Service Sector Productivity and Economic Growth in Asia

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Contents

- Patterns of Structural Adjustment in Asia
- Role of Service Sector for Economic Growth
- Determinants of Service Sector Productivity Growth
- Future Scenarios of Service Sector Productivity Growth

Purpose of the Study

- Analyze the role of service sector in structural change and economic growth in Asia.
- Investigate determinants of service sector productivity growth.
- Explore a scenario of more rapid catch-up of service productivity growth over coming decades for Asian economies.

Pattern of Structural change in Asia

- **Data**

  - GGDC 10-sector Database and Chinese Data

  - value added and employment (1990-2005)

- **Country**

  - Japan, 4 Asian NIES, ASEAN-4, India, China, USA

- **Stylized Patterns**

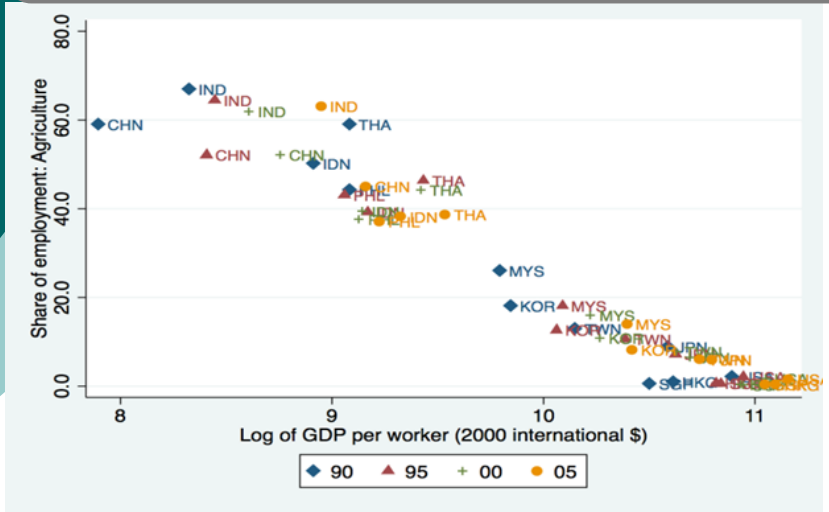
  - Increase in employment and value added shares for services

  - Convergence of sectoral labor productivity

  - Significant differences in labor productivity across sectors and across economies

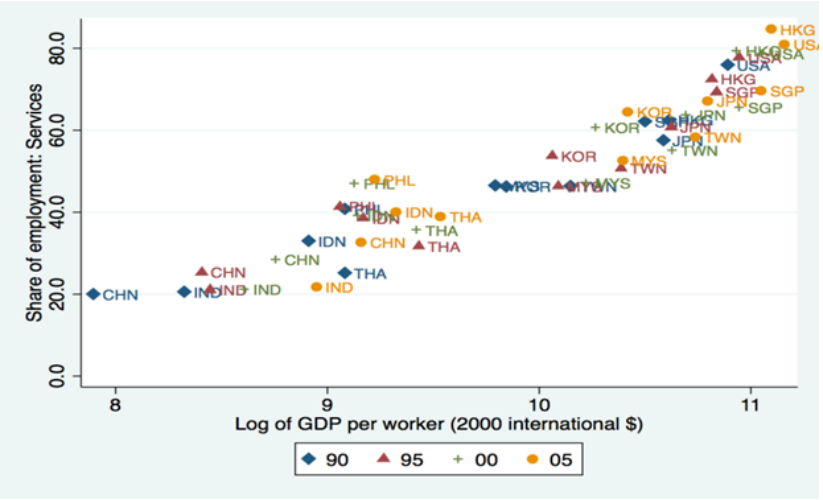
Change in Sectoral Employment Shares, 1990-2005

Share of employment: Agriculture



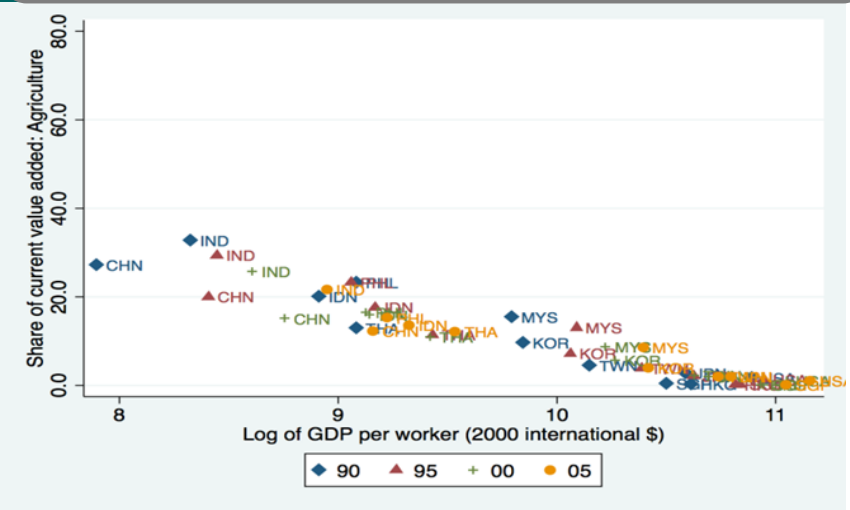
Share of employment: Manufacturing

Share of employment: Services

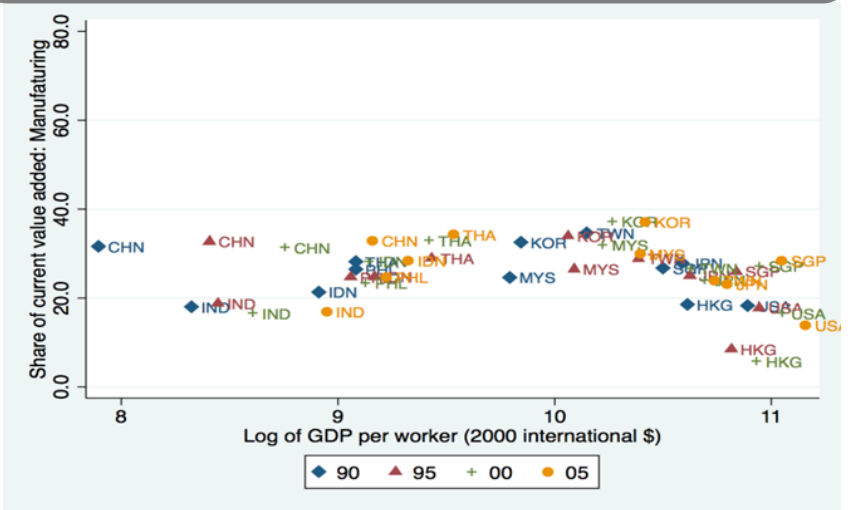


Change in Sectoral Valued Added Shares

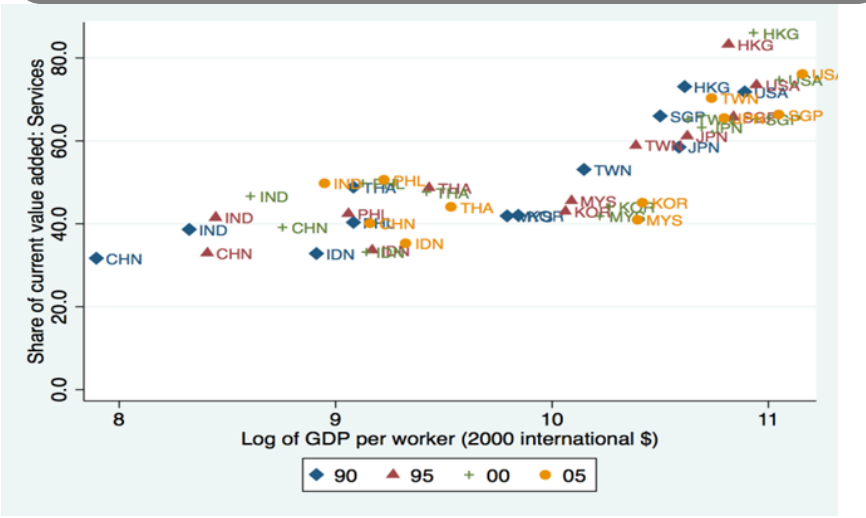
Share of value added: Agriculture



Share of value added: Manufacturing

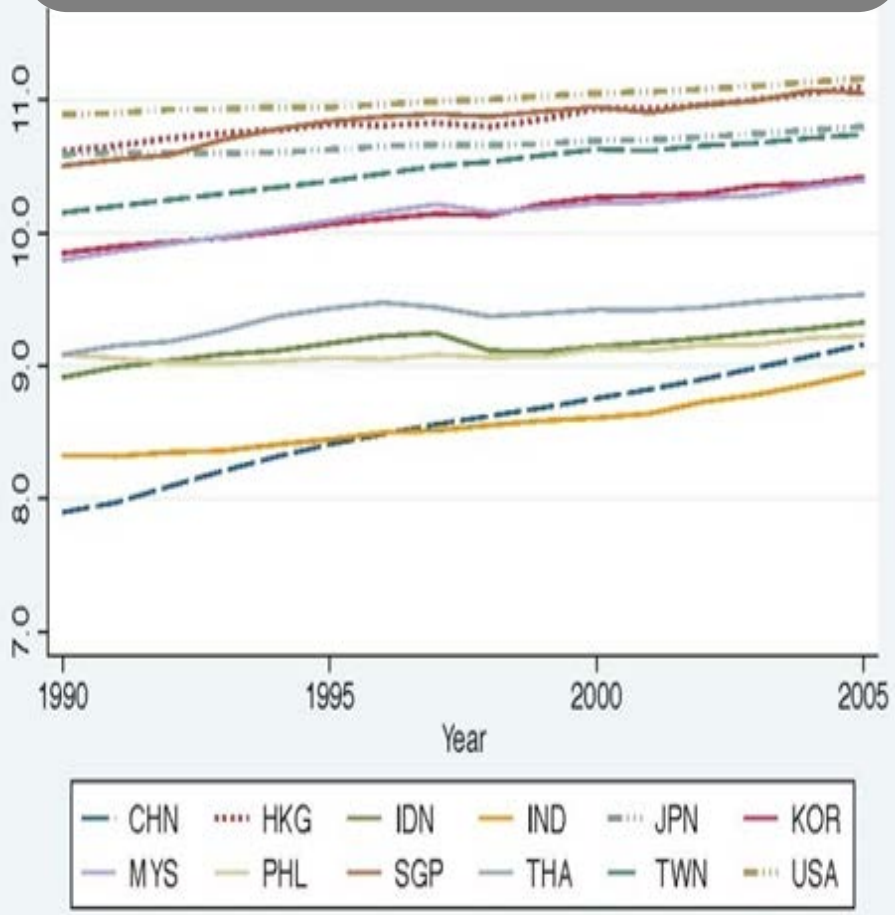


Share of value added: Services

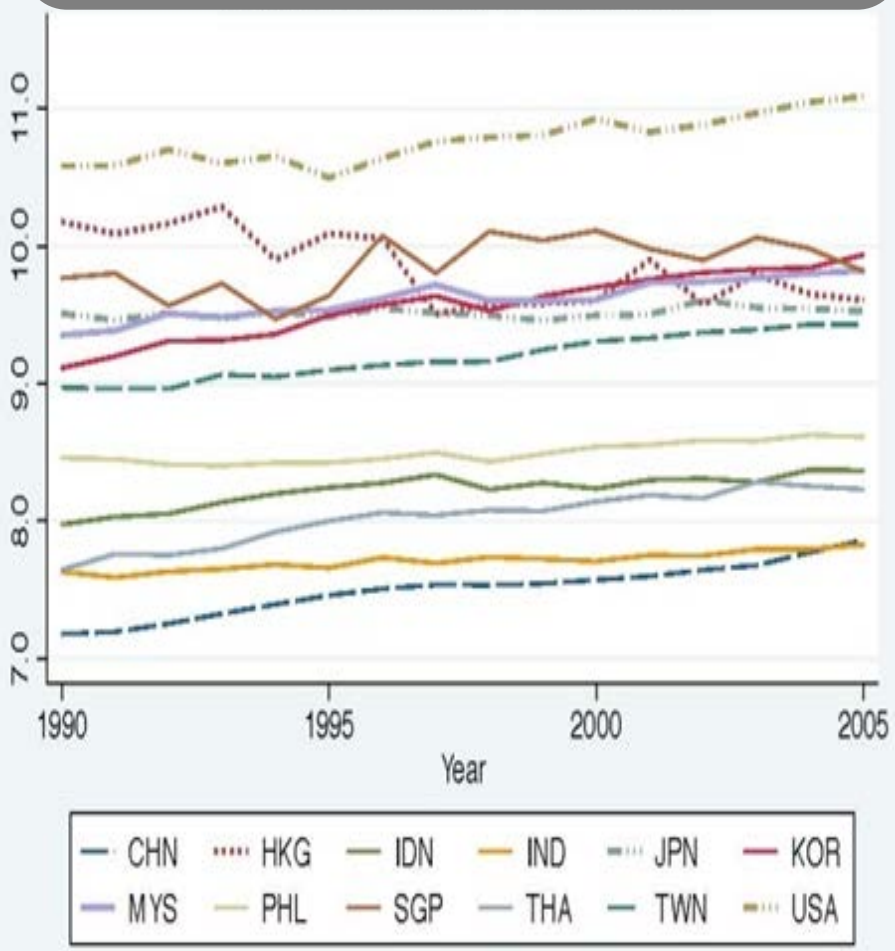


Labor Productivity in Aggregate Economy and Agriculture Sector, 1990-2005

Labor Productivity
All Economy

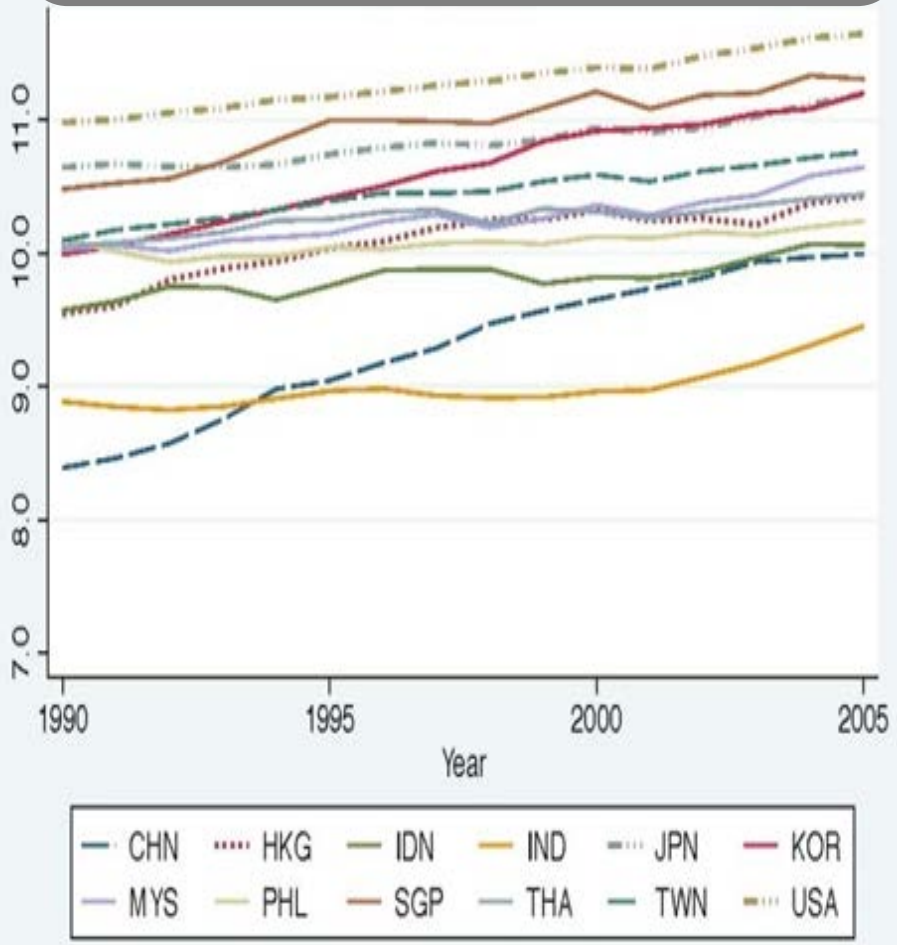


Labor Productivity
Agriculture, Hunting, Forestry and Fishing

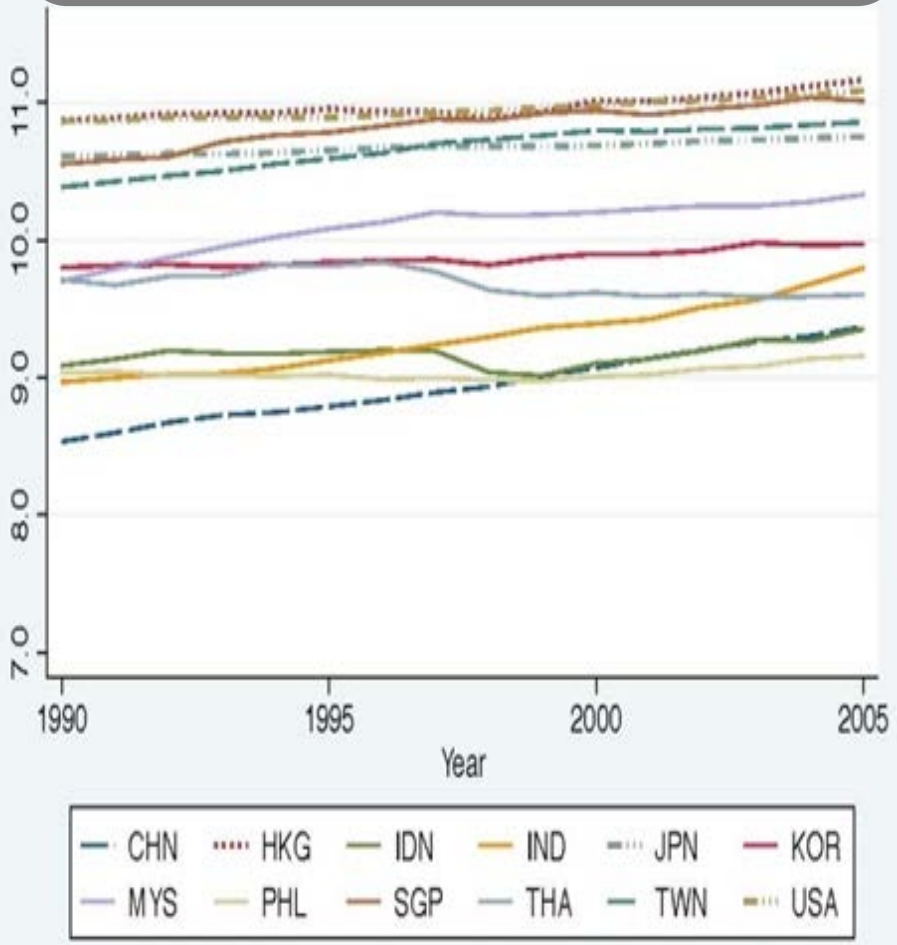


Labor Productivity in Manufacturing and Service Sectors, 1990-2005

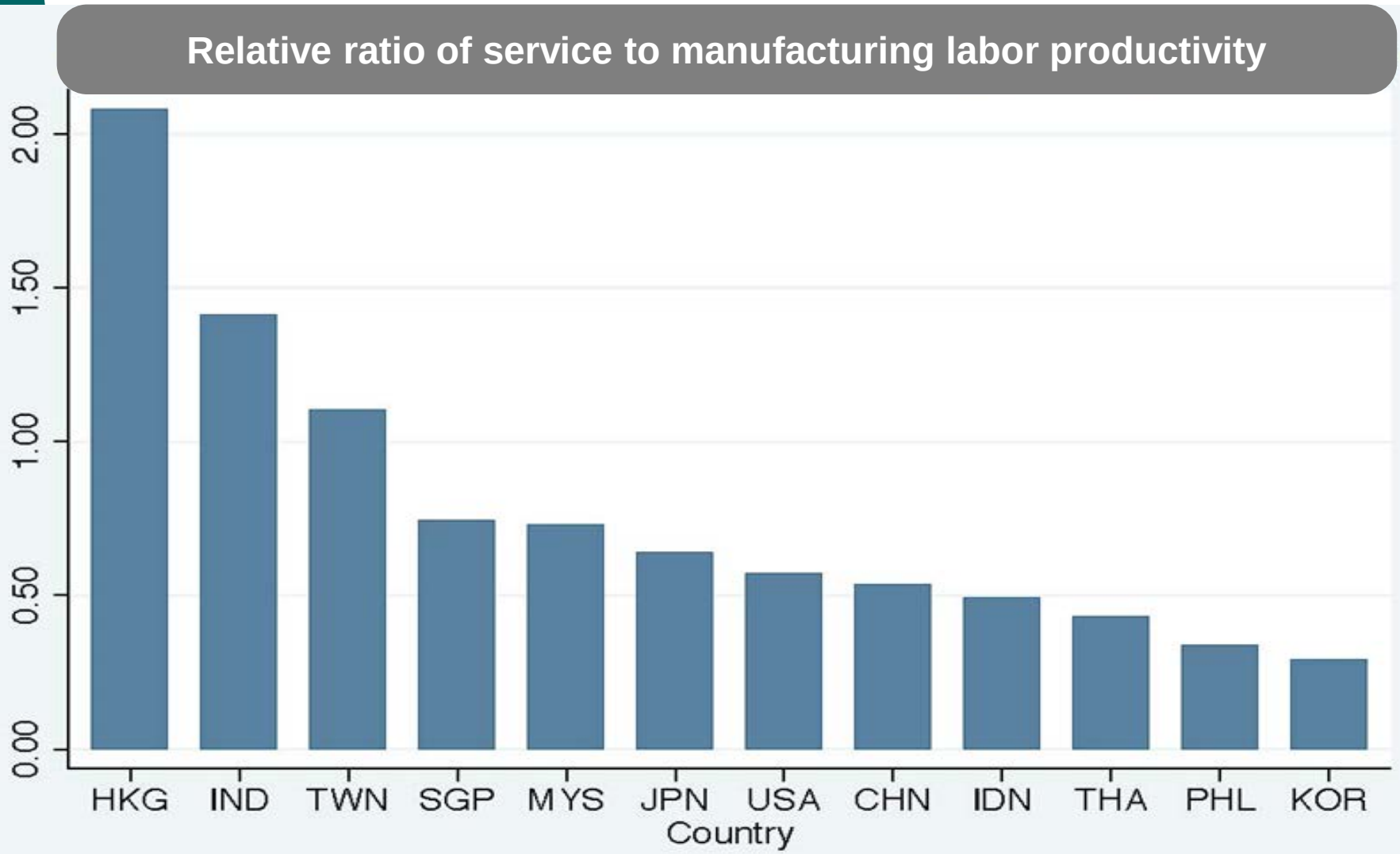
Labor Productivity Manufacturing



Labor Productivity Services



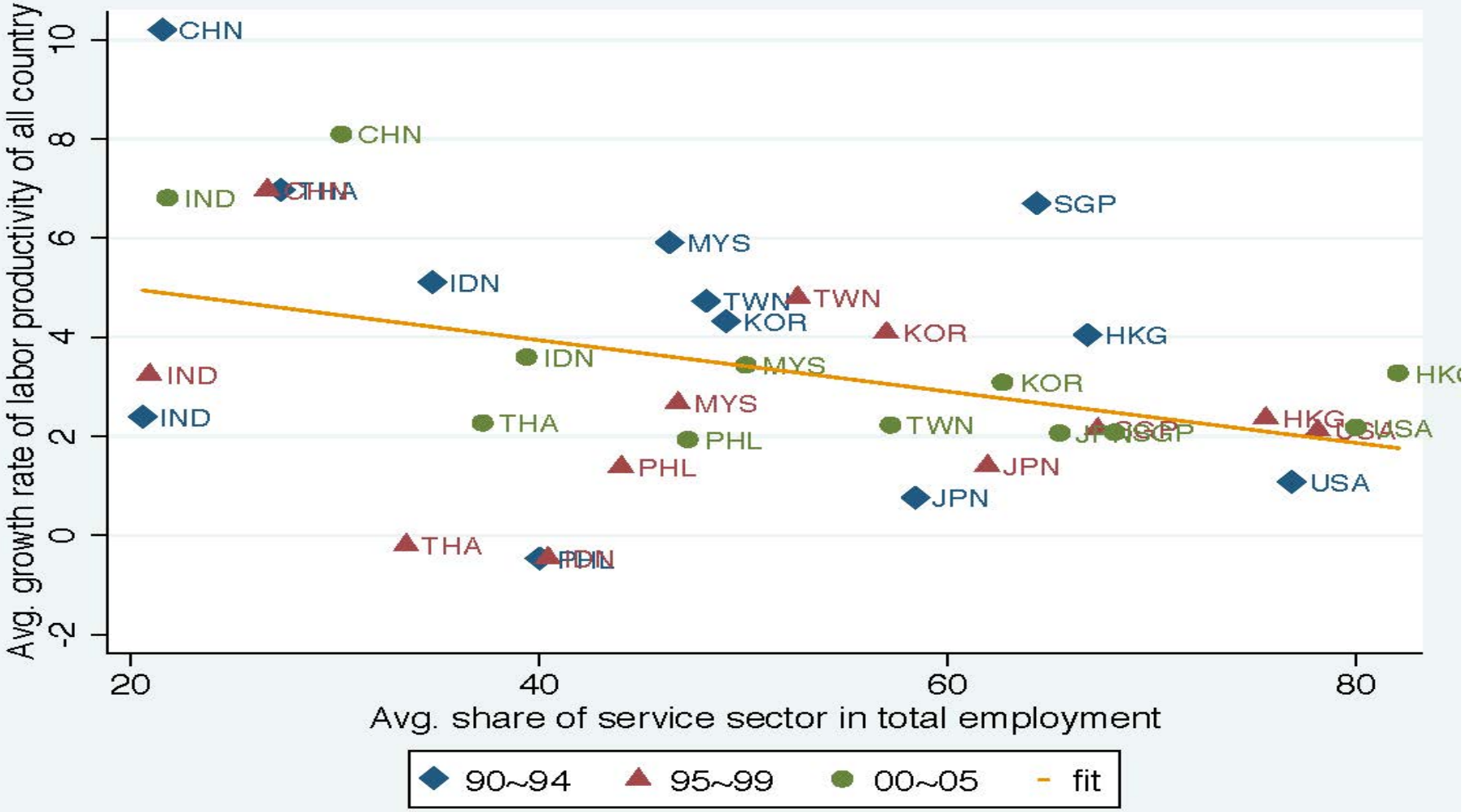
Ratio of Service to Manufacturing Labor Productivity in 2005



Ratio of Each Sector's Labor Productivity to Manufacturing Labor Productivity in 2005

	CHN	HKG	IDN	IND	JPN	KOR	MYS	PHL	SGP	THA	TWN	USA
Agriculture, Hunting, Forestry and Fishing	0.12	0.44	0.18	0.20	0.19	0.28	0.44	0.20	0.22	0.11	0.26	0.57
Manufacturing	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Services	0.54	2.08	0.49	1.41	0.64	0.29	0.73	0.34	0.74	0.43	1.10	0.57
Wholesale and Retail Trade, and Restaurants	0.50	1.79	0.41	1.24	0.54	0.22	0.58	0.31	0.69	0.31	0.86	0.43
Transport, Storage and Communications	0.73	2.05	0.44	2.17	0.83	0.87	1.21	0.43	0.84	1.36	1.51	0.88
Finance, Real Estate and Business Services	4.84	4.02	3.43	2.59	0.46	0.13	1.95	0.66	1.21	0.49	1.50	1.05
Community and Government Services	0.33	1.34	0.36	1.03	0.71	0.28	0.43	0.27	0.40	0.40	1.13	0.38
Others	0.79	1.39	0.92	1.52	0.62	0.68	0.99	0.60	0.46	0.53	0.55	0.54
Mining and Quarrying	2.56	1.90	3.66	1.87	0.76	1.61	11.2	1.80	0.38	3.23	3.64	0.91
Electricity, Gas, and Water	2.77	12.01	1.13	3.74	2.38	4.70	3.69	3.22	2.36	4.72	6.01	3.42
Construction	0.36	0.78	0.42	1.17	0.46	0.51	0.23	0.32	0.34	0.18	0.29	0.34
All Economy	0.44	1.95	0.48	0.60	0.67	0.46	0.78	0.36	0.77	0.40	0.98	0.61

Service Sector and Aggregate Labor Productivity Growth



Labor Productivity Growth by Sector, 1990-2005

	CHN	HKG	IDN	IND	JPN	KOR	MYS	PHL	SGP	THA	TWN	USA
Agriculture, Hunting, Forestry and Fishing	4.6	-3.8	2.6	1.3	0.1	5.5	3.1	1.0	0.3	3.9	3.1	3.4
Manufacturing	10.7	5.9	3.3	3.8	3.7	8.1	4.1	0.9	5.5	2.6	4.4	4.5
Services	5.6	2.0	1.8	5.5	1.0	1.1	4.2	0.8	3.1	-0.7	3.2	1.5
Wholesale and Retail Trade, & Restaurants	4.0	2.3	1.0	4.6	1.1	1.8	4.0	0.4	5.1	-2.5	3.9	3.2
Transport, Storage and Communications	6.8	3.5	0.7	6.2	1.3	6.0	4.1	0.9	3.1	3.9	6.4	3.2
Finance, Real Estate and Business Services	5.8	0.0	1.3	-2.9	2.5	-5.2	5.0	0.7	1.1	-2.9	0.3	1.3
Community and Government Services	7.3	1.4	2.0	6.4	0.2	-0.8	2.7	0.7	2.5	0.6	2.6	-0.2
Others	9.6	0.7	-1.3	1.3	-1.0	2.3	0.7	-0.2	2.0	-0.1	1.3	-0.2
Mining and Quarrying	16.7	0.2	-0.6	1.5	-0.1	9.1	2.7	4.6	-7.9	6.4	3.5	0.5
Electricity, Gas, and Water	13.8	7.9	6.5	2.8	2.0	8.3	5.3	2.9	5.0	5.9	5.3	3.7
Construction	5.5	-2.0	-0.3	1.2	-2.1	1.0	-0.4	-2.0	1.7	-4.8	0.2	-0.7
All Economy	8.4	3.2	2.7	4.1	1.4	3.8	4.0	0.9	3.6	3.0	3.9	1.8

Shift-share Analysis

- Model : $$\Delta Y_t = \sum_{i=1}^{N} (s_{i,t-k} \times \Delta y_{i,t}) + \sum_{i=1}^{N} (y_{i,t} \times \Delta s_{i,t})$$

- 'Within effect' : contribution from labor productivity growth within each industry (weighted by sectoral employment share)

- 'Shift effect' or 'Structural-change effect' : labor productivity growth due to employment shifts toward more productivity industries

- Structural-change effect can be either positive or negative.

Results of Shift-share Analysis

- 'Within-effects' dominated 'shift-effects'.
- Structural change contributed positively to overall labor productivity growth in most economies.
- Service sector contributed positively to the overall structural change effect.
- 'Structural change effect' of manufacturing sector was negative in industrial Asia, but positive in latecomers (e.g., China, India).
- Positive within- and structural-change effects of the service sector contributed significantly to aggregate productivity growth in Hong Kong, India, Malaysia and Taiwan.

Decomposition of Labor Productivity Growth, 1990-2005

Country	Sector	Total	Within	Structural change
China	All Economy	8.42	7.46	0.95
	Manufacturing	3.04	3.21	-0.17
	Services	3.46	1.8	1.66
India	All Economy	4.14	3.17	0.97
	Manufacturing	0.8	0.63	0.17
	Services	2.68	2.05	0.62
Japan	All Economy	1.4	1.41	-0.01
	Manufacturing	0.38	1.08	-0.71
	Services	1.23	0.46	0.77
Korea	All Economy	3.82	5.19	-1.37
	Manufacturing	2.07	3.69	-1.62
	Services	1.41	0.51	0.9
Singapore	All Economy	3.64	3.72	-0.08
	Manufacturing	1	1.8	-0.81
	Services	2.53	1.75	0.78
Taiwan	All Economy	3.91	3.38	0.53
	Manufacturing	0.99	1.4	-0.42
	Services	2.92	1.7	1.22

TFP growth in service sector

- Data : EUKLEMS data base (Japan and USA)

  KIP database (Korea)

- Modern service sectors experienced higher TFP growth in all three countries over 1990-2006

- TFP also increased rapidly in some traditional service sector

Comparison of TFP Growth by Sector between Japan, Korea, and the USA, 1990-2006

INDUSTRY	JAPAN	KOREA	USA
Total Economy	0.05	0.58	0.54
Agriculture, Hunting, Forestry and Fishing	-0.64	1.10	2.21
Total Manufacturing	0.63	3.61	2.87
Services	0.00	-0.87	0.11
Wholesale and Retail Trade	2.02	-1.89	2.89
Hotels and Restaurants	-0.29	-4.97	0.13
Transport, Storage and Communication	0.64	5.98	1.51
Financial Intermediation	0.95	2.43	0.37
Real Estate, Renting and Business Activities	-0.63	-2.28	-0.66
Public Admin and Defense; Compulsory Social security	-0.24	-1.82	-1
Education	-0.36	-1.23	-1.41
Health and Social Work	0.06	-3.3	-1.32
Other Community, Social and Personal Services	-2.29	-2.31	0.62
Others	-1.50	-0.27	-1.41
Mining and Quarrying	-0.22	-2.77	-0.53
Electricity, Gas and Water Supply	0.08	1.92	0.69
Construction	-2.12	-2.76	-2.34

Determinants of Labor Productivity Growth in Services

$$g_{yiT} = log\left(\frac{y_{Ti}}{y_{0i}}\right)/T = \beta_0 + \beta_2 log(y_{0i}) + \beta_3 Z_i + \varepsilon$$

- g_{yiT}: growth rate of labor productivity in service sector for the period T for country i
- $\log(y_{0i})$: a log value of the initial level of labor productivity for country *i*
- Z_i : variables that influence the country *i*'s steady-state level of labor productivity in service sector
- Data : a panel dataset of cross-country data over five 5-year periods from 1985-2009 (270 observations for 83 countries)
- Panel IVs with and without country fixed effects

Regressions for Labor Productivity Growth in the Service Sector

	(1)	(2)	(3)	(4)
	Panel GLS	Panel GLS Fixed Effects	Panel IV	Panel IV Fixed Effects
Log (Lagged Service Labor Productivity)	-0.0058*** (0.0018)	-0.0440*** (0.0133)	-0.0118*** (0.0029)	-0.0495*** (0.0172)
Log (Fertility Rate)			-0.0117* (0.0071)	0.0426* (0.0254)
Investment Ratio			0.0440 (0.0350)	0.0396 (0.0946)
Average School Years			0.0024** (0.0011)	0.0126** (0.0062)
Government Consumption Ratio			0.0117 (0.0439)	-0.0810 (0.2727)
Rule of Law Index			0.0260** (0.0120)	0.0595*** (0.0234)
Share of Trade in GDP			-0.0024 (0.0038)	-0.0389** (0.0168)
Terms-of-Trade Change			0.0218 (0.0618)	0.0226 (0.0840)
Share of Services Trade in Total Trade			0.0099 (0.0205)	0.0032 (0.0567)
Urban Population (Ratio to Total Population)			0.0139 (0.0119)	0.1347 (0.0873)
Democracy			-0.0853** (0.0429)	-0.1296* (0.0736)
Democracy Squared			0.0416 (0.0348)	0.0780 (0.0681)

Regression Results

- Unconditional convergence in labor productivity across service sectors.
- The estimated effects of human capital and the maintenance of rule of law are strong positive and statistically significant.
- Non-linear relationship between democracy and growth.
- Significantly negative effect of overall trade openness on service sector labor productivity growth.

Simulations with the Intertemporal General Equilibrium Global Model

- The G-cubed model developed by McKibbin and Wilcoxen, drawing on Mckibbin- Sachs and Jorgenson- Wilcoxen models.
- Hybrid of macro models (dynamic stochastic general equilibrium model) and a computable general equilibrium models
- Allow for inter-industry input-output linkages, capital movements, and consumption and investment dynamics.
- Annual frequency with detailed macroeconomic and sectoral dynamics
- Extensive econometric estimation of key consumption and production substitution elasticities

Main Features of the G-Cubed Model

- Firms produce output using capital, labor, energy and material inputs and maximize share market value subject to costs of adjusting physical capital.
- Households maximize expected utility subject to a wealth constraint and liquidity constraints.
- A mix of rational and non rational expectations.
- Short run unemployment possible due to wage stickiness based on labor institutions.
- Financial markets for bonds, equity, foreign exchange.
- International trade in goods, services and financial assets.

Countries and Sectors (G-cubed, version 108V)

Countries

1 United States
2 Japan
3 United Kingdom
4 Germany
5 Euro Area
6 Canada
7 Australia
8 Korea
9 Rest of Advanced Economies
10 China
11 India
12 Indonesia
13 Other Asia
14 Latin America
15 Other Emerging Economies
16 Eastern Europe and the former Soviet Union
17 Oil Exporting Developing Countries

Sectors

1. Energy
2. Mining
3. Agriculture
4. Durable Manufacturing
5. Non-Durable Manufacturing
6. Services

*Capital producing sector

Experiments

- Rise in labor productivity growth in the services sector of Asian economies by 1% per year from 2014 to 2053
  - In each economy individually
  - In all Asian economies together

* For comparison, we also experiment an increase in labor productivity growth in the manufacturing sectors of Asian economies by 1% per year from 2014 to 2053

Simulation Results for GDP and Investment

Table 10: Effects Rise in Labor Productivity in the Service Sector (%)

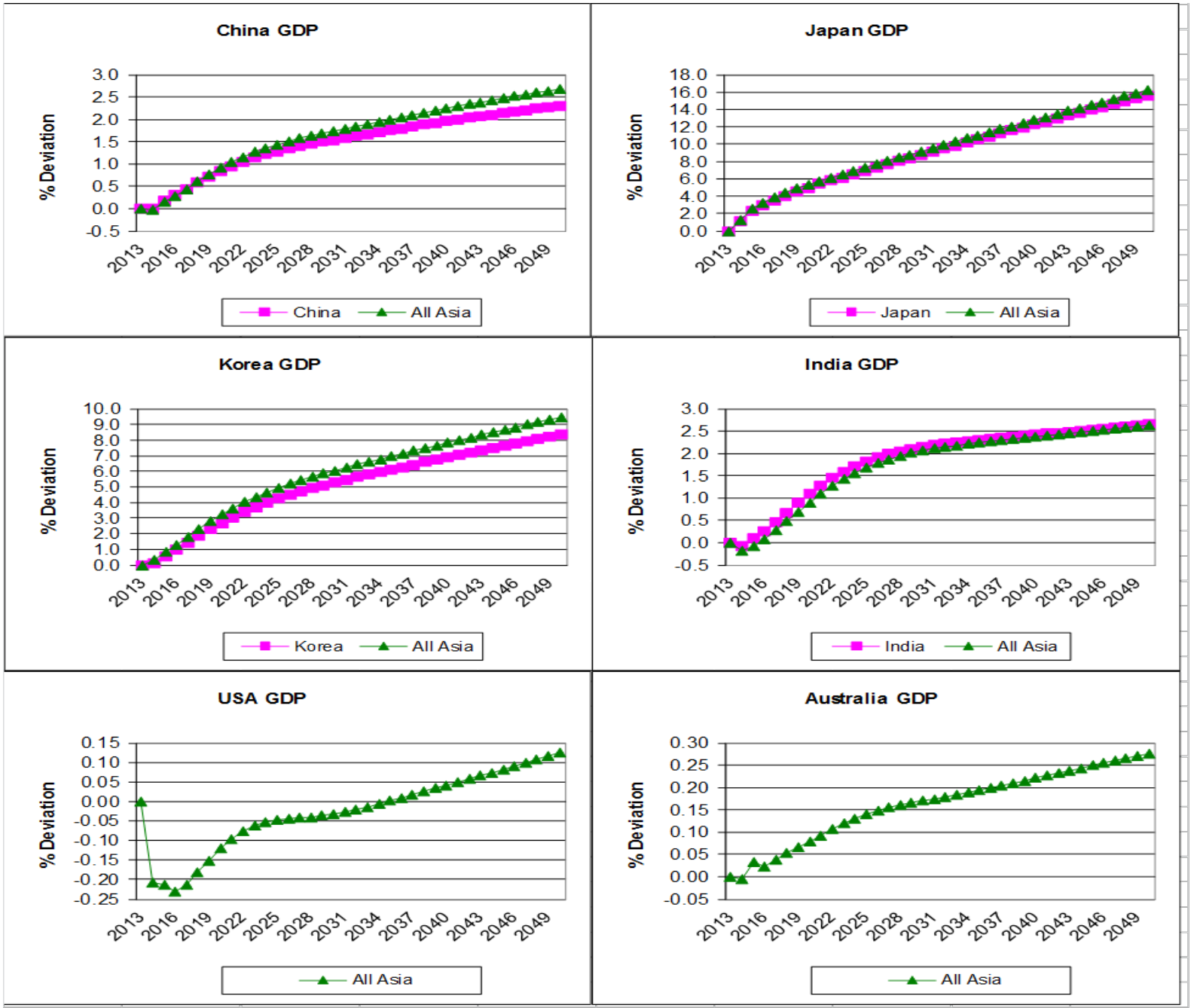
		Real GDP				Investment		
		2014	2020	2040		2014	2020	2040
Japan	Asia wide	1.24	5.32	12.78		18.87	40.45	54.06
	Own	1.05	4.98	12.27		16.57	38.56	52.24
Korea	Asia wide	0.30	3.23	7.82		5.00	15.16	17.01
	Own	0.11	2.67	6.87		3.57	13.28	15.35
China	Asia wide	-0.02	0.91	2.24		0.97	3.01	3.90
	Own	0.00	0.83	1.96		0.87	2.75	3.48
India	Asia wide	-0.19	0.89	2.37		0.20	3.44	3.95
	Own	-0.07	1.09	2.42		0.73	3.81	4.02
Indonesia	Asia wide	-0.07	1.30	3.77		0.92	6.02	7.15
	Own	-0.10	1.18	3.50		0.72	5.54	6.81
OAS	Asia wide	-0.35	1.22	5.17		-0.35	8.04	12.16
	Own	-0.29	1.19	4.69		0.18	7.53	11.05
USA	Asia wide	-0.21	-0.12	0.04		-1.95	-0.80	-0.09
Australia	Asia wide	-0.01	0.08	0.22		0.19	0.49	0.55
REURO	Asia wide	-0.15	-0.19	0.01		-1.32	-1.05	-0.28
Germany	Asia wide	-0.03	-0.04	0.15		-0.42	-0.70	0.17

Simulation Results for Consumption and Trade Balance

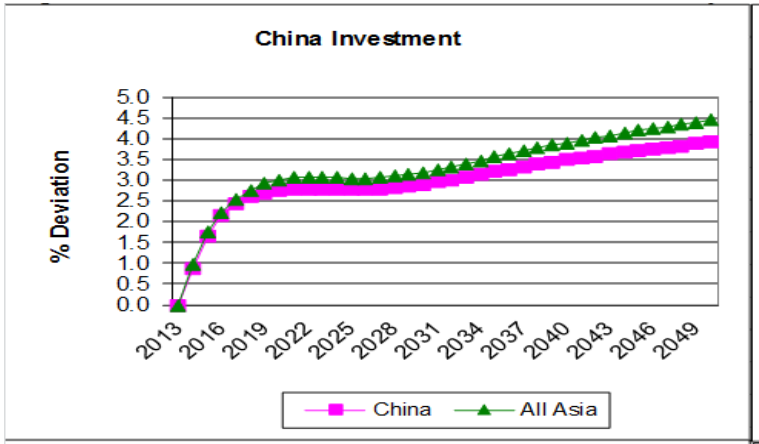
Table 11: Effects Rise in Labor Productivity in the Service Sector (%)

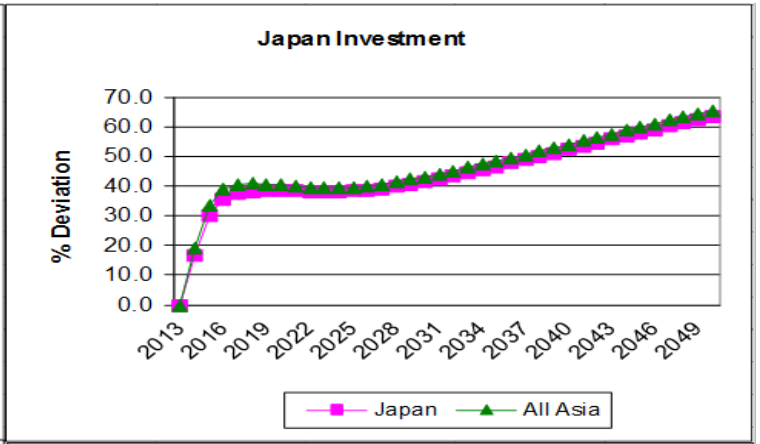
		Consumption				Trade Balance		
		2014	2020	2040		2014	2020	2040
Japan	Asia wide	0.53	1.52	5.14		-1.61	-1.81	-1.32
	Own	0.36	1.14	4.52		-1.36	-1.68	-1.25
Korea	Asia wide	-0.41	-1.13	3.45		-0.42	-0.62	-0.29
	Own	-0.69	-1.42	2.63		-0.10	-0.55	-0.38
China	Asia wide	-0.44	-0.85	1.71		-0.18	-0.16	-0.02
	Own	-0.47	-0.77	1.37		-0.09	-0.16	-0.07
India	Asia wide	-0.77	-1.05	1.12		0.20	0.07	0.00
	Own	-0.54	-0.60	1.26		0.08	-0.07	-0.09
Indonesia	Asia wide	-0.31	-0.70	2.09		-0.01	0.02	0.20
	Own	-0.40	-0.61	1.90		0.08	-0.06	0.06
OAS	Asia wide	-0.98	-2.29	0.83		0.43	0.24	0.29
	Own	-1.06	-2.17	0.38		0.50	0.21	0.24
USA	Asia wide	-0.22	-0.31	-0.09		0.19	0.20	0.15
Australia	Asia wide	0.03	-0.11	0.02		-0.04	0.08	0.14
REURO	Asia wide	-0.28	-0.43	-0.13		0.21	0.23	0.17
Germany	Asia wide	-0.11	-0.25	0.07		0.11	0.22	0.14

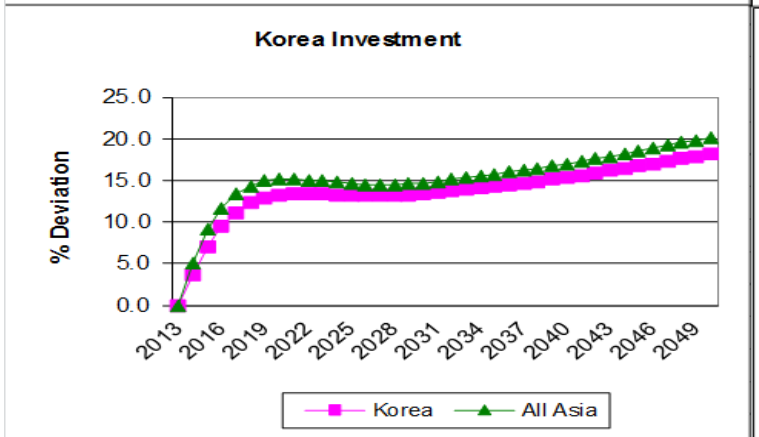
GDP Effects of Services Productivity Shock

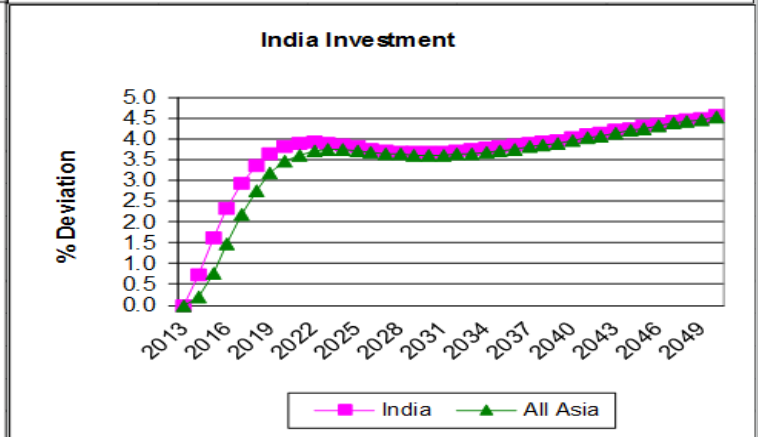


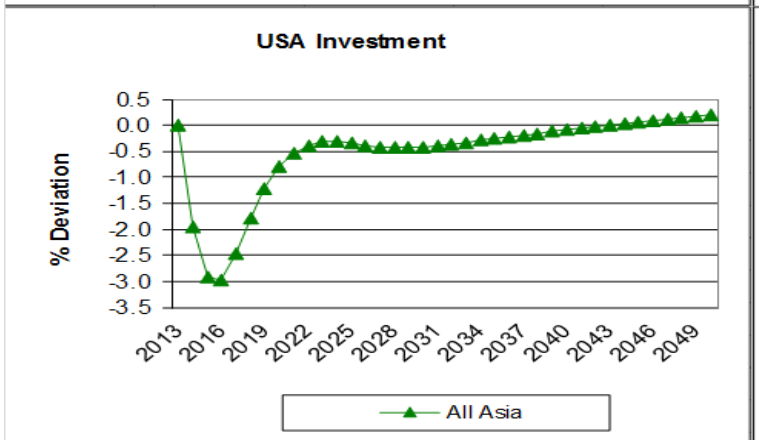
Investment Effects of Services Productivity Shock

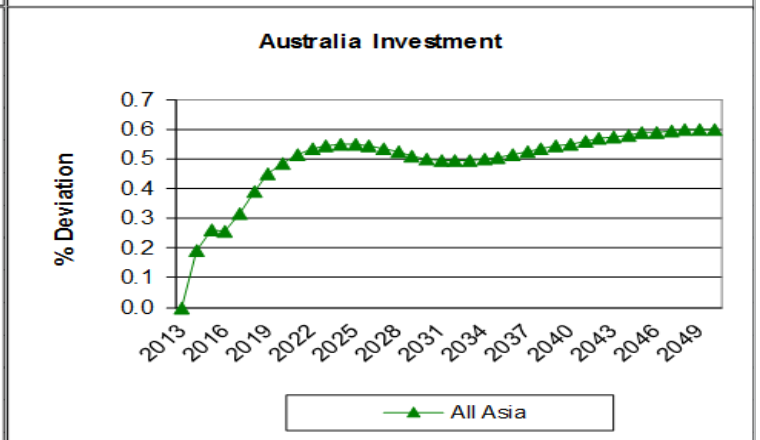








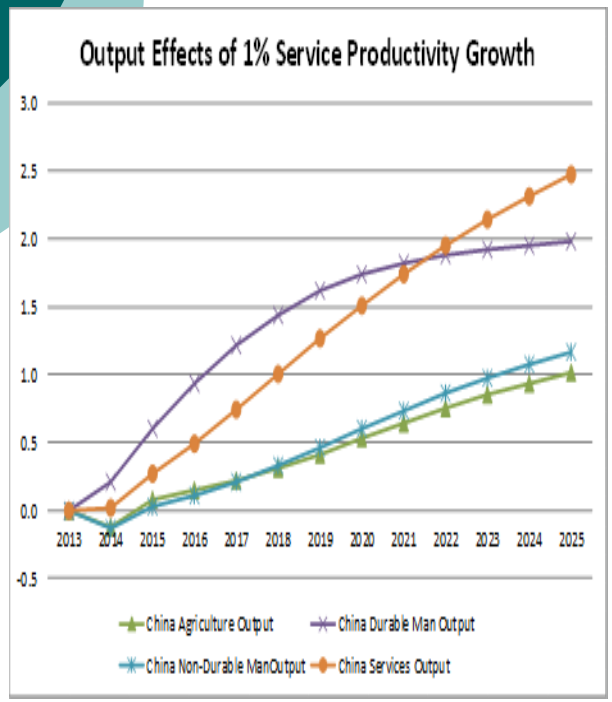


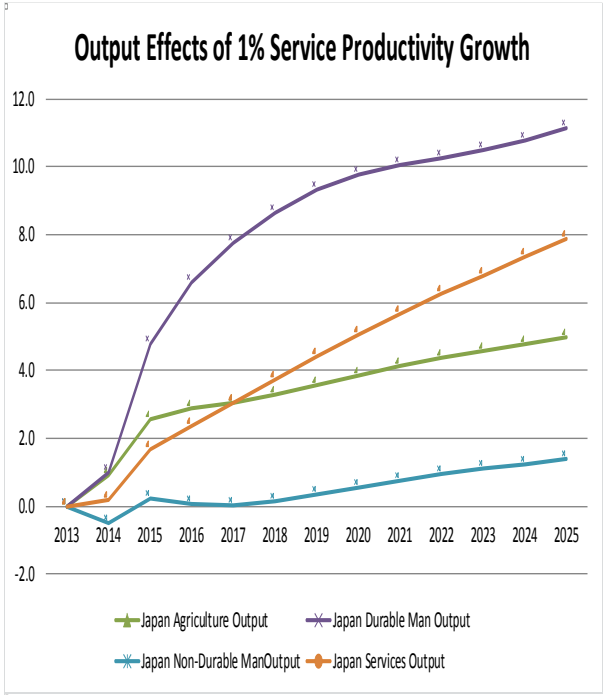


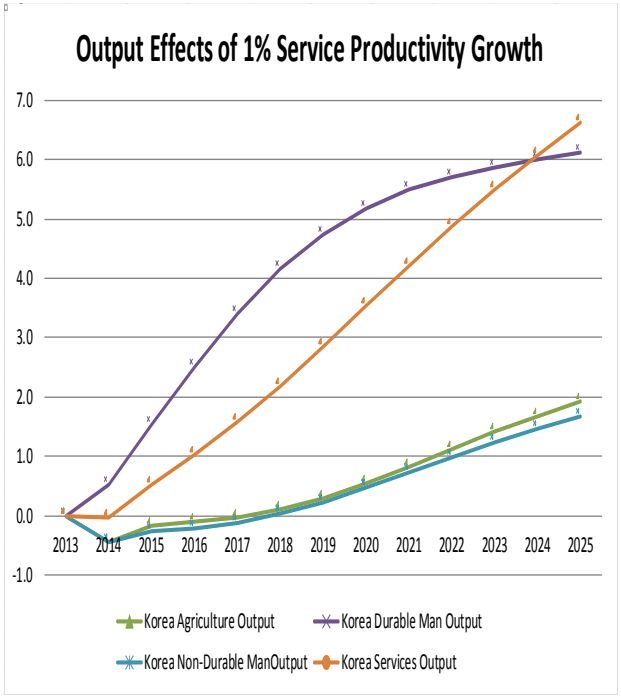
Consumption Effects of Services Productivity Shock

Sectoral Output Effects of Services Productivity Shock

China Japan Korea

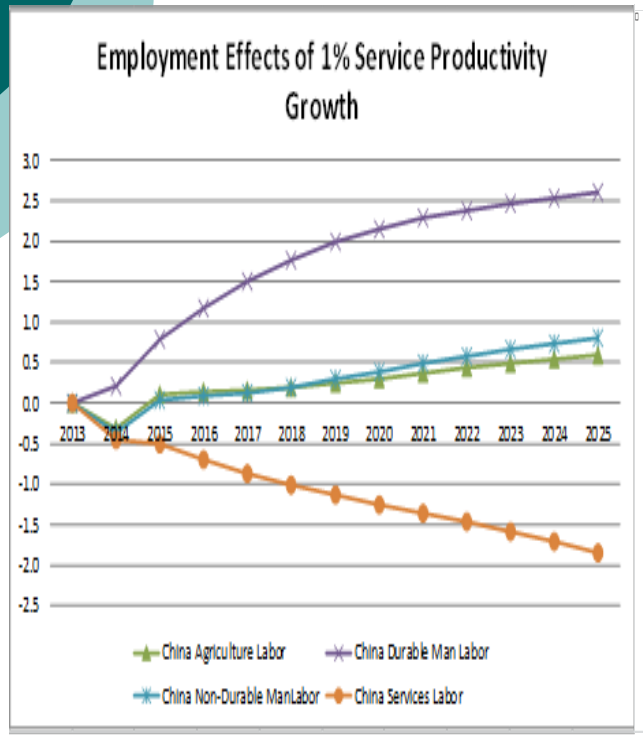




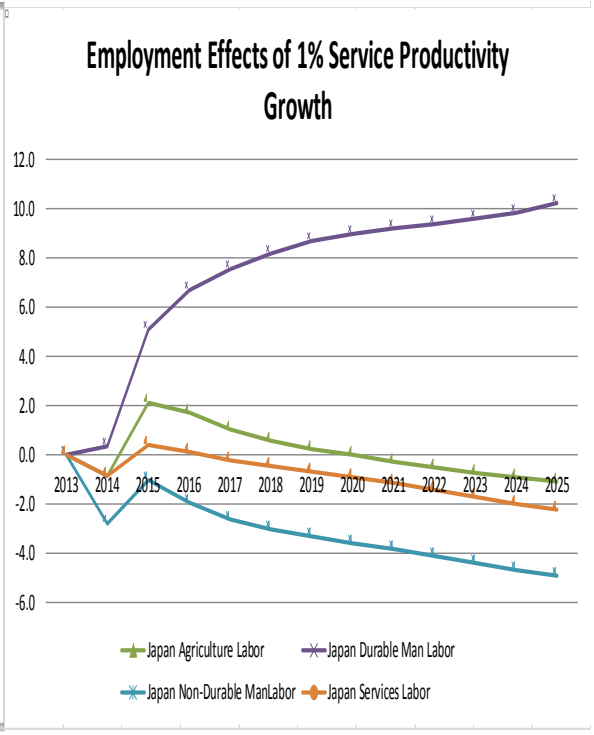


Sectoral Employment Effects of Services Productivity Shock

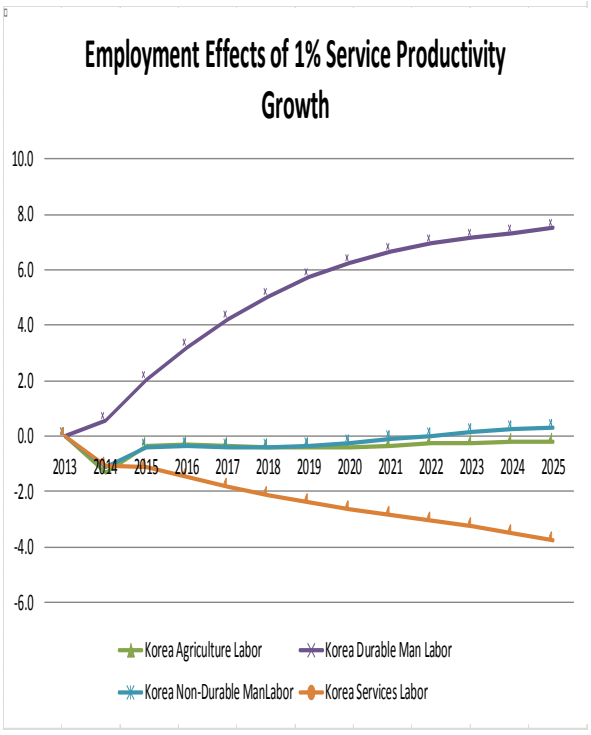
China



Japan



Korea



Summary and Conclusion

- There remain significant gaps in labor productivity across sectors and across economies.
- Service sector made a significantly positive contribution to aggregate labor productivity growth both through own productivity growth and through structural change effect.
- There is a great potential for faster productivity growth in service sectors in Asia.
- Human capital, institutional quality, democracy and more domestic-oriented policy play a significant role in improving service sector productivity growth.
- Faster productivity growth in service sector in Asia can significantly contribute to more balanced and sustainable growth of Asian economies.