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International Comparison of Total Factor Productivity from KLEMS Database

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History of KIP Database

- Korea Industrial Productivity (KIP) Database Project in 2007
  - Following EU KLEMS Manual (Timmer et al., 2007)
  - KIP DB 2007 released in Dec., 2007
  - Gross output (GO), KLEMS & TFPGO
  - 72 industries from 1970 to 2005
- The latest KIP DB 2012
  - Up to 2010 (Available in January 2012)
  - Available at www.kpc.or.kr

Productivity Research Institute

Statistical analyses&Researches on Productivity Improvement

Productivity Statistics
- Labor Productivity Statistics
- Indices of labor Productivity
  - Indices of labor Productivity
  - Indices of Value Added Labor Productivity
  - Unit Labor Costs In Manufacturing
- KIP Database
  - 2011 KIP Database
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  - 2008 KIP Database
  - 2007 KIP Database
- International Statistics
  - Indices of labor Productivity
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  - Earnings in Manufacturing

Productivity & Certification Dept

2011 KIP Database

Introduction | Data Structure | Estimated results | KIP DB

Introduction

Korea Industrial Productivity Database 2011(hereafter KIP Database 2011) has been compiled from EU KLEMS manual 2007 and supported by Ministry of Knowledge Economy.

KIP Database 2011 contains the annual data on 72 sectors in economy-wide during 1970-2009 that can be used for gross output growth accounting TFP analysis, but 6 sectors(code 5, code 6, code 33, code 39, code 56, code 72) are excepted because of the insufficient raw data. The database includes detailed information on sectoral gross output, value-added, capital stock, labor input, energy input, material input and service input, as well as each input share. KIP Database will be updated continuously in future, and this is the fifth version. KIP Database was compiled by the following scholars.

- **Capital input: Hak K. Pyo (Seoul National University)**
- **Gross output, Intermediates inputs: Hyunbae Chun (Sogang University)**
- **Labor input: Hyunbae Chun (Sogang University), Keunhee Rhee (Korea Productivity Center)**

KIP and JIP

- JIP DB
  - Japan Industrial Productivity Database at RIETI
    http://www.rieti.go.jp/jp/database
  - 108 industries, 1970-2009

- Cooperation with JIP DB
  - Workshop on productivity in Korea and Japan
  - International Productivity Conference
  - Asia KLEMS Conferences

RIETI Research Institute of Economy, Trade & Industry, IAA

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Data

JIP Database 2011

Home > Data > current page

Printer Friendly

Data

- **JIP Database 2011**
  - JIP Database 2010
  - JIP Database 2009
  - JIP Database 2008
  - JIP Database 2006
- CIP Database 2011
- AMU and AMU Deviation Indicators
- JSTAR (Japanese Study of Aging and Retirement)
- RIETI-TID
- RIETI FDI Database 2010
  - RIETI FDI Database 2009
  - RIETI FDI Database 2006
- International Comparison of Productivity among Asian Countries (ICPA) Project

About The Japan Industrial Productivity Database 2011 (JIP Database 2011)

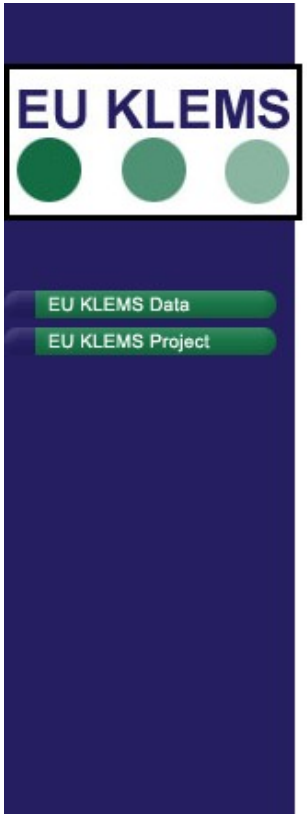
The Japan Industrial Productivity Database 2011 (JIP Database 2011) is an extended version of the JIP Database 2010 that was compiled in a collaborative effort between RIETI and Hitotsubashi University's Global COE Hi-Stat Program. It was developed under RIETI's East Asian Industrial Productivity project within the Raising Industrial and Firm Productivity program and Hitotsubashi University's research project titled "Research Unit for Statistical and Empirical Analysis in Social Sciences."

JIP 2011 comprises various types of annual data sets that are necessary for the estimation of sectoral total factor productivity (TFP) in the 108 industries, covering Japan's economy as a whole from 1970-2008. These data sets include annual data on sectoral capital service input indices and capital costs, labor service input indices by attribute and labor costs. They also include nominal and real production intermediate inputs and the results of growth accounting, which include the calculation of the rates of increase in TFP.

KIP and EU KLEMS

- EU KLEMS DB
  - March 2008 release (72 industries up to 2005)
  - Nov. 2009 release (32 industries up to 2007)

- Cooperation with EU KLEMS DB
  - KIP DB 2009 was sent to EU KLEMS
  - The latest DB (Nov. 2009 release) is available at http://www.euklems.net



EU KLEMS Growth and Productivity Accounts

Jump To NACE 1.1
March 2011 Update
72 industries up to 2007

Jump To NACE 2
Rolling Updates
35 industries

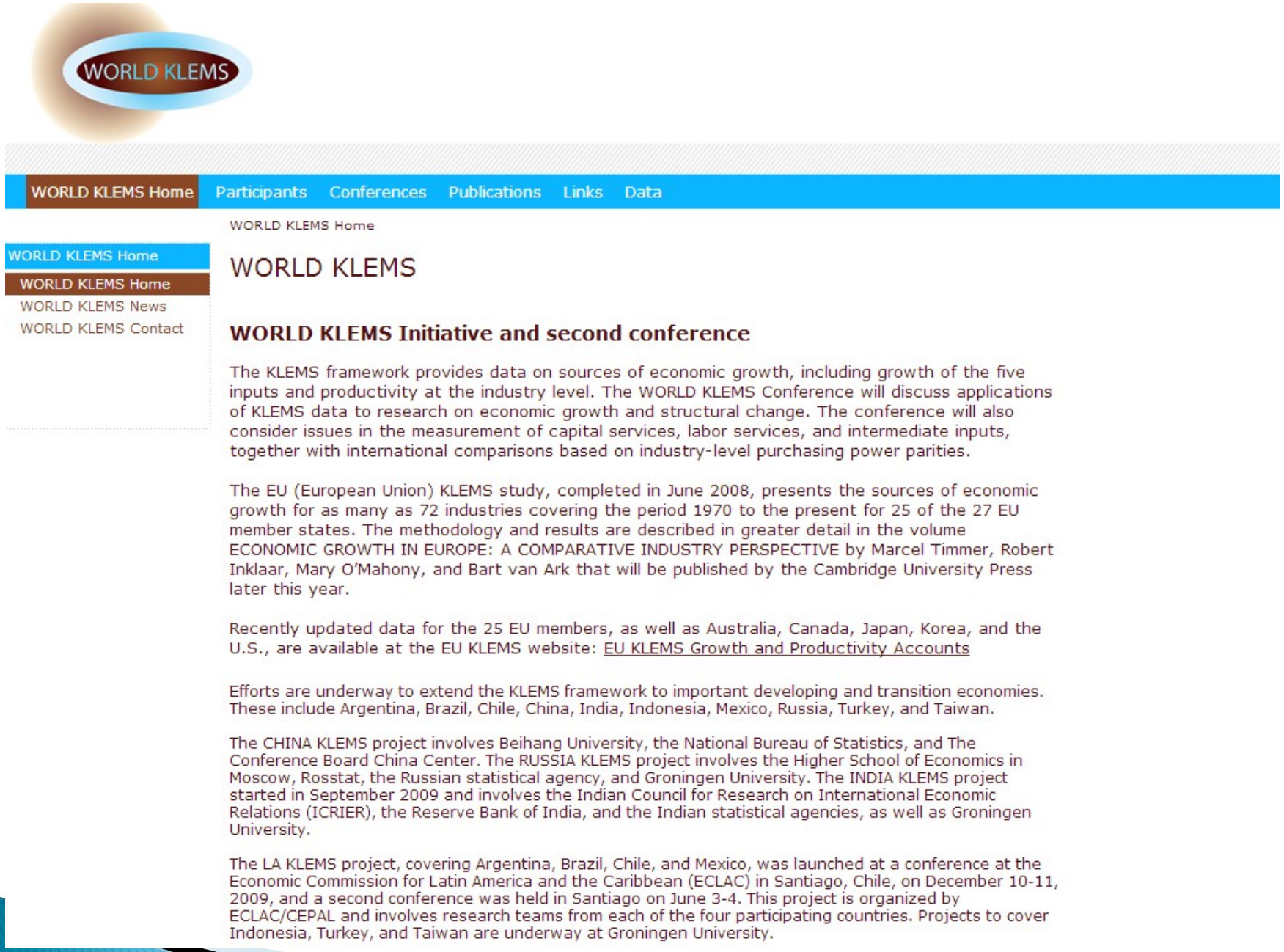
- The March 2011 release is an update of the November 2009 release. It provides data up to 2007, for a limited set of variables for 72 industries. The March 2008 release provides the most extended range of variables, but period coverage is limited to data up to 2005.
- The data in the NACE revision 2 classification is published on a rolling, country by country, basis. Data up to the most recent year available is included. Back-casts to the year 1970 are provided for most variables based on the March 2011 EU KLEMS data in NACE 1. More details can be found in the source documentation for each country.
- Additional EU KLEMS files for non-European countries can be found on the website of the World KLEMS initiative.

www.euklems.net

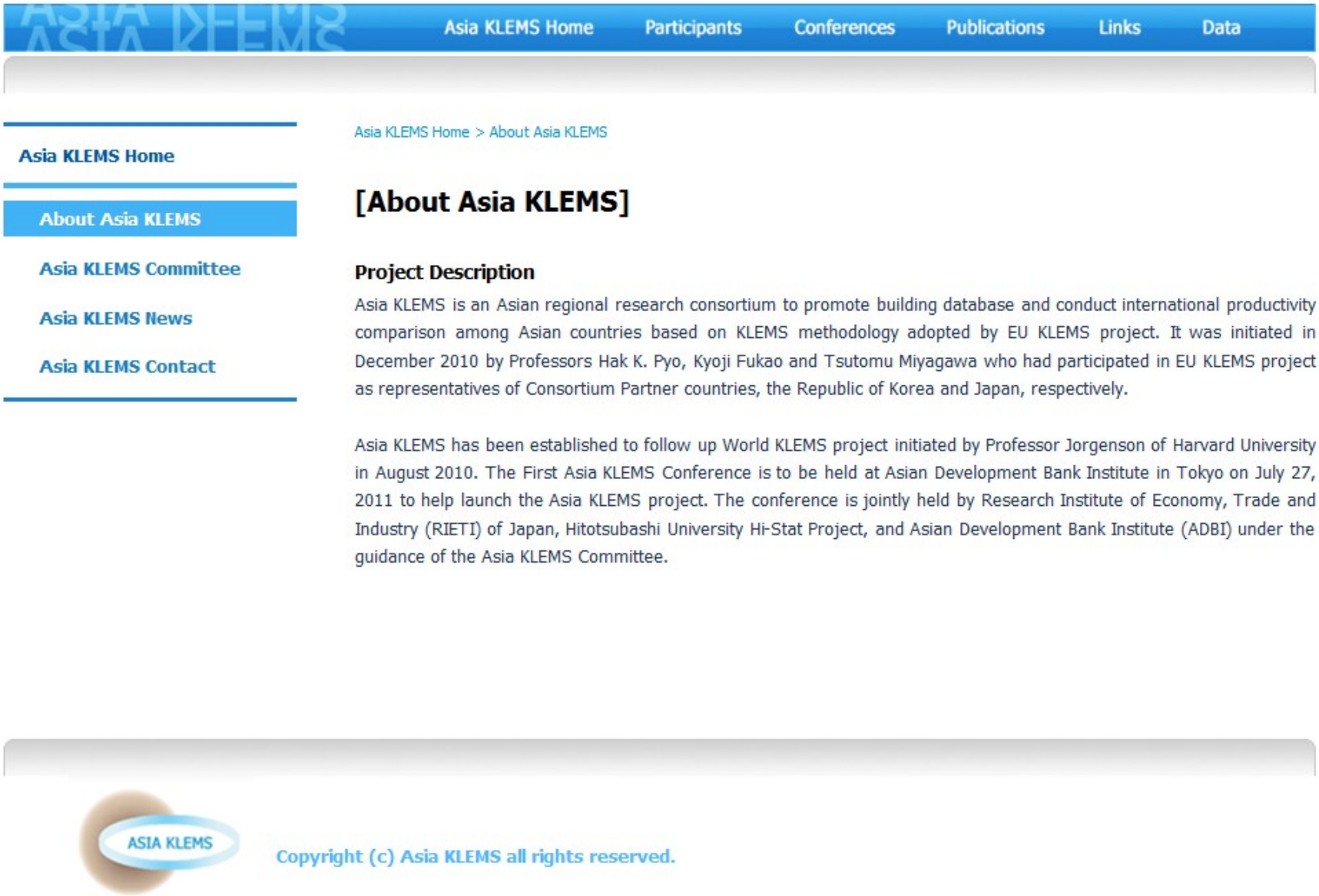
KIP, World KLEMS, and Asia KLEMS

- World KLEMS
  - Participated in the first & second World KLEMS conference (Harvard University, 2010 & 2012)
  - http://www.worldklems.net

- Asia KLEMS
  - Participating the first Asia KLEMS conference (Tokyo, 2011 and Seoul, 2012)
  - http://www.asiaklems.net



www.worldklems.net



www.asiaklems.net

KIP DB: Variables Construction

- Gross output (GO) and value-added (VA)
  - GO & VA from Bank of Korea (BOK)
  - Two datasets: 78(147) & 397(399) industries

- Intermediate Input
  - Use U & V tables to divide intermediate inputs into energy, materials, and purchased services (E,M,S)

KIP DB: Variables Construction

- Labor Input
  - Employment and Hours from Economically Active Population Survey (NSO), Survey Report on Wage Structure (MOL) and etc
  - Labor Compensation from National Accounts (BOK)
  - Labor Composition: 18 types = Gender(2) x Age (3) x Education (3) for 15 industries (incl. 6 MFG)

KIP DB: Variables Construction

- Capital Input
  - 1970–1997
    - National Wealth Survey (1968,1977,1987,1997)
  - 1998–2010
    - Modified Perpetual inventory method
    - Country-specific depreciation rates (Pyo et al., 2007)

Total Factor Productivity (TFP)

- Gross output

$$\Delta \ln MFP_{it} = \Delta \ln Y_{it} - \sum_{X=L,K,E,M,S} \bar{v}_{X,t} \Delta \ln X_{it}$$

- Value-added

$$\Delta \ln TFP_{it} = \Delta \ln V_{it} - \sum_{X=L,K} \bar{v}_{X,t} \Delta \ln X_{it}$$

KIP 72-Industry Classification

EUKLEMS	KIP	Industry
1	1	Agriculture
2	2	Forestry
B	3	Fishing
10	4	Mining of coal and lignite; extraction of peat
11	5	Extraction of crude petroleum and natural gas and services
12	6	Mining of uranium and thorium ores
13	7	Mining of metal ores
14	8	Other mining and quarrying
15	9	Food products and beverages
16	10	Tobacco products
17	11	Textiles
18	12	Wearing apparel, dressing and dying of fur
19	13	Leather, leather products and footwear
20	14	Wood and products of wood and cork
21	15	Pulp, paper and paper products
221	16	Publishing
22x	17	Printing and reproduction
23	18	Coke, refined petroleum products and nuclear fuel
244	19	Pharmaceuticals
24x	20	Chemicals excluding pharmaceuticals
25	21	Rubber and plastics products
26	22	Other non-metallic mineral products
27	23	Basic metals
28	24	Fabricated metal products

KIP 72-Industry Classification

EUKLEMS	KIP	Industry
29	25	Machinery, nec
30	26	Office, accounting and computing machinery
313	27	Insulated wire
31x	28	Other electrical machinery and apparatus nec
321	29	Electronic valves and tubes
322	30	Telecommunication equipment
323	31	Radio and television receivers
331t3	32	Scientific instruments
334t5	33	Other instruments
34	34	Motor vehicles, trailers and semi-trailers
351	35	Building and repairing of ships and boats
353	36	Aircraft and spacecraft
35x	37	Railroad equipment and transport equipment nec
36	38	Manufacturing nec
37	39	Recycling
40x	40	Electricity supply
402	41	Gas supply
41	42	Water supply
F	43	Construction
50	44	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel
51	45	Wholesale trade and commission trade, except of motor vehicles and motorcycles
52	46	Retail trade, except of motor vehicles and motorcycles; repair of household goods
H	47	Hotels and restaurants
60	48	Inland transport

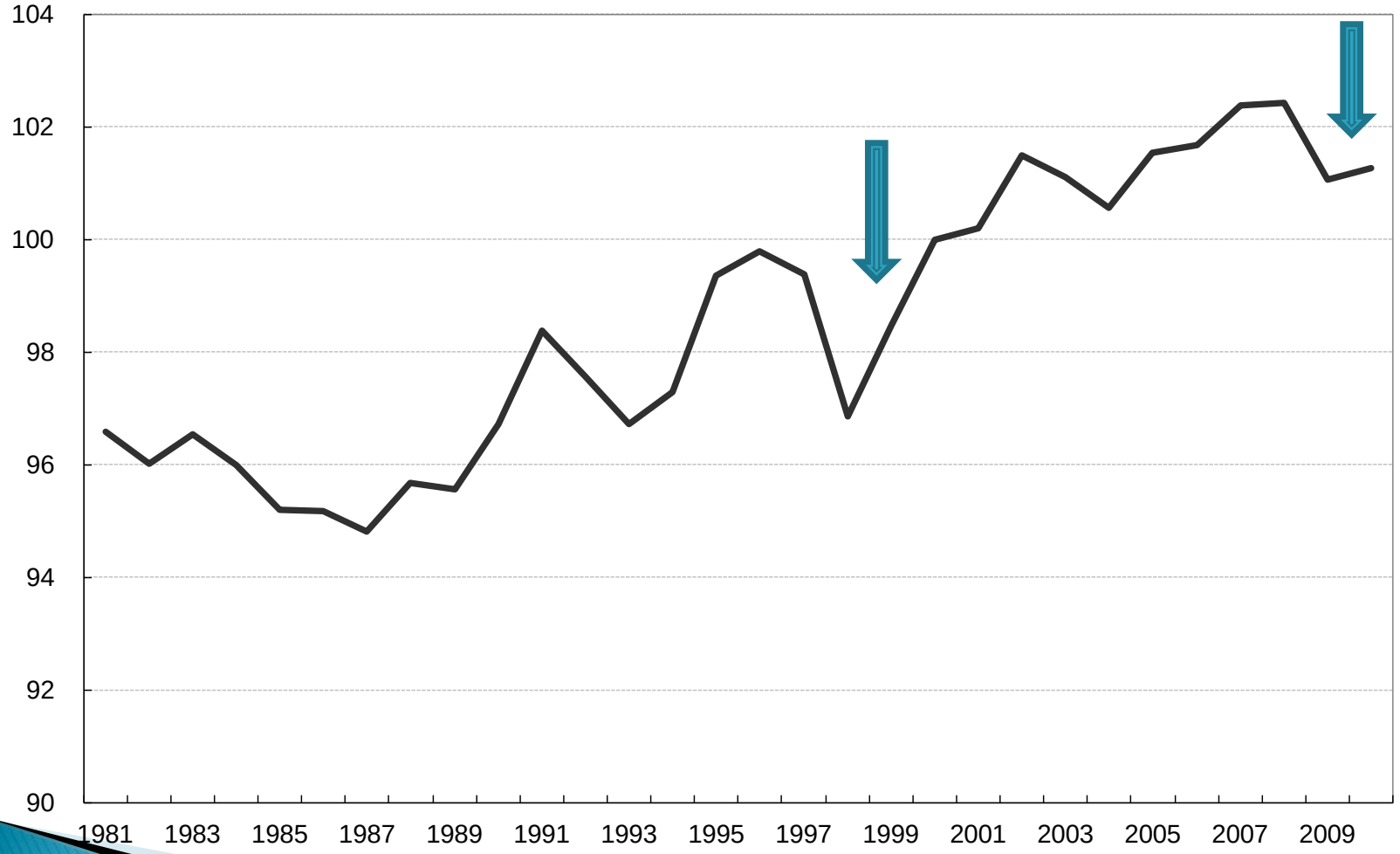
KIP 72-Industry Classification

EUKLEMS	KIP	Industry
61	49	Water transport
62	50	Air transport
63	51	Supporting and auxiliary transport activities; activities of travel agencies
64	52	Post and telecommunications
65	53	Financial intermediation, except insurance and pension funding
66	54	Insurance and pension funding, except compulsory social security
67	55	Activities related to financial intermediation
70imp	56	Imputation of owner occupied rents
70x	57	Other real estate activities
71	58	Renting of machinery and equipment
72	59	Computer and related activities
73	60	Research and development
741t4	61	Legal, technical and advertising
745t8	62	Other business activities, nec
L	63	Public admin and defence, compulsory social security
M	64	Education
N	65	Health and social work
90	66	Sewage and refuse disposal, sanitation and similar activities
91	67	Activities of membership organizations nec
921t2	68	Media activities
923t7	69	Other recreational activities
93	70	Other service activities
P	71	Private households with employed persons
Q	72	Extra territorial organizations and bodies

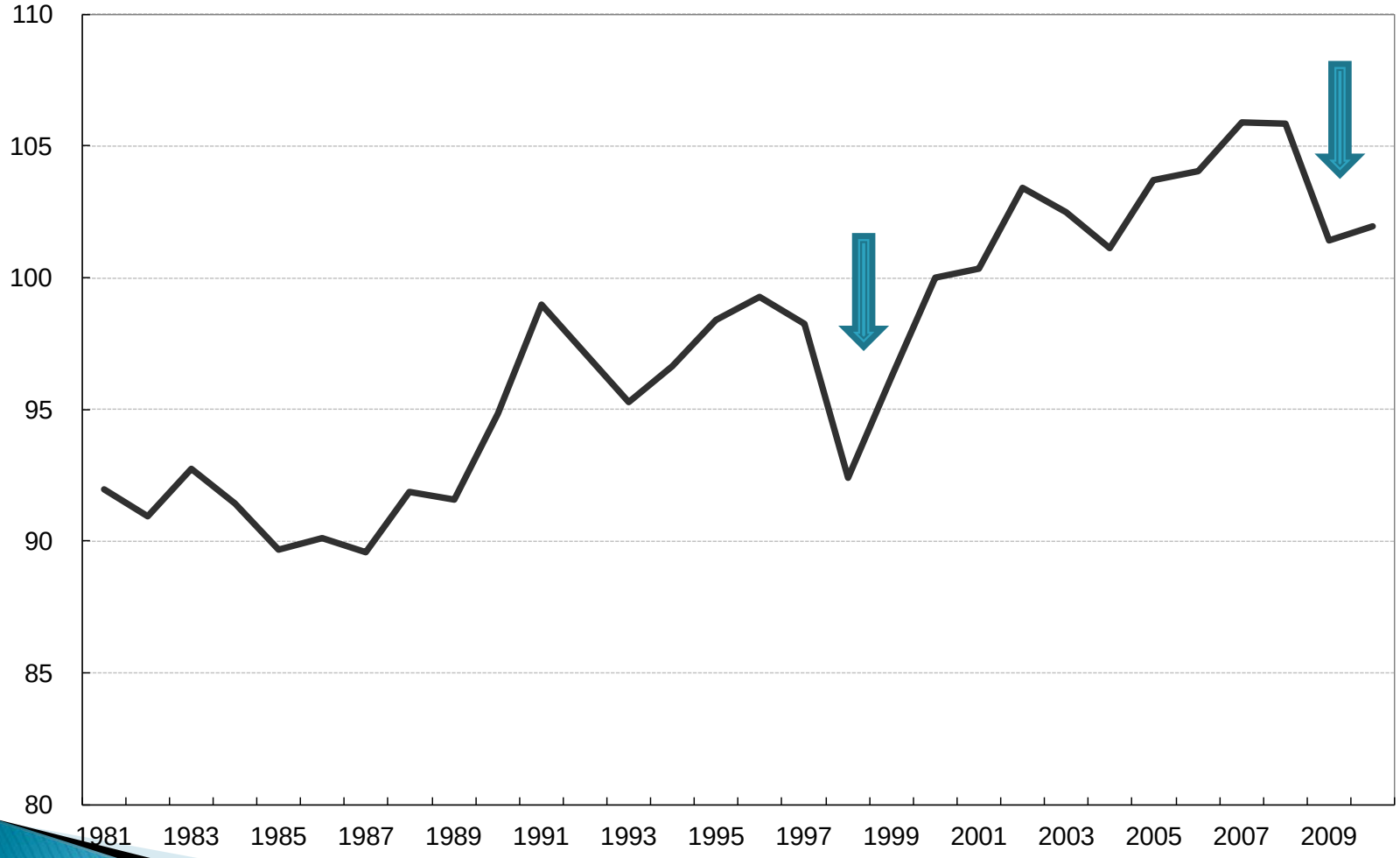
Findings from KIP2012

- In 2010, the output growth rate jumped, but the TFP growth rate slightly increased.
  - In 2010, the value-added output growth rate is about 6.1%, but the TFPV growth rate is only 0.53%.
  - Contrast to the quick TFP recovery in the 1998 Asian financial crisis.
- Weak TFP recovery is due to the weak TFP recovery n the service sector

Weak recovery in TFP in 2010 (Gross output TFP level; 2000=1)



Weak recovery in TFP in 2010 (value-added TFP level; 2000=1)



KIP DB in Next 3 Years

- Synchronization with the BOK National Accounts
- Reclassification of industry codes
  - ISIC rev 3 to ISC rev 4
- Incorporating intangibles as investment
  - R&D expenditures as investment

ISIC Rev. 4/NACE Rev. 2

Section	Divisions	Description
A	01–03	Agriculture, forestry and fishing
B	05–09	Mining and quarrying
C	10–33	Manufacturing
D	35	Electricity, gas, steam and air conditioning supply
E	36–39	Water supply; sewerage, waste management and remediation activities
F	41–43	Construction
G	45–47	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	49–53	Transportation and storage
I	55–56	Accommodation and food service activities
J	58–63	Information and communication
K	64–66	Financial and insurance activities
L	68	Real estate activities
M	69–75	Professional, scientific and technical activities
N	77–82	Administrative and support service activities
O	84	Public administration and defence; compulsory social security
P	85	Education
Q	86–88	Human health and social work activities
R	90–93	Arts, entertainment and recreation
S	94–96	Other service activities
T	97–98	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
U	99	Activities of extraterritorial organizations and bodies

NACE Rev. 1.1 versus NACE Rev. 2

NACE Rev. 1.1		NACE Rev. 2	
Section	**Description**	**Section**	**Description**
A	Agriculture, hunting and forestry	A	Agriculture, forestry and fishing
B	Fishing		
C	Mining and quarrying	B	Mining and quarrying
D	Manufacturing	C	Manufacturing
E	Electricity, gas and water supply	D E	Electricity, gas, steam and air conditioning supply Water supply, sewerage, waste management and remediation activities
F	Construction	F	Construction
G	Wholesale and retail trade: repair of motor vehicles, motorcycles and personal and household goods	G	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	Hotels and restaurants	I	Accommodation and food service activities
I	Transport, storage and communications	H J	Transportation and storage Information and communication
J	Financial intermediation	K	Financial and insurance activities
K	Real estate, renting and business activities	L M N	Real estate activities Professional, scientific and technical activities Administrative and support service activities
L	Public administration and defence; compulsory social security	O	Public administration and defence; compulsory social security
M	Education	P	Education
N	Health and social work	Q	Human health and social work activities
O	Other community, social and personal services activities	R S	Arts, entertainment and recreation Other service activities
P	Activities of private households as employers and undifferentiated production activities of private households	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
Q	Extraterritorial organisations and bodies	U	Activities of extraterritorial organisations and bodies

EU KLEMS 2012:
35 Industries based on NACE2

Description	Code
TOTAL INDUSTRIES	TOT
AGRICULTURE, FORESTRY AND FISHING	A
MINING AND QUARRYING	B
TOTAL MANUFACTURING	C
Food products, beverages and tobacco	10-12
Textiles, wearing apparel, leather and related products	13-15
Wood and paper products; printing and reproduction of recorded media	16-18
Coke and refined petroleum products	19
Chemicals and chemical products	20-21
Rubber and plastics products, and other non-metallic mineral products	22-23
Basic metals and fabricated metal products, except machinery and equipment	24-25
Electrical and optical equipment	26-27
Machinery and equipment n.e.c.	28
Transport equipment	29-30
Other manufacturing; repair and installation of machinery and equipment	31-33
ELECTRICITY, GAS AND WATER SUPPLY	D-E
CONSTRUCTION	F

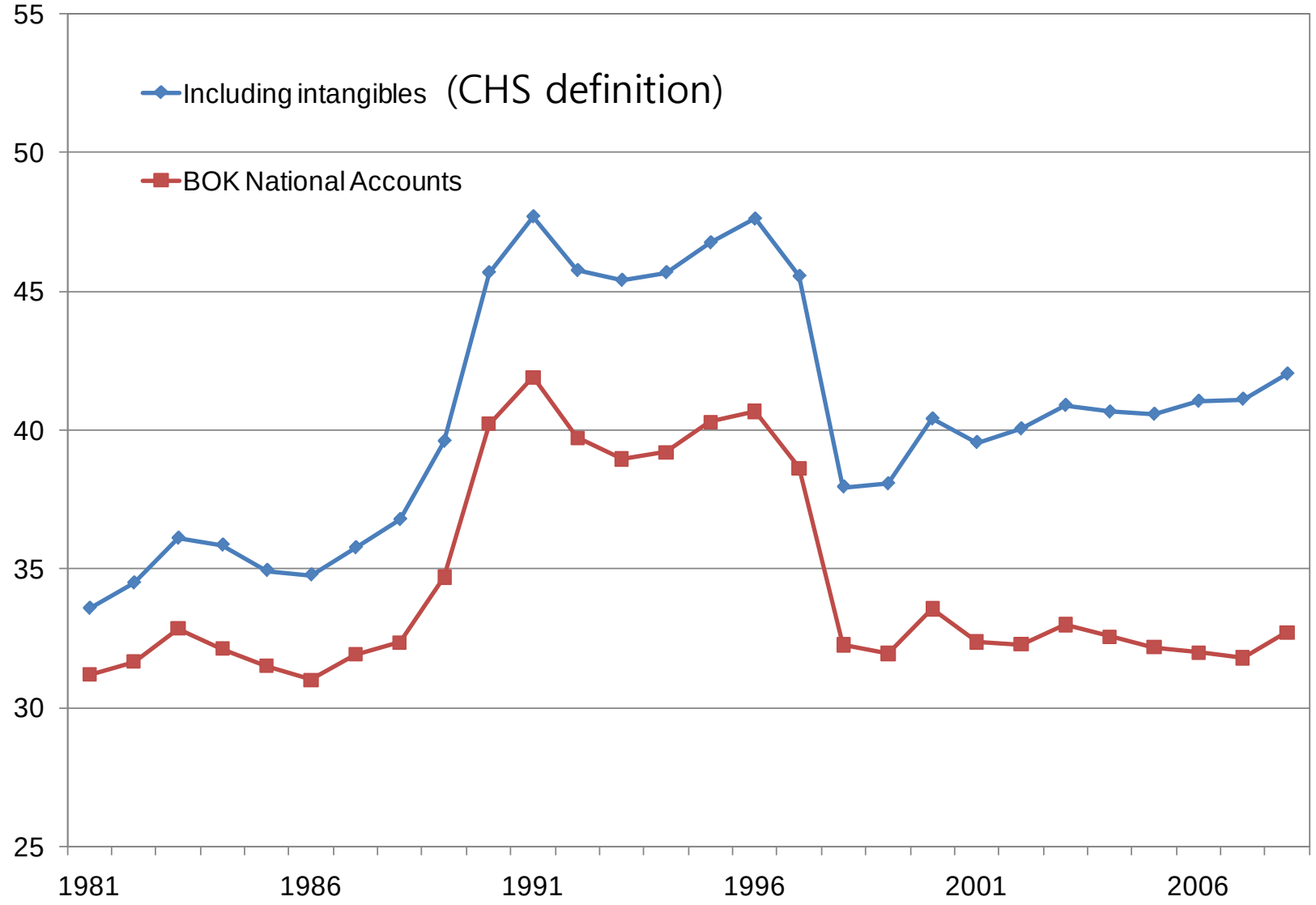
Description	Code
WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	G
Wholesale and retail trade and repair of motor vehicles and motorcycles	45
Wholesale trade, except of motor vehicles and motorcycles	46
Retail trade, except of motor vehicles and motorcycles	47
TRANSPORTATION AND STORAGE	H
Transport and storage	49-52
Postal and courier activities	53
ACCOMMODATION AND FOOD SERVICE ACTIVITIES	I
INFORMATION AND COMMUNICATION	J
Publishing, audiovisual and broadcasting activities	58-60
Telecommunications	61
IT and other information services	62-63
FINANCIAL AND INSURANCE ACTIVITIES	K
REAL ESTATE ACTIVITIES	L
PROFESSIONAL, SCIENTIFIC, TECHNICAL, ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	M-N
COMMUNITY SOCIAL AND PERSONAL SERVICES	O-U
Public administration and defence; compulsory social security	O
Education	P
Health and social work	Q
ARTS, ENTERTAINMENT, RECREATION AND OTHER SERVICE ACTIVITIES	R-S
Arts, entertainment and recreation	R
Other service activities	S
Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	T
Activities of extraterritorial organizations and bodies	U

R&D as Invesment

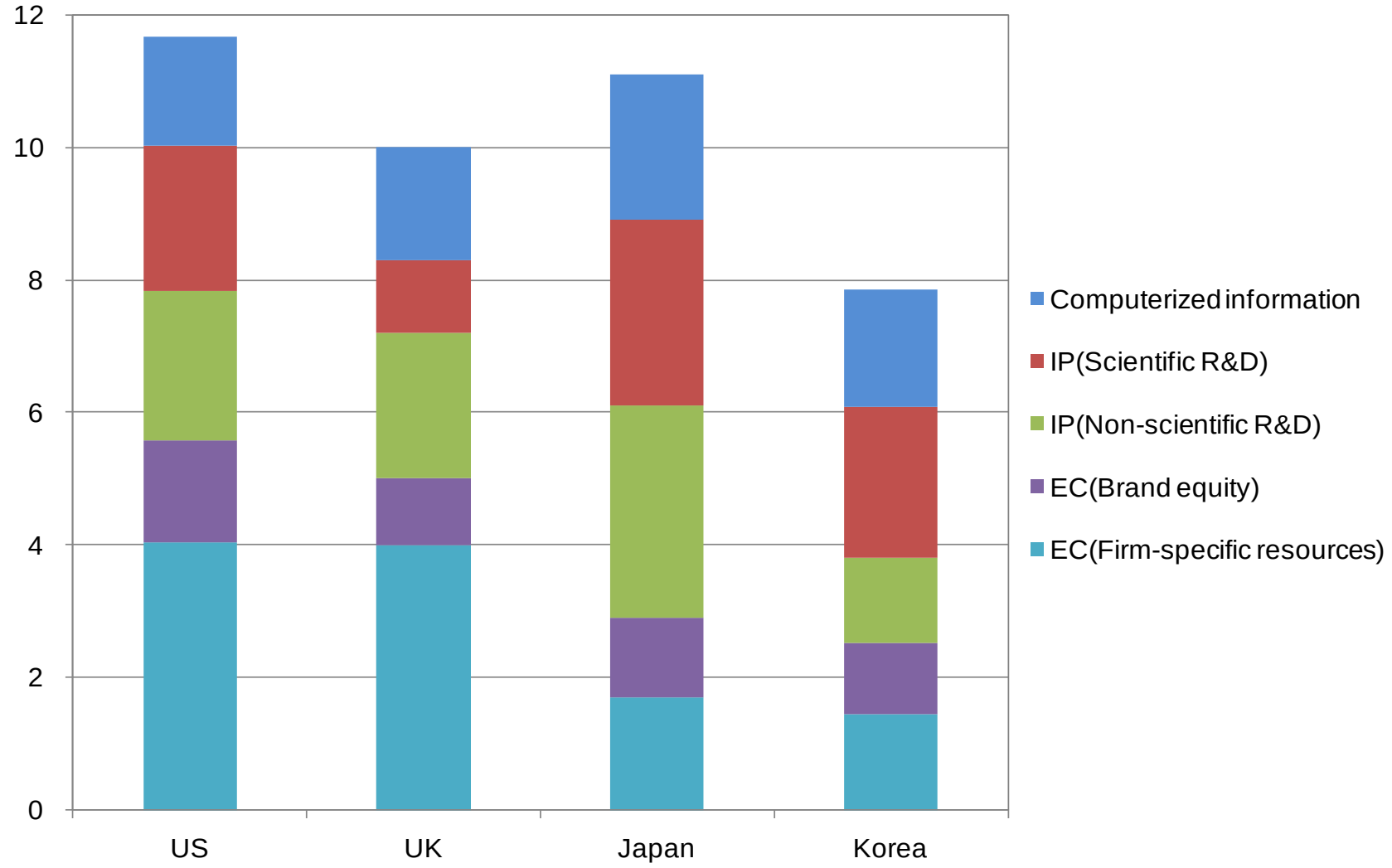
- 2008 SNA treats R&D expenditures as investment
- BOK has a plan to include R&D as intangible investment by **2014**
- **R&D expenditure as a paercentage of GDP in 2011 is about 4.03%**

R&D as a Percentage of GDP

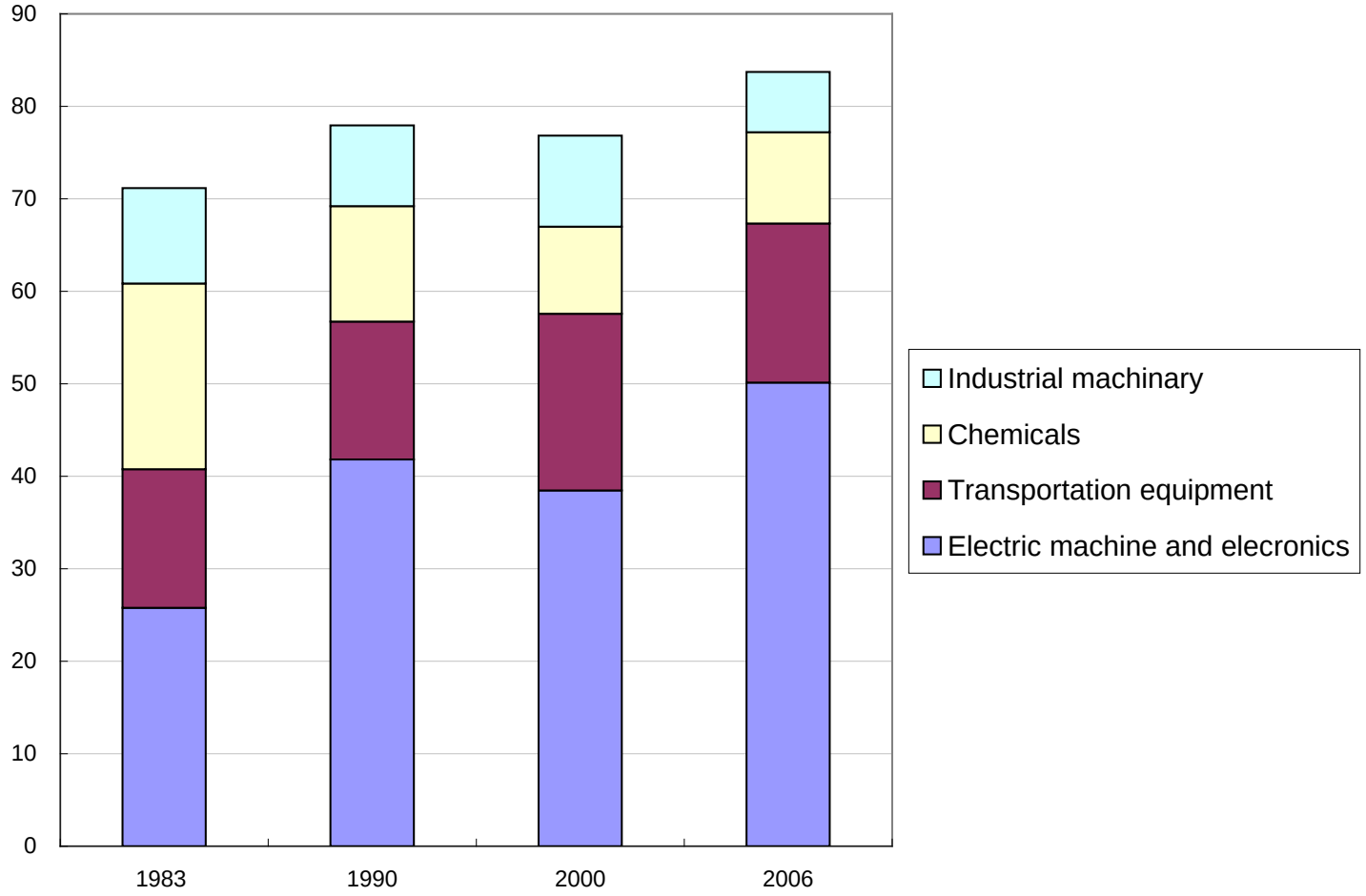
Investments as percentages of of GDP in Korea, 1981-2008



Share of CHS Intangible Investment in GDP: US, UK, Japan, and Korea



The Share of 4 R&D Intensive Industries as a Percentage of Total Industrial R&D



International Comparison

- Data
  - KIP 2012 (1981-2010)
  - EUKLEMS Nov. 2009 release (1981-2007)

- Output and TFP measure
  - Value-added, labor (hours and composition), capital, and TFP

International Comparison

- Countries
  - Korea, 1981-2007
  - USA, 1981-2007
  - Japan, 1981-2006
  - EU15EX, 1981-2007
- Industries
  - 30 industries
  - 2 AGR/MIN,13 MFG, 2 UTL/CST,13 SER

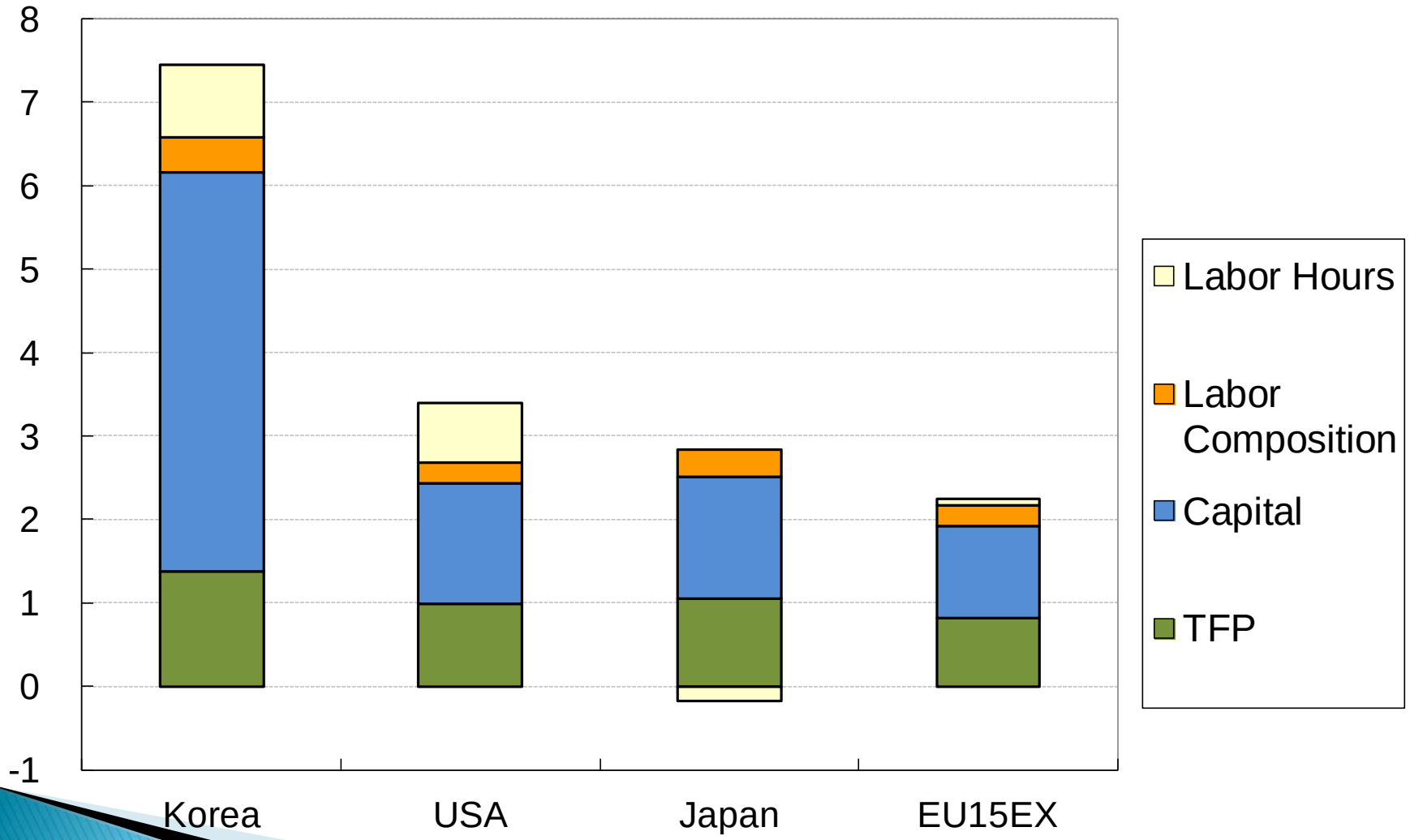
30-Industry Classification

30 IND	EUKLEMS	Industry Name	MFG/SER
1	AtB	Agriculture, hunting, forestry and fishing	
2	C	Mining and quarrying	
3	15t16	Food , beverages and tobacco	MFG
4	17t19	Textiles, textile , leather and footwear	MFG
5	20	Wood and of wood and cork	MFG
6	21t22	Pulp, paper, paper , printing and publishing	MFG
7	23	Coke, refined petroleum and nuclear fuel	MFG
8	24	Chemicals and chemical	MFG
9	25	Rubber and plastics	MFG
10	26	Other non-metallic mineral	MFG
11	27t28	Basic metals and fabricated metal	MFG
12	29	Machinery, nec	MFG
13	30t33	Electrical and optical equipment	MFG
14	34t35	Transport equipment	MFG
15	36t37	Manufacturing nec; recycling	MFG

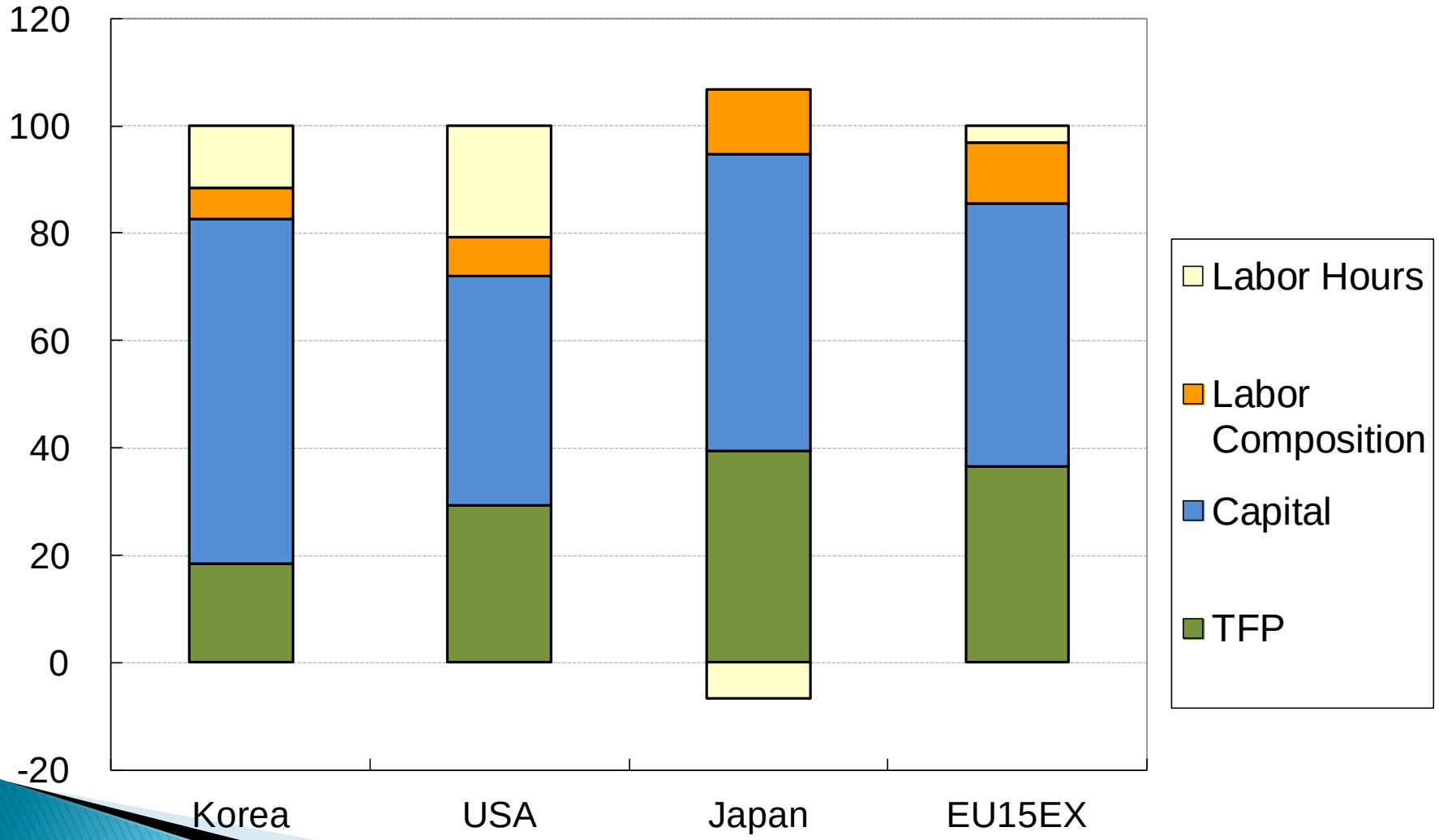
30-Industry Classification

30 IND	EUKLEMS	Industry Name	MFG/SER
16	E	Electricity, gas and water supply	
17	F	Construction	
18	50	Sale, maintenance and repair of motor vehicles	SER
19	51	Wholesale trade and commission trade	SER
20	52	Retail trade	SER
21	H	Hotels and restaurants	SER
22	60t63	Transport and storage	SER
23	64	Post and telecommunications	SER
24	J	Financial intermediation	SER
25	**70**	**Real estate activities**	**Non-Mkt SER**
26	71t74	Renting of m&eq and other business activities	SER
27	**L**	**Public admin&defence; compul. social security**	**Non-Mkt SER**
28	**M**	**Education**	**Non-Mkt SER**
29	**N**	**Health and social work**	**Non-Mkt SER**
30	O	Other community, social and personal services	SER

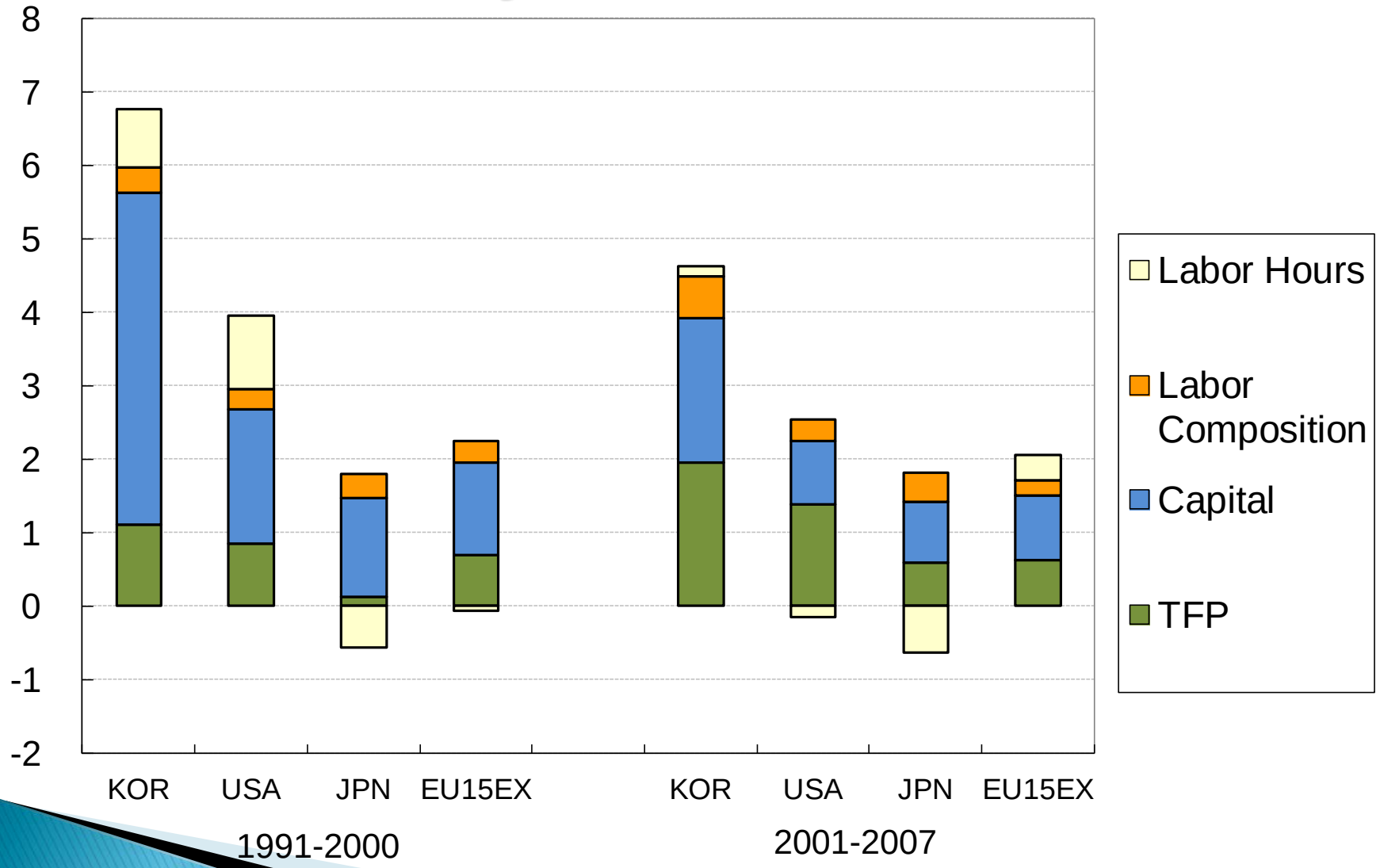
Output Growth and Contributions, Market Economy, 1981-2007



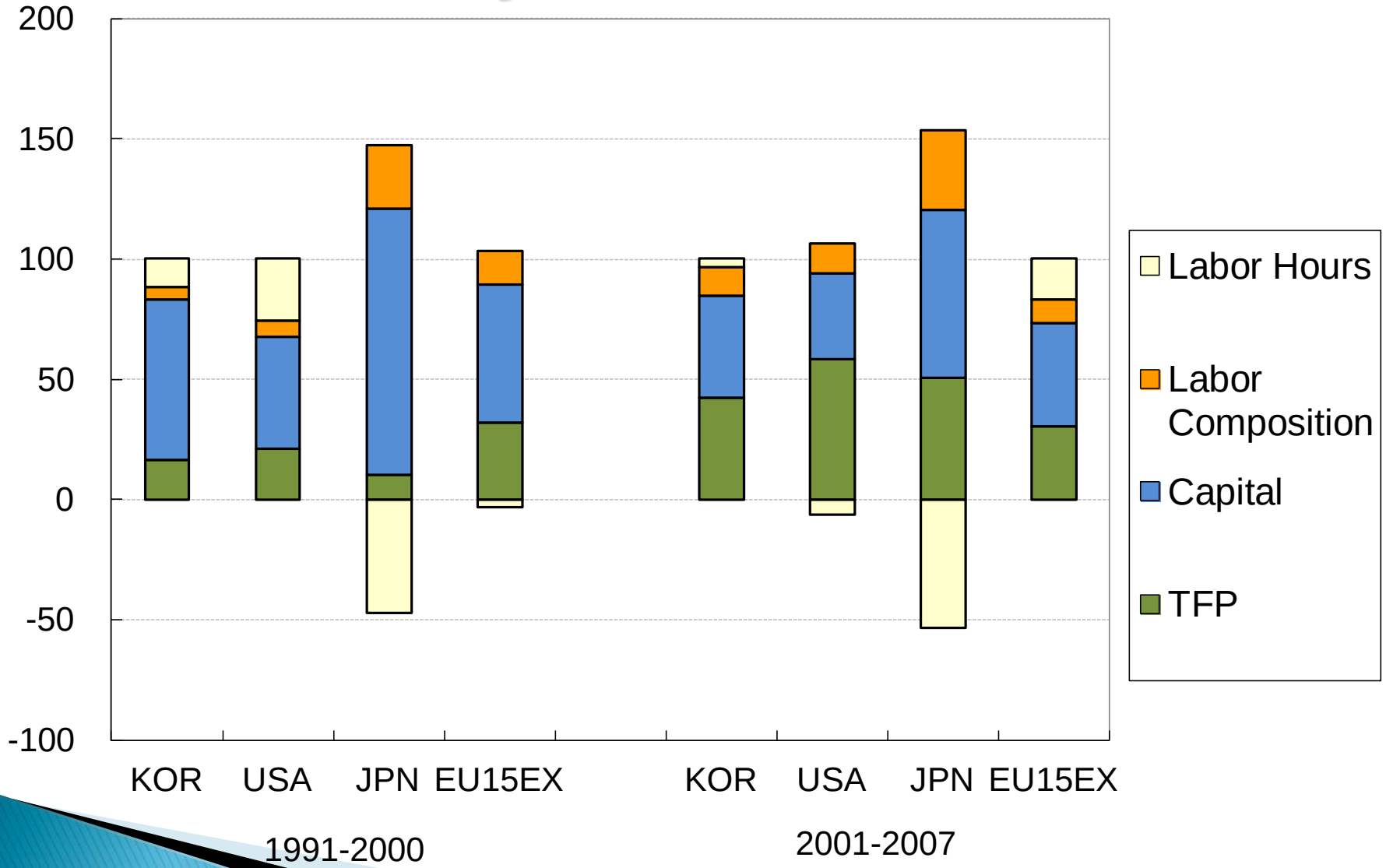
Contributions to Output Growth, Market Economy, 1981-2007



Output Growth and Contributions, Market Economy, 1991-2000 vs. 2001-2007



Contributions to Output Growth, Market Economy, 1991-2000 vs. 2001-2007



TFP Growth Rates, 1991-2000 vs. 2001-2007

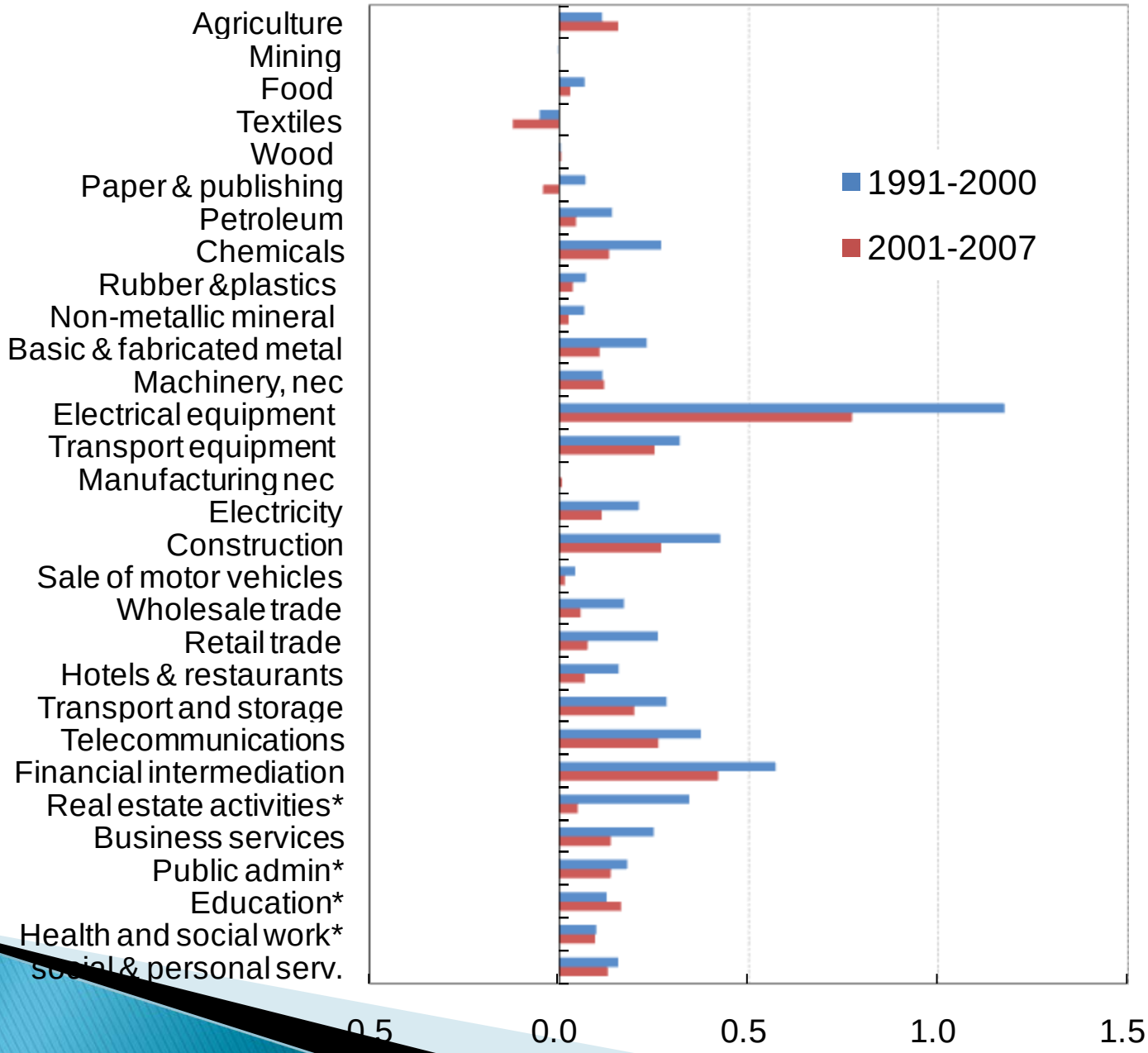
	MFG	SER			MKT	TOT
		MKT	NonMKT	TOT		
1991-2000						
KOR	4.45	-0.32	-0.85	-0.60	1.10	0.64
USA	2.39	0.38	-1.10	-0.26	0.84	0.22
JPN	0.57	0.78	-0.78	0.21	0.12	-0.09
EU15EX	1.41	0.26	0.28	0.27	0.69	0.57
2001-2007						
KOR	3.75	1.30	-5.94	-1.55	1.95	0.49
USA	3.61	1.55	-0.39	0.72	1.39	0.39
JPN	0.68	0.67	-0.51	0.21	0.59	0.58
EU15EX	1.73	0.34	-0.26	0.09	0.62	0.65

Industry Contribution to Aggregate Output and TFP Growth

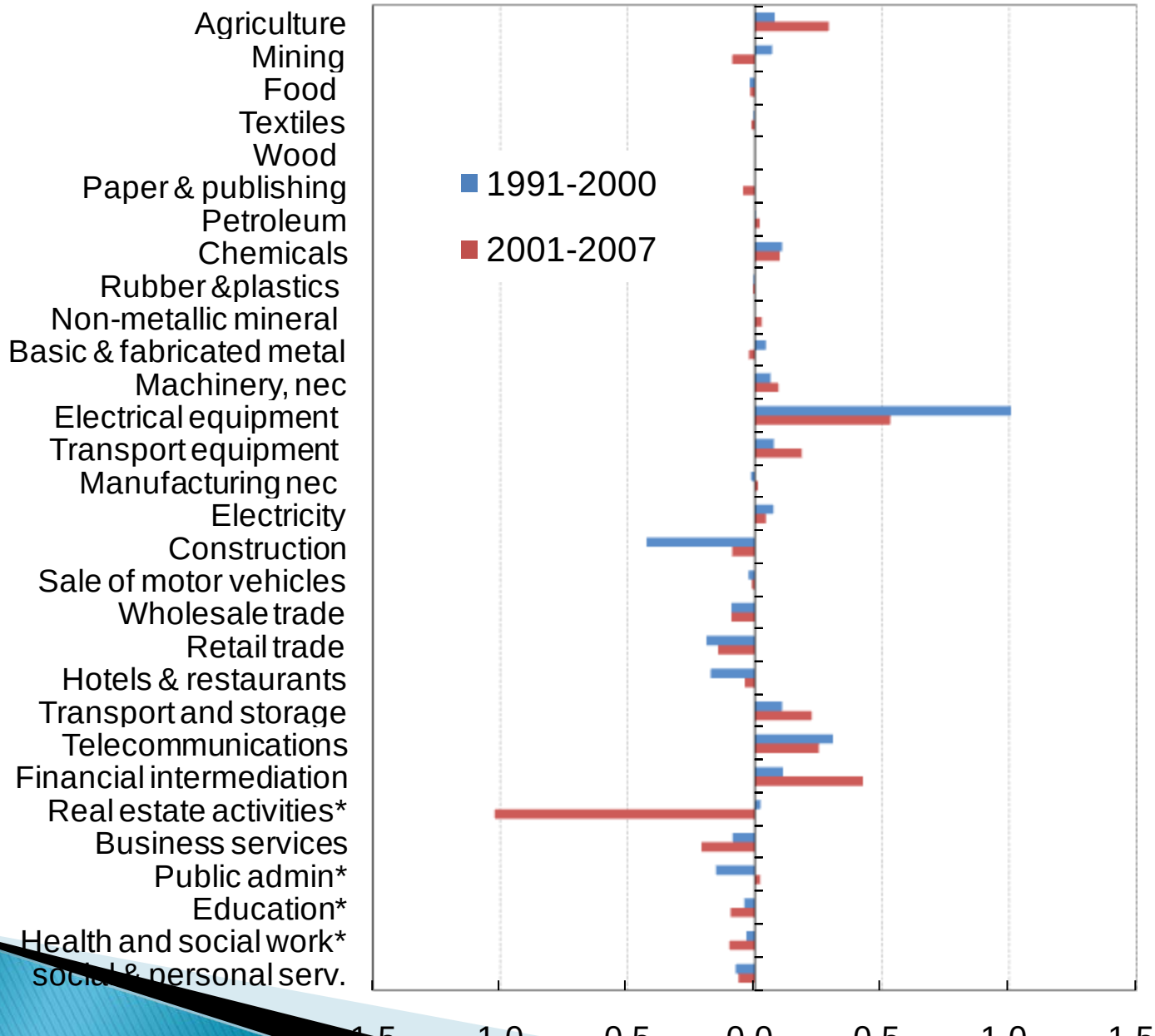
- Data
  - 30 industry-level data
  - Korea, USA, Japan, EU15EX
  - 1991-2000 and 2001-2007

- Industry contribution measures
  - Both output and TFP growth contributions are weighted by industry nominal value-added

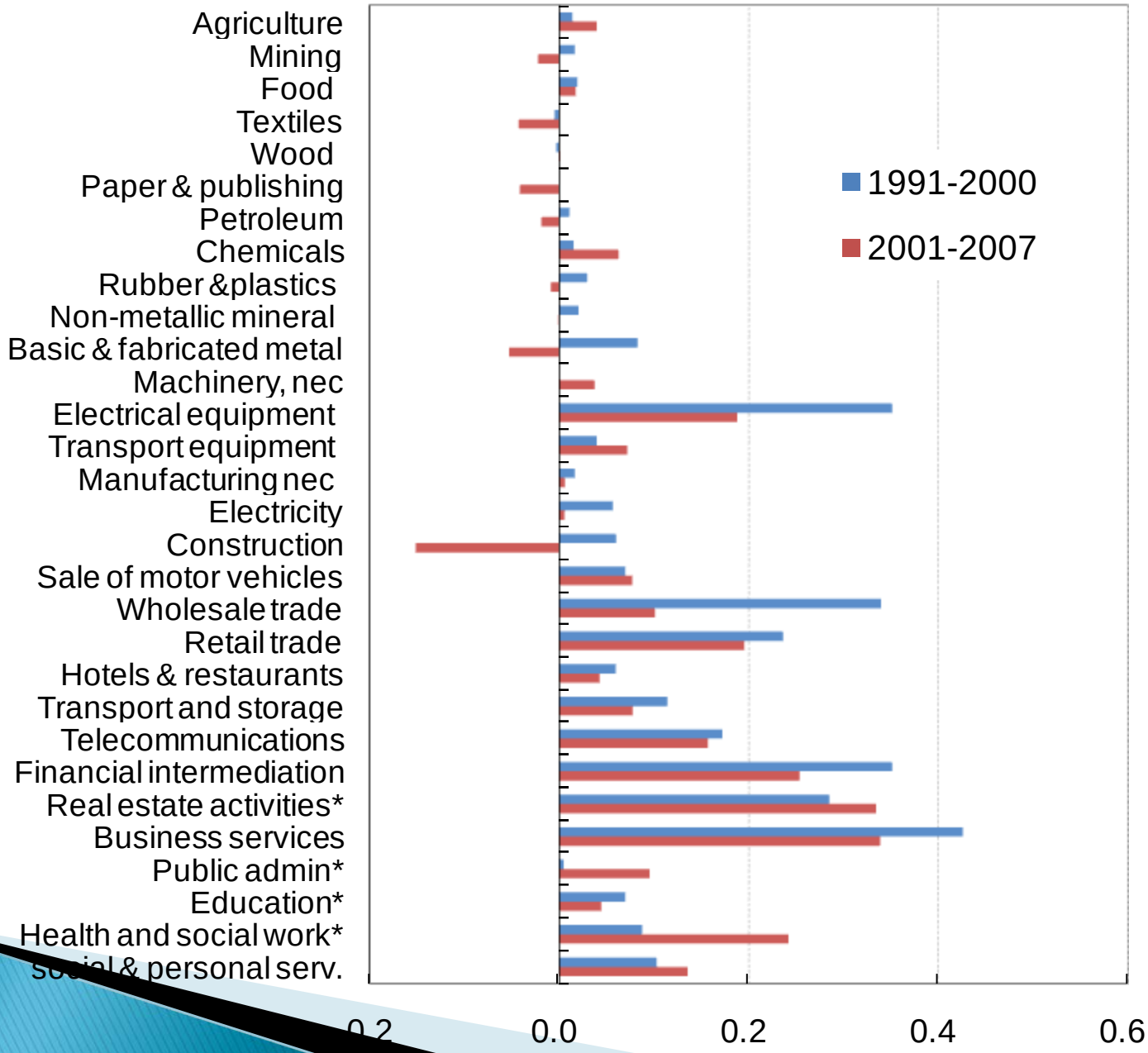
Industry Contributions to Output Growth in the Total Economy, Korea, 1991-2000 vs. 2001-2007



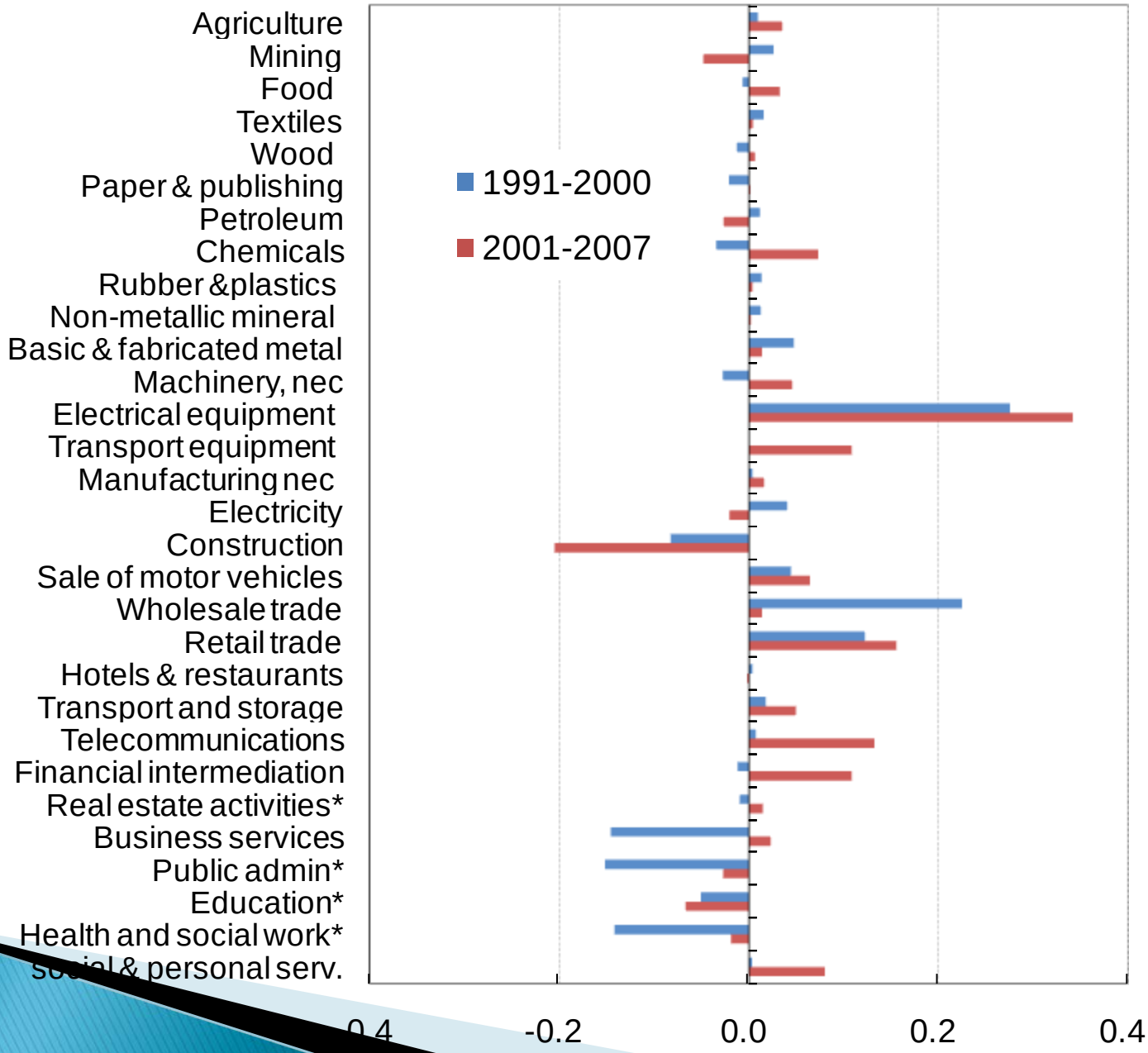
Industry Contributions to TFP Growth in the Total Economy, Korea, 1991-2000 vs. 2001-2007



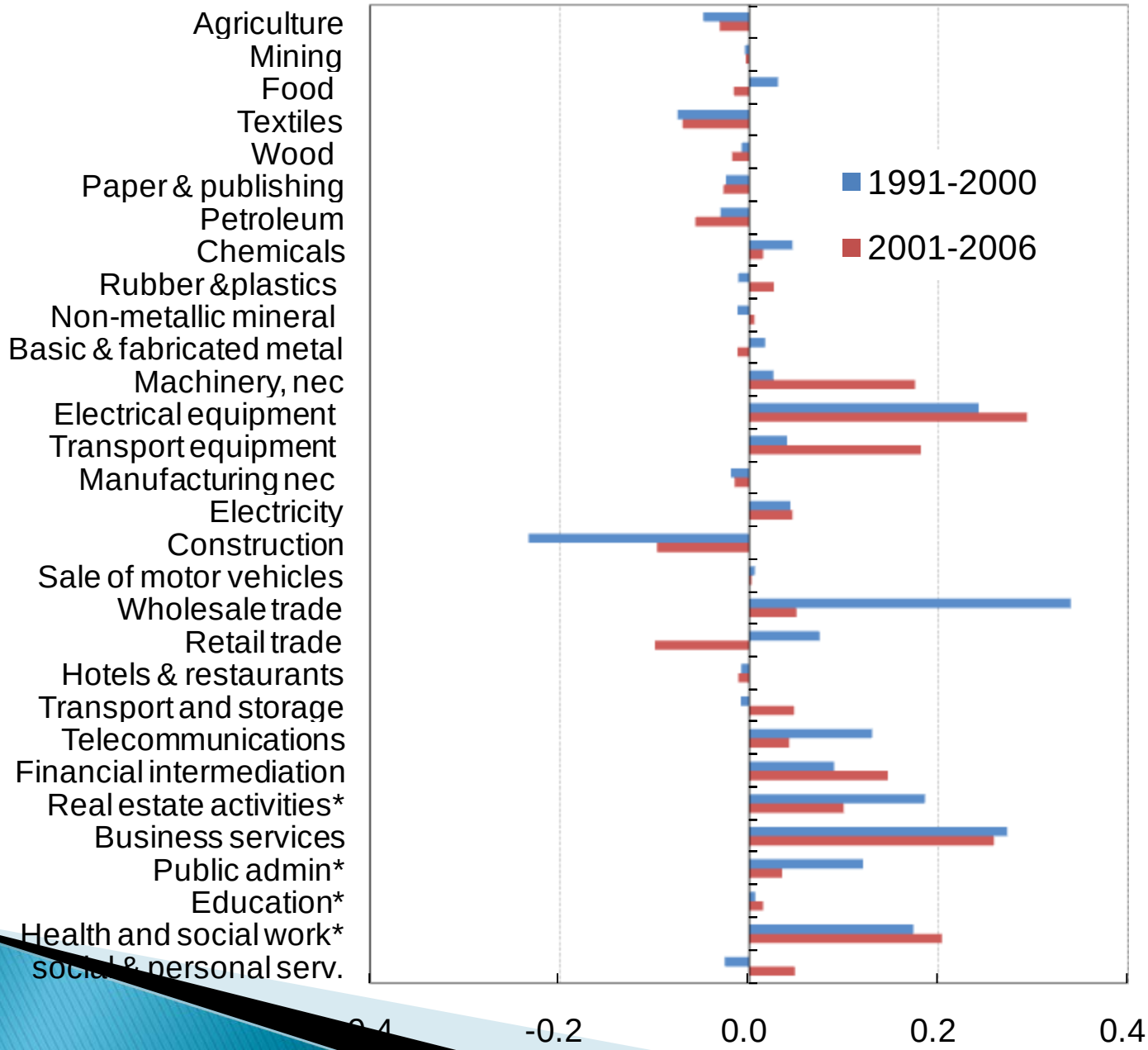
Industry Contributions to Output Growth in the **Total Economy**, **USA**, 1991-2000 vs. 2001-2007



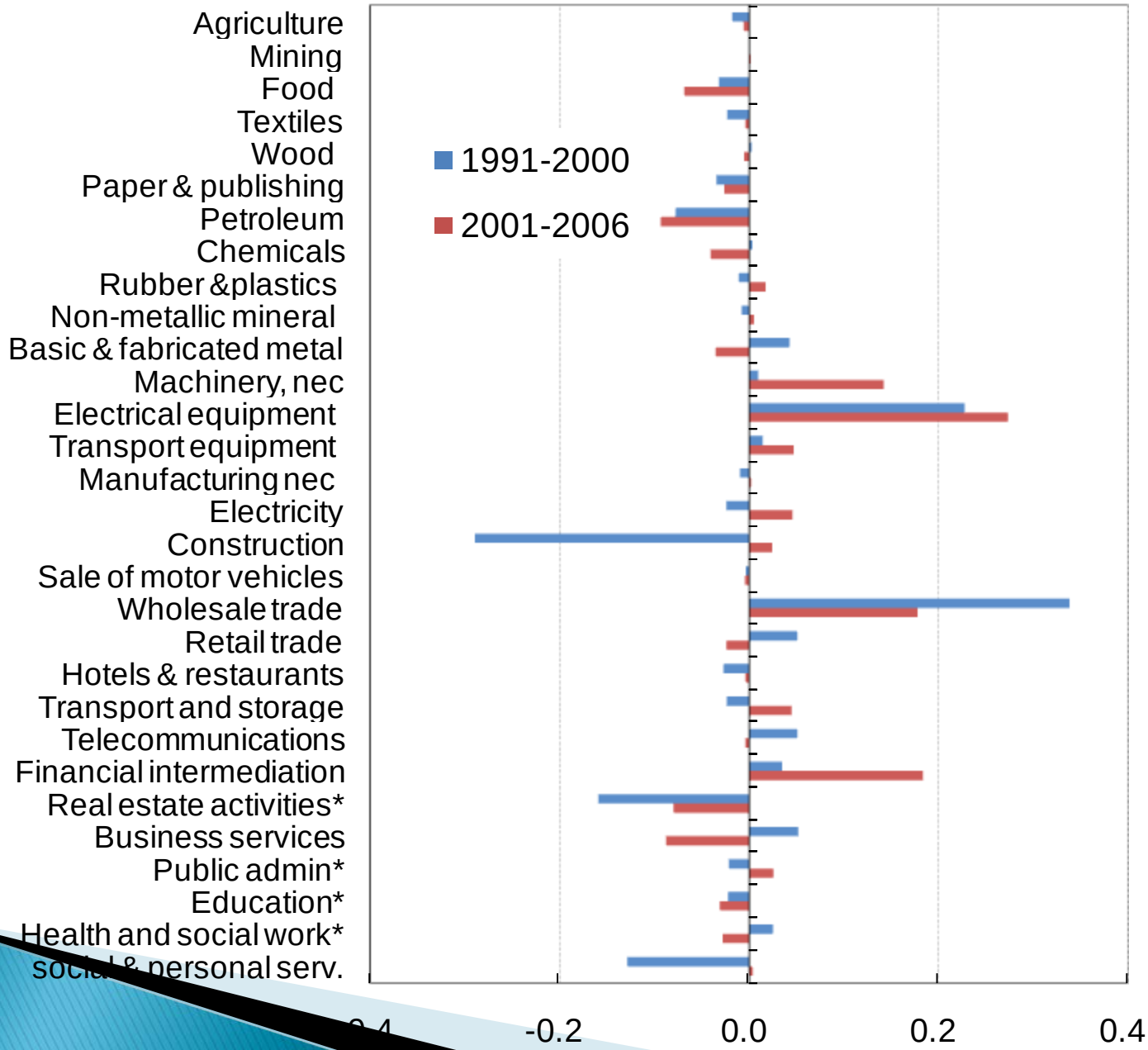
Industry Contributions to TFP Growth in the Total Economy, USA, 1991-2000 vs. 2001-2007



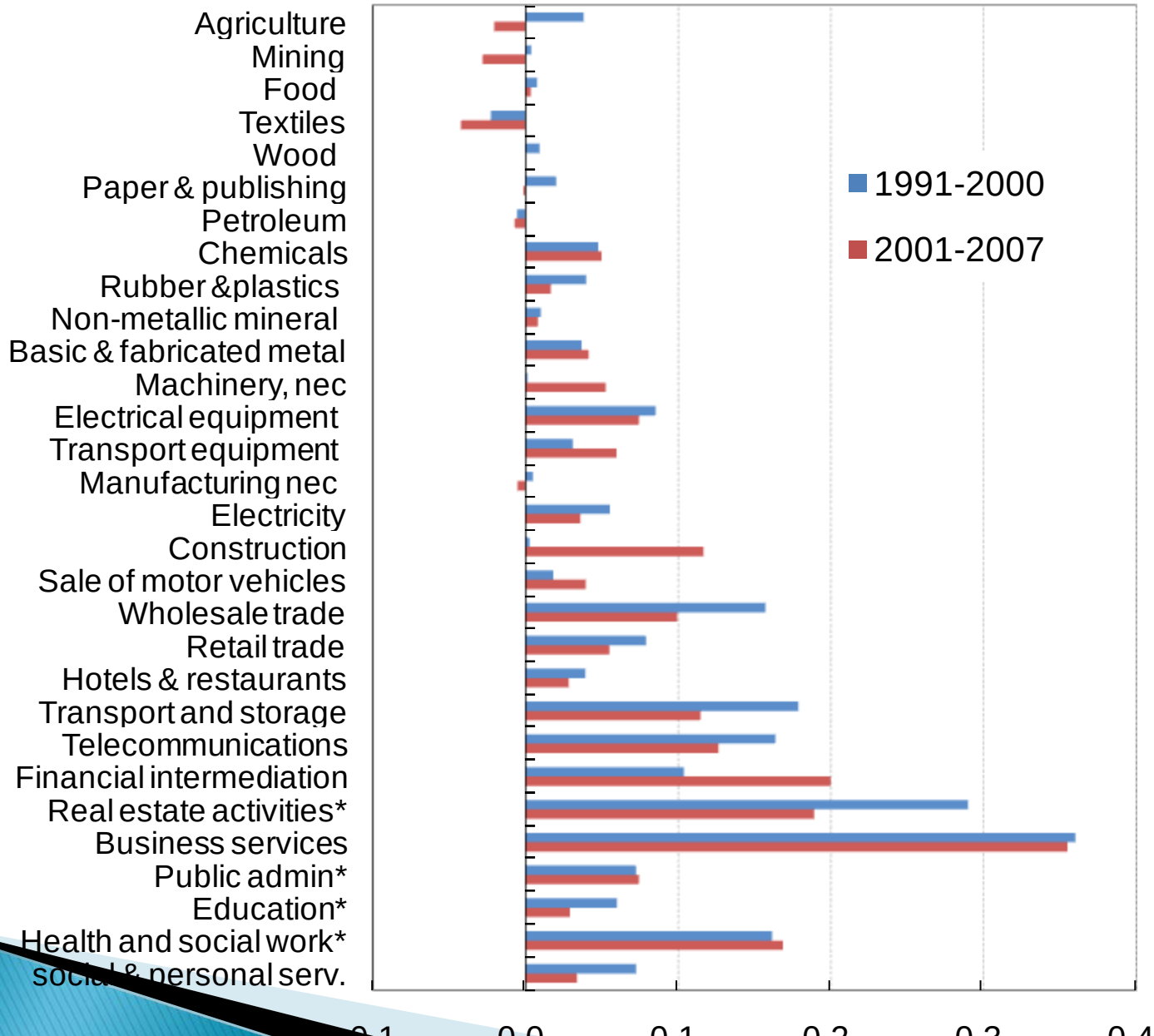
Industry Contributions to Output Growth in the Total Economy, Japan, 1991-2000 vs. 2001-2006



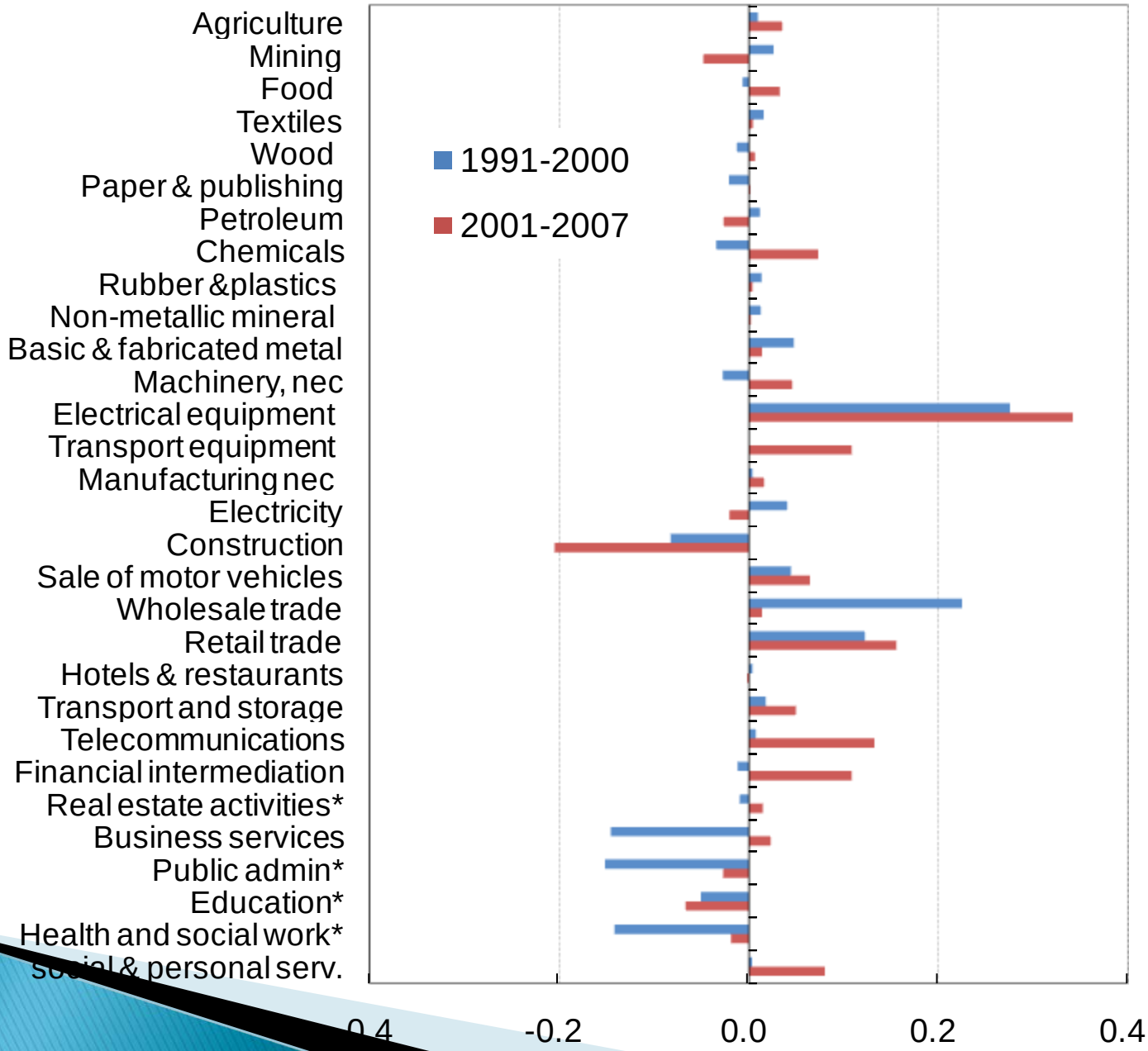
Industry Contributions to TFP Growth in the Total Economy, Japan, 1991-2000 vs. 2001-2006



Industry Contributions to Output Growth in the **Total Economy**, EU15EX, 1991-2000 vs. 2001-2007



Industry Contributions to TFP Growth in the Total Economy, EU15EX, 1991-2000 vs. 2001-2007



TFP Growth Slowdown in Korea

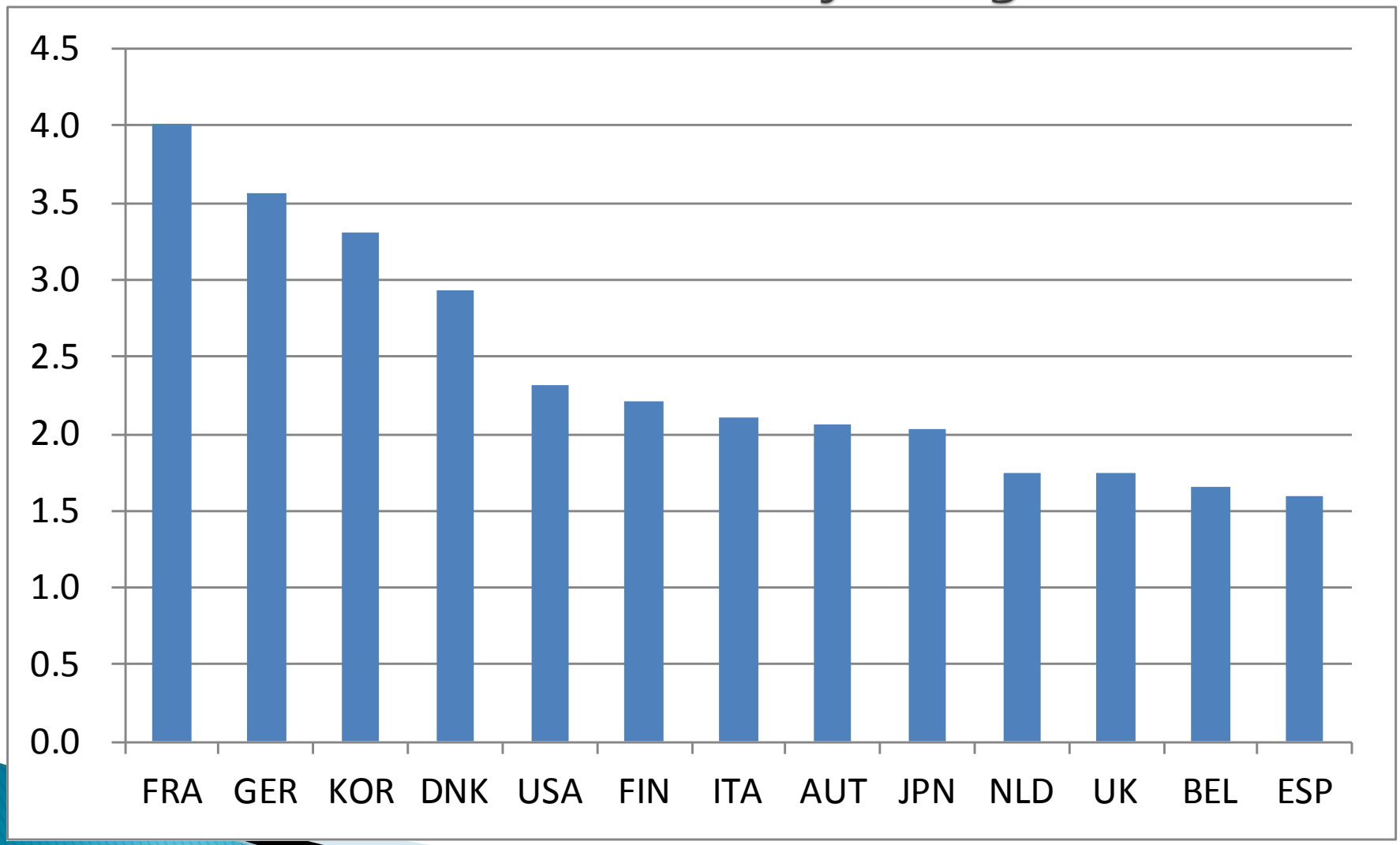
- Low TFP growth in the service sector
  - Especially, in the non-market service sector
- Non-market service sector
  - Measurement errors
  - Non-market (non-profit maximization) as well as low competition (regulation)
- Other factors: R&D, firm size, and etc

Dispersion in Industry-level TFP Growth Rates

- Industry-level TFP growth rate is more dispersed in Korea than other advanced countries
- God or bad?
- Some sectors become less productive
  - More strict regulation
- Some sectors become more productive
  - Active innovations or catch-up
  - International specialization
- Weak cross-industry reallocation

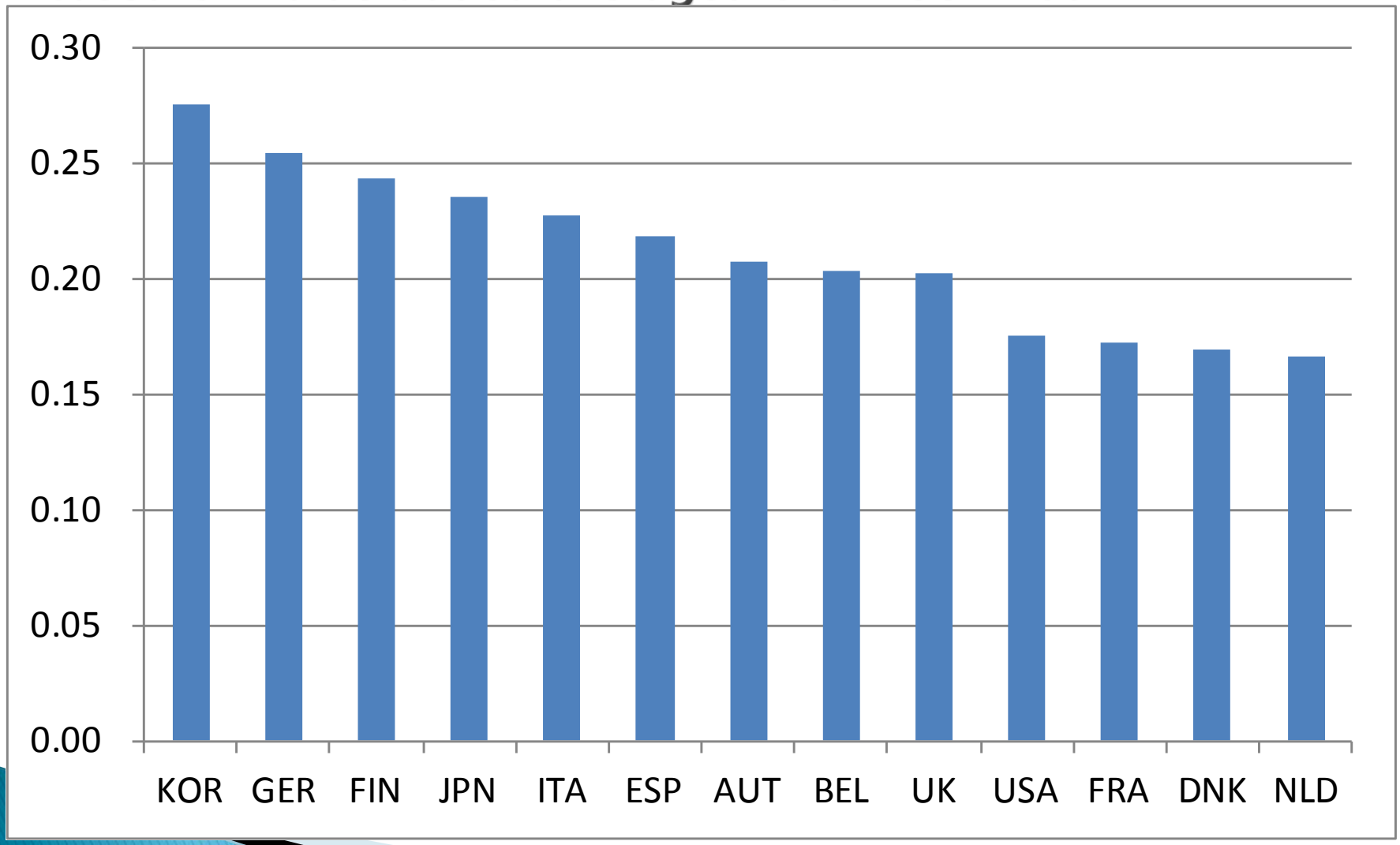
Productivity Dispersion

Standard deviation of industry TFP growth rates

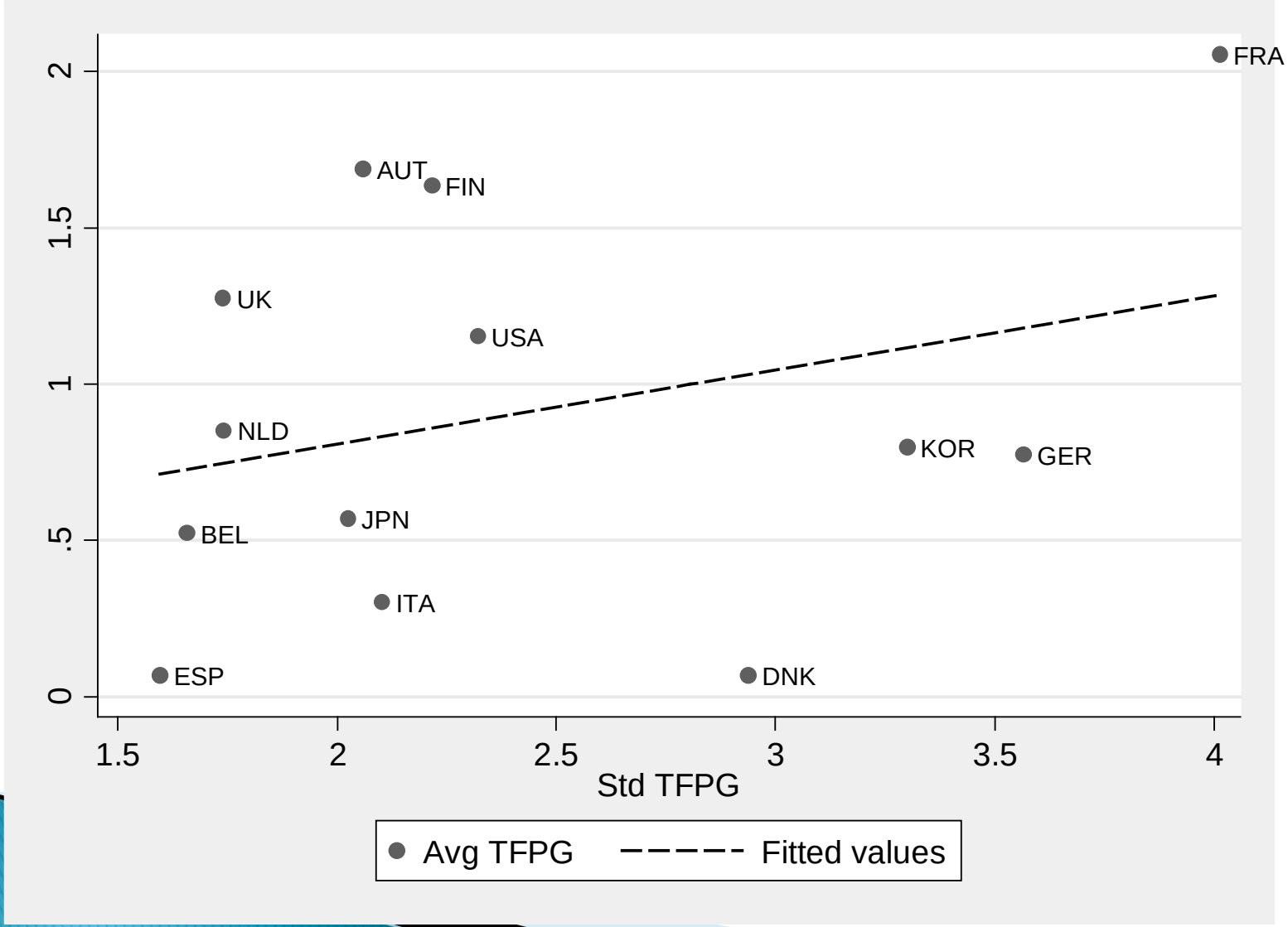


Manufacturing share

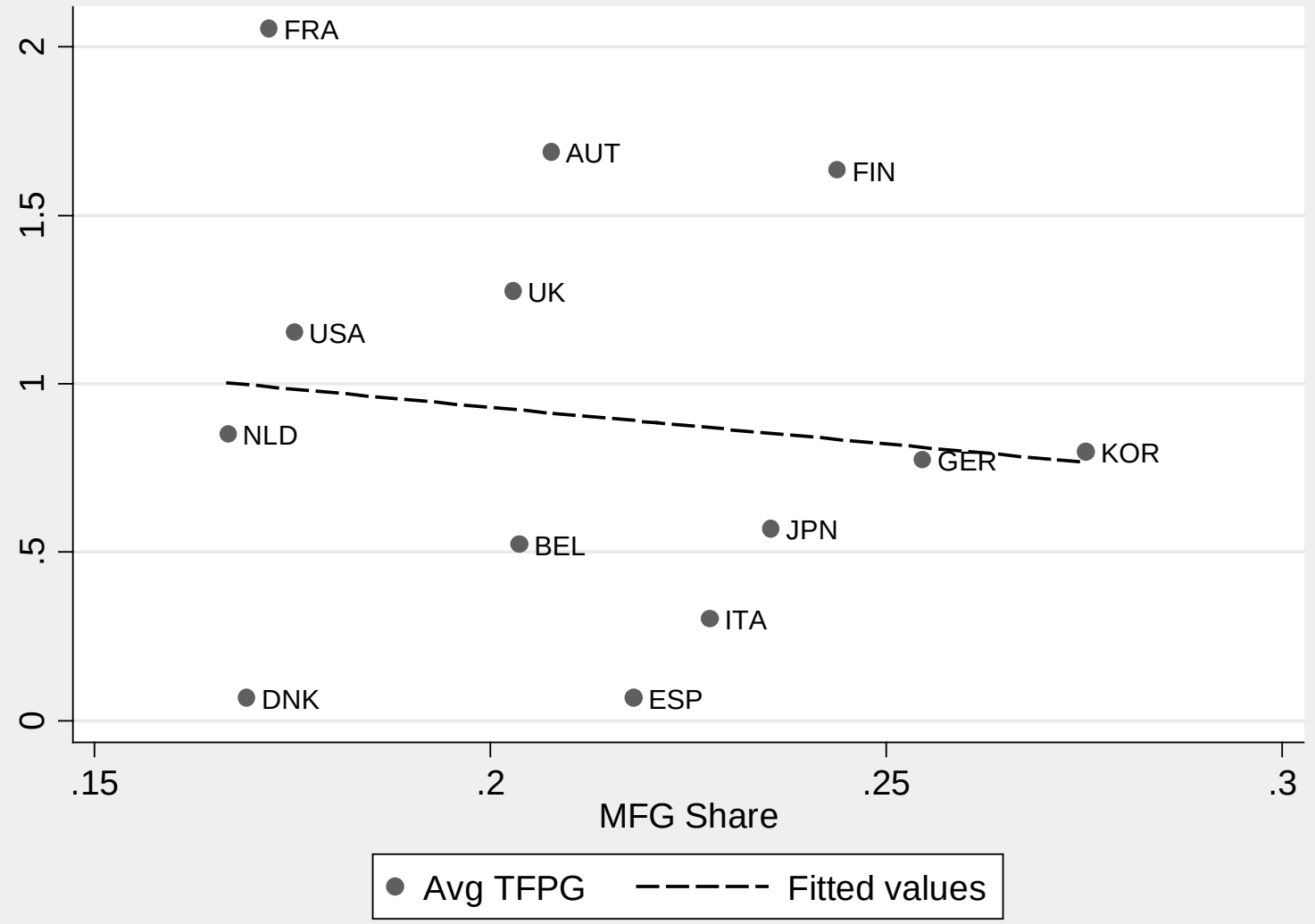
based on value-added averaged over 1981-2007



Average Industry TFP Growth and Sectoral TFP Growth Dispersion



Average Industry TFP Growth and Share of Manufacturing



Panel Regressions

$$TFPG_{i,t} = \alpha + \beta \times STD(TFP)_{i,t-1} + \gamma \times MFGSH_{i,t-1} + \mu_i + \eta_t + \varepsilon_{i,t}$$

- Country panel data: 13 countries, 1981-2007
- Panel regressions with both country (i) and year (t) fixed effects
- Dependent variable: Industry-average TFP growth
- Independent variables
  - Standard deviation of industry TFP growth
  - Manufacturing share

Regressions of Average Industry TFP Growth on Industry TFP GR Dispersion and MFG share

	(1)	(2)	(3)	(4)	(5)
STD(TFPG)	0.049***		0.048***		
	(0.014)		(0.014)		
MFGSH		3.239	2.925		2.705
		(6.235)	(6.275)		(6.369)
STD(TFPG_MFG)				0.024*	0.024*
				(0.011)	(0.012)
STD(TFP_NFG)				0.042	0.041
				(0.052)	(0.051)
Observations	325	325	325	325	325
Adj. R2	0.127	0.119	0.124	0.123	0.120

*, **, ***: 10%, 5%, 1%

Robustness Check 1

- Excluding Korea
  - May not be comparable to other advanced countries
- Excluding the ICT sector
  - ICT MFG, Telecommunication & business services
- Manufacturing and Non-manufacturing subsamples
  - Dep. variable is MFG or NMFG sector average TFPG

Robustness Check 1

	(1) Excl. Korea	(3) Excl. Korea	(4) Excl. ICT sector	(5) Excl. ICT sector	(5) MFG sector subsample	(6) NMFG sector subsample
STD(TFPG)	0.050***	0.050***	0.042***	0.042***		
	(0.013)	(0.014)	(0.010)	(0.010)		
MFGSH		-2.309		1.088		
		(6.240)		(7.909)		
STD(TFPG_MFG)					0.083**	
					(0.032)	
STD(TFP_NFG)						0.020
						(0.044)
Observations	299	299	325	325	325	325
Adj. R2	0.136	0.133	0.126	0.123	0.137	0.020

*, **, ***: 10%, 5%, 1%

Robustness Check 2

- Measurement errors
  - TFP Gr dispersion based on annual TFP Gr may have measurement errors
  - To reduce the measurement errors, use 5yr averaged TFP GR
  - STD TFG is also calculated based on 5-yr av. TFP Gr.
  - Explanatory variables are 5-yr lagged averages.

Robustness check 2: 5-yr sample

	(1)	(2)	(3)	(4)	(5)
STD(TFPG)	0.096**		0.096**		
	(0.042)		(0.039)		
MFGSH		0.983	-0.004		0.103
		(6.618)	(6.638)		(6.317)
STD(TFPG_MFG)				0.061***	0.061***
				(0.019)	(0.019)
STD(TFP_NFG)				-0.028	-0.028
				(0.139)	(0.132)
Observations	63	63	63	63	63
Adj. R2	0.069	0.040	0.052	0.056	0.038

*, **, ***: 10%, 5%, 1%