WG_t * W\_MRS_t,$

where the component terms are defined as

(11) $W\_MP_t^N = \frac{F_{b,t}^N / F_{a,t}^N}{\left(\frac{w_{b,t}}{p_{b,t}}\right) / \left(\frac{w_{a,t}}{p_{a,t}}\right)}$: Marginal products of labor wedge

(12) $WG_t = \frac{w_{b,t}}{w_{a,t}}$: Wage gap

(13) $W\_MRS_t = \frac{u_{b,t}/u_{a,t}}{p_{b,t}/p_{a,t}}$: Marginal rate of substitution wedge

$w_{i,t}$ and $p_{i,t}$ denote the wage and the goods price of sector i

DECOMPOSITION OF CAPITAL WEDGE

(14) $\tau_t^K = W\_MP_t^K * RRG_t^K * W\_MRS_t,$

where the component terms are defined as

(15) $W\_MP_t^K = \frac{F_{b,t}^K / F_{a,t}^K}{\left(\frac{r_{b,t}^K}{p_{b,t}}\right) / \left(\frac{r_{a,t}^K}{p_{a,t}}\right)}$: Marginal products of capital wedge

(16) $RRG_t^K = \frac{r_{b,t}^K}{r_{a,t}^K}$: Rental rate gap of capital

$r_{i,t}^K$ denotes the rental rate of capital of sector i

DECOMPOSITION OF LAND WEDGE

(17) $\tau_t^L = W\_MP_t^L * RRG_t^L * W\_MRS_t,$

where the component terms are defined as

(18) $W\_MP_t^L = \frac{F_{b,t}^L / F_{a,t}^L}{\left(\frac{r_{b,t}^L}{p_{b,t}}\right) / \left(\frac{r_{a,t}^L}{p_{a,t}}\right)}$: Marginal products of land wedge

(19) $RRG_t^L = \frac{r_{b,t}^L}{r_{a,t}^L}$: Rental rate gap of land

$r_{i,t}^L$ denotes the rental rate of land of sector i

DECOMPOSITION OF INVESTMENT WEDGE

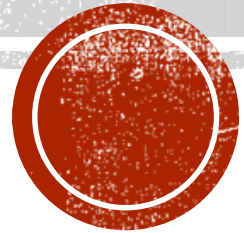
(20) $\tau_t^I = W\_IMRS_t * W\_RI_t,$

where the component terms are defined as

(21) $W\_IMRS_t = \frac{\beta u_{b,t+1}/u_{b,t}}{p_{b,t+1}/p_{b,t}}$: Intertemporal marginal rate of substitution wedge

(22) $W\_RI_t = \left(1 + F_{b,t+1}^K - \delta\right)\frac{p_{b,t+1}}{p_{b,t}}$: Returns to investment wedge

EFFICIENCY DYNAMICS OF KOREA'S STRUCTURAL TRANSFORMATION



CALIBRATION OF PARAMETERS

- Cheremukhin, Golosov, Guriev, and Tsyvinsky (2017) is a special case of our model by setting $\alpha_a^L = \alpha_b^L = 0$ (i.e. production functions without land), dropping the human capital and work hours in measuring effective unit of labor. We do allow these factors.
- Calibration of Cheremukhin, Golosov, Guriev, and Tsyvinsky (2017):

  - time discount factor $\beta = 0.96$

  - inter-sectoral elasticity of substitution $\epsilon = 1$

  - relative weight $\eta_a = 0.15$ (long-run food expenditure share)

  - Industry sector non-homothetic demand parameter $\zeta_b = 0$

  - perfect substitutability between intertemporal consumptions $\sigma = \infty$

  - depreciation rate $\delta = 0.06$
- Subsistence food consumption level $\zeta_a = 0.6 * 0.4 = 0.24$

  - Poverty line \$2 per day $\Rightarrow$ Annual consumption in KRW by PPP exchange rate = 0.6 million

  - Korea's average food expenditure share in 1970s = 40%

DATA

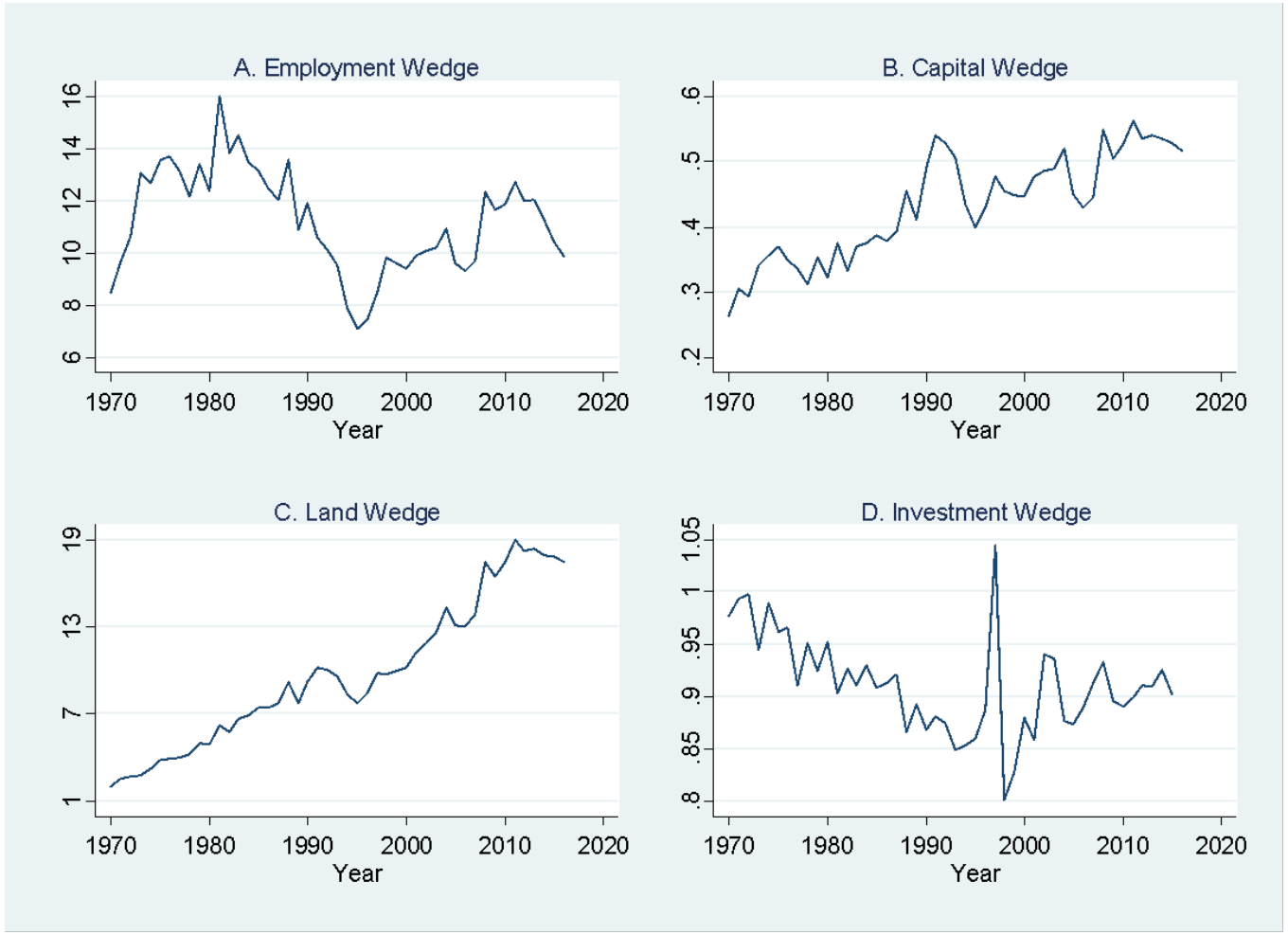
- Sectoral consumption

$$C_{i,t} = Y_{i,t} - I_{i,t} - G_{i,t} - \left(EX_{i,t} - IM_{i,t}\right) \; for \; i = a, b$$

- Expenditure-side income accounting data

1. $\left(Y_{a,t}, Y_{b,t}, I_{a,t}, I_{b,t}\right)$: National income accounting data from Bank of Korea
2. G_t: Bank of Korea Statistics
3. $G_{a,t}$: *Key Statistics of Agriculture, Forestry, Livestock and Food, Fifty Years of History of Korean Agriculture*
4. EX_t and IM_t: Bank of Korea Statistics
5. $EX_{a,t}$ and $IM_{a,t}$: *Agriculture, Forestry and Fisheries Export and Import Trends and Statistics 2017, Year Book of Agriculture and Forestry Statistics 1975*

MEASURED WEDGES

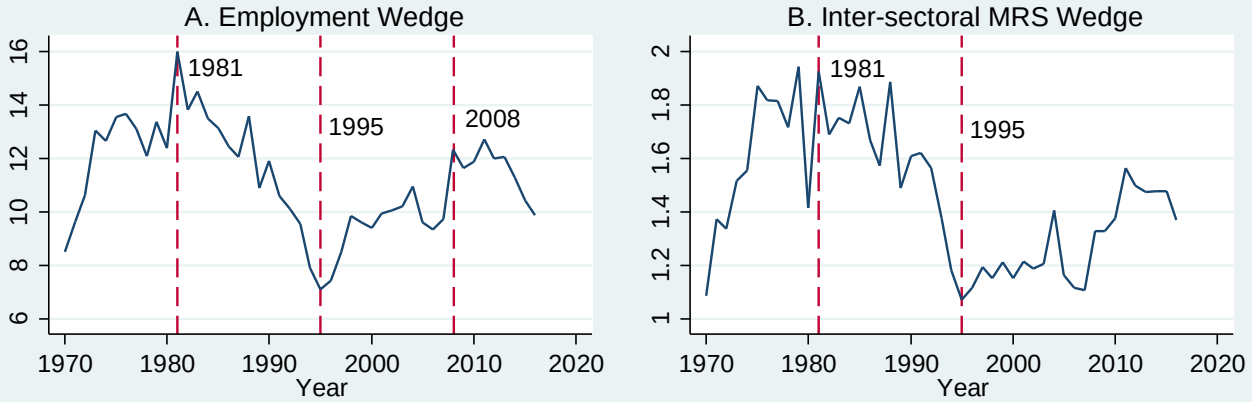


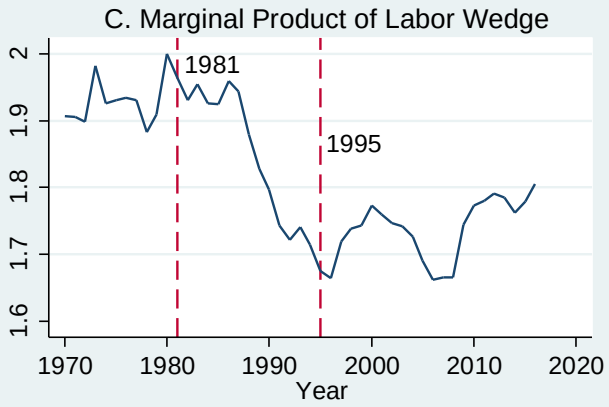
- Excessive labor and land in agriculture relative to industry

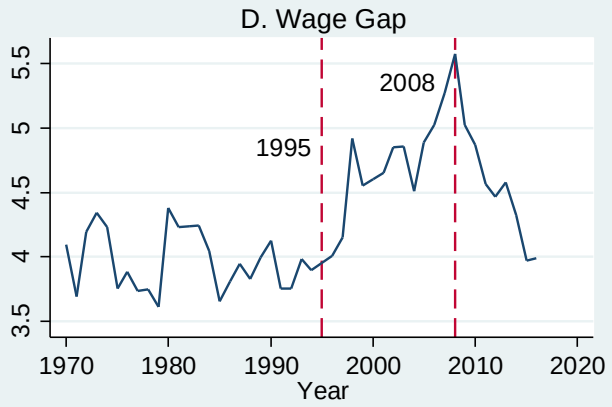
- Excessive capital in industry relative to agriculture

- Overinvestment

EMPLOYMENT EFFICIENCY DYNAMICS





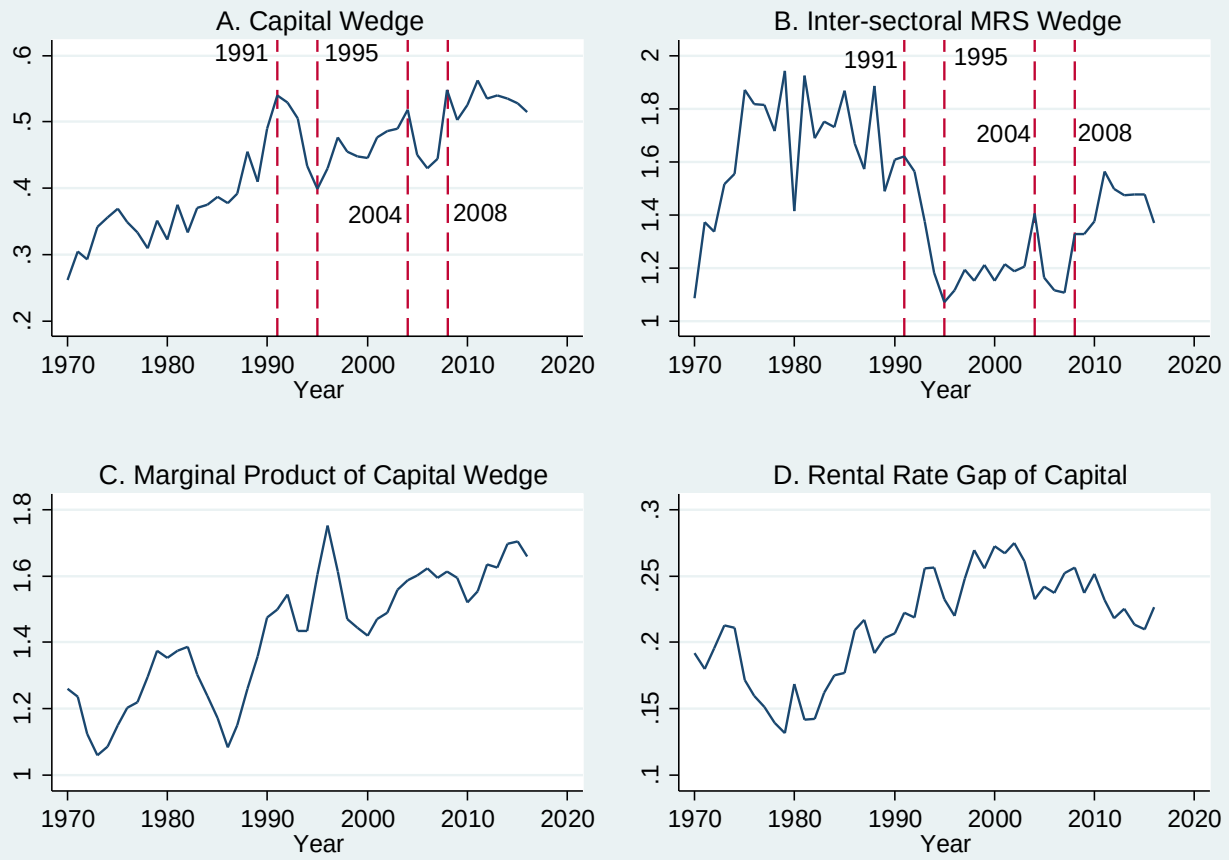


- Worsening labor allocation efficiency for the take-off input-driven growth period (1970-1981) due to the rise in MRS wedge (demand side, related to agricultural price subsidy policy)

- Improving labor allocation efficiency for the productivity-driven growth period (1981-1995) due to the fall in MPN wedge (production side)

- With the WTO shock in 1995, the direction was reversed via MRS wedge and wage effects

CAPITAL EFFICIENCY DYNAMICS

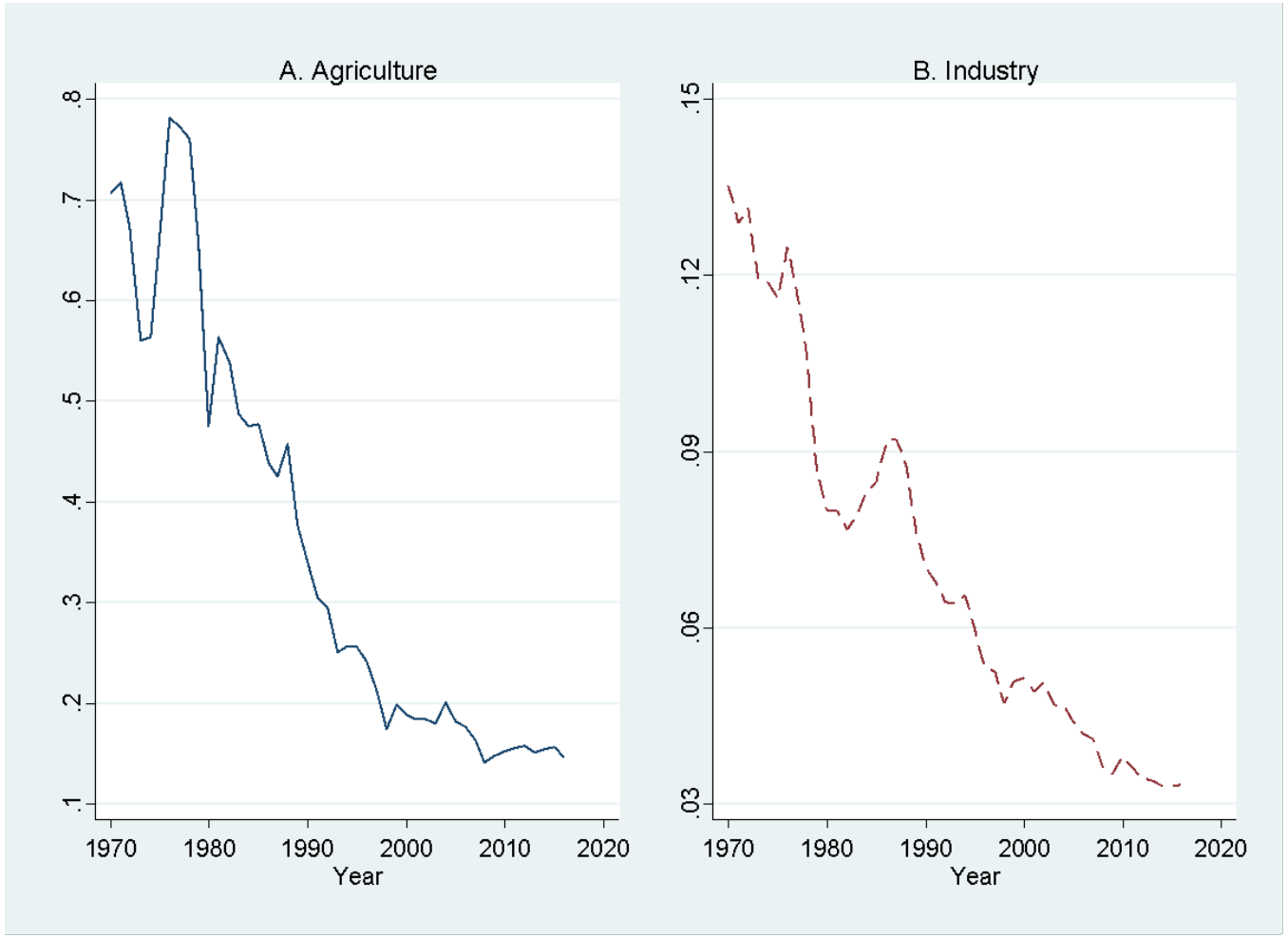


- Inter-sectoral capital allocation efficiency improved mainly due to MPK wedge and rental rate gap effects (production side) for 1970-1991 period

- Interruption of improvement for 1991-1995 period because of the MRS wedge effect (demand side)

- Improvement resumed after 1995 due to MPK wedge and MRS wedge effects, but from rental gap effect because of the stagnation of agricultural capital accumulation and the stopped agricultural rental rate fall

WITHIN-SECTOR RENTAL RATES OF CAPITAL

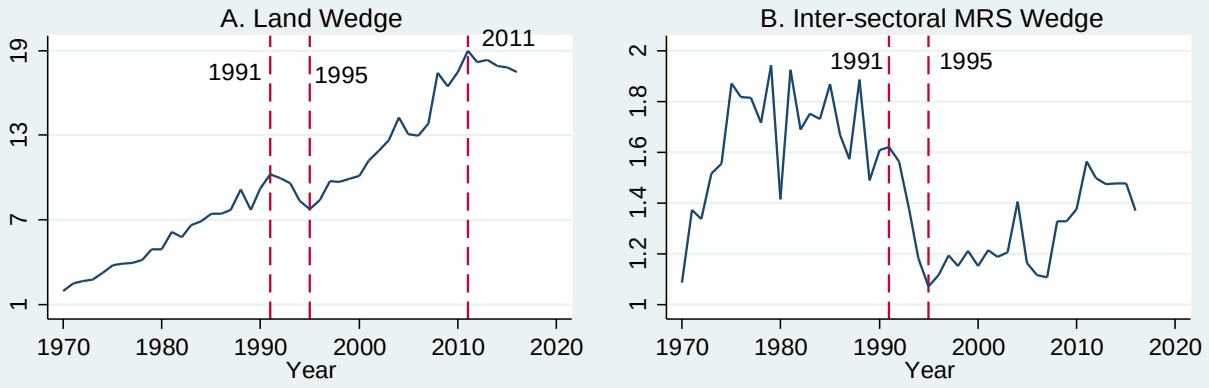


- Confirming diminishing returns to capital accumulation in both sectors

- Rental rate of agricultural capital fell faster than that of industrial capital

- Conforming to the predictions of neoclassical growth models

LAND EFFICIENCY DYNAMICS

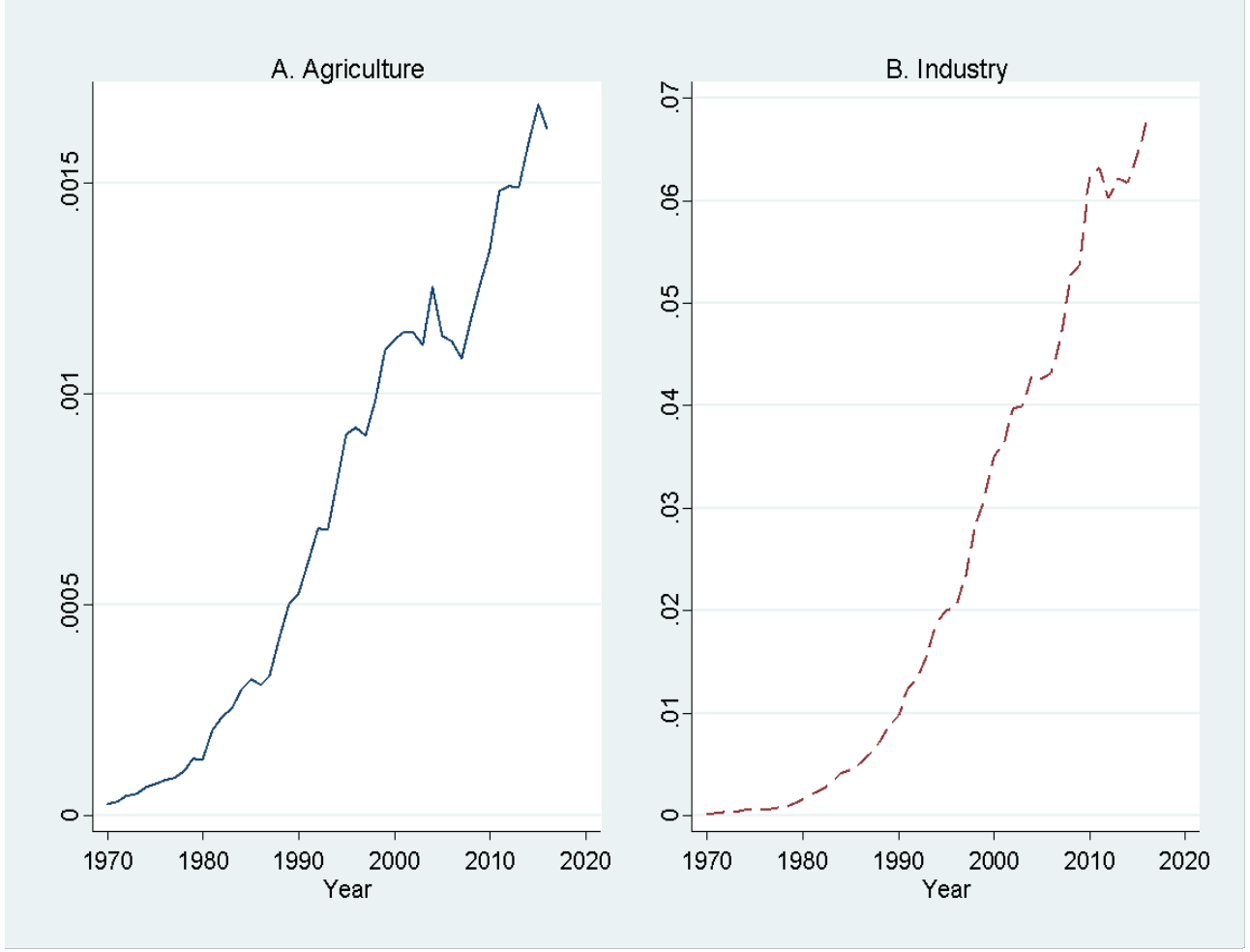


- Worsening inter-sectoral land allocation efficiency for most period (1970-2011) mainly because of the diverging rental rage gap

- Not much trends for marginal product of land wedge

- Impacts of MRS wedge were negligible

WITHIN-SECTOR RENTAL RATES OF LAND

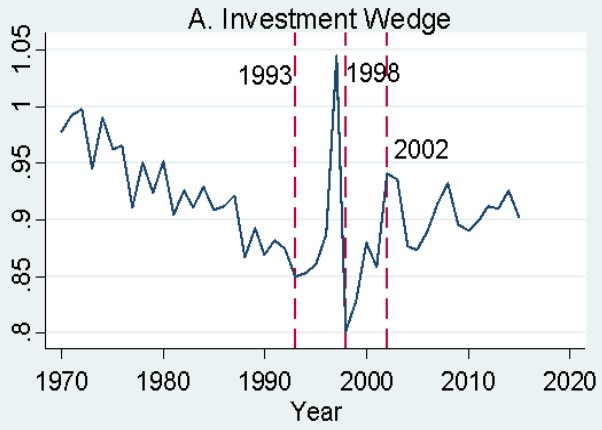


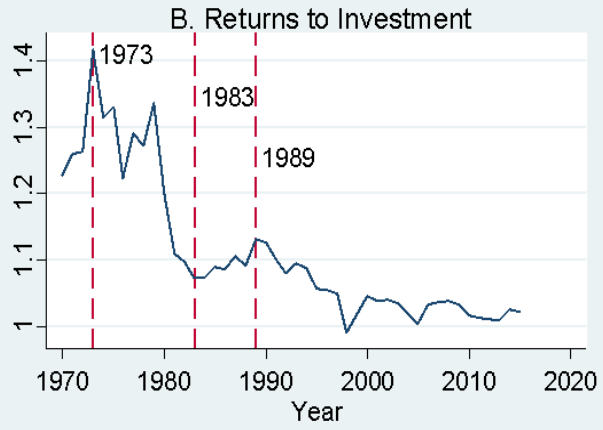
- The force of diminishing returns is confirmed for agricultural sector, recalling the fall in agricultural land because of the shifts of land use from agriculture to industry

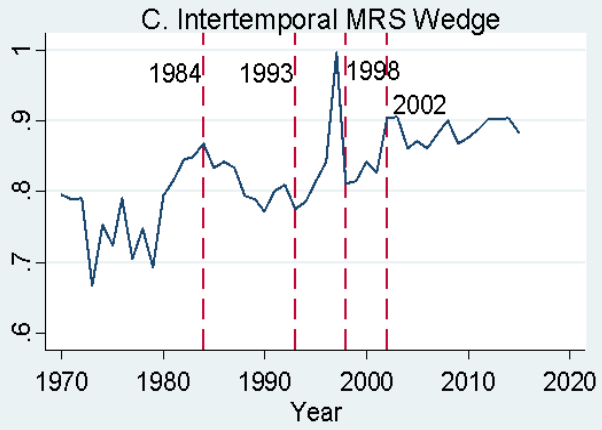
- Puzzling movement of the rental rate of industrial land use, recalling the expansion of industrial land use (which is likely to be related to land use regulation policies such as Greenbelt Zone or quantity subsidy to agriculture such as Direct Payment Program for Paddy policy)

- This is the main reason for the land allocation inefficiency

INVESTMENT EFFICIENCY DYNAMICS







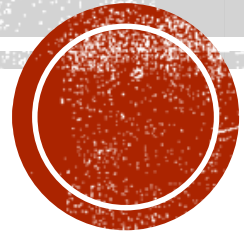
- Investment efficiency worsened (reinforced overinvestment) for 1970-1993 period

- Investment efficiency significantly improved due to the intertemporal MRS wedge effect with the trade and capital liberalization around 1993, which was interrupted by the Asian financial crisis (Korean economy was not over-heated from too much investment before the 1997 crisis)

- Restoration of the investment efficiency improvement resumed until 2002, and then stopped afterwards

- No changes of investment efficiency around the 2008 global financial crisis

LESSONS FOR DEVELOPMENT POLICY



LESSON LEARNED (1)

- Reasons for Korea's sustained and rapid growth during its structural transformation

1. Balanced sources of growth: within-sector TFP growth (1.69%), Within-sector input per worker growth (1.68%), Compositional changes of labor market demography (1.39%), Employment rate growth (0.89%)
2. Switch from input-driven to productivity-driven growth regimes
3. Maintained human capital growth in both industry and agriculture

LESSON LEARNED (2)

- Growth and efficiency do not necessarily coincide with each other

1. For the input growth process, labor and land were excessively used in agriculture relative to industry, while it is opposite for capital.
2. Capital accumulation was too fast considering the optimal intertemporal consumption allocation.
3. Employment allocation efficiency worsened during the input-driven growth period, while it improved during the productivity-driven growth period
4. Accumulated inefficiency for factor allocation and investment may cause the stagnation of the productivity growth

LESSON LEARNED (3)

- Efficiency dynamics responds to policy measures

1. Agricultural product price subsidy policies affect the inter-sectoral consumption MRS wedge, which is behind the movements of the employment wedge
2. Land use regulation policies affect the land rental rate gap, worsening the land allocation efficiency for long and huge

- Efficiency dynamics responds to macroeconomic shocks

1. Improvement of labor and land allocation efficiency due to the changes in demand-side wedges was interrupted by the WTO shock (particularly seriously for labor)
2. Improvement of investment efficiency due to the increase of the intertemporal MRS wedge was interrupted by the Asian financial crisis shock

POLICY IMPLICATIONS

- Balance the sources of growth among productivity, inputs, compositional changes, and employment expansion for rapid growth.
- Proper sequence of growth regimes is important (labor, human capital, structural changes, physical capital, and then productivity) to maintain growth.
- Growth regime switch from input-driven to productivity-driven one is critical in escaping from the middle-income trap for sustainable development.
- Need to pay attention to factor market policy designs for improving efficiency as well as for promoting growth during the structural transformation, in particular for the agriculture protection and land use policies.
- Institutional design for macroeconomic management system in response to macroeconomic shocks (particularly to external shocks) would be important for preventing the negative disturbances for efficiency dynamics.

THANK YOU FOR LISTENING!