

Industrial Productivity Growth in Korea, 1996-2018

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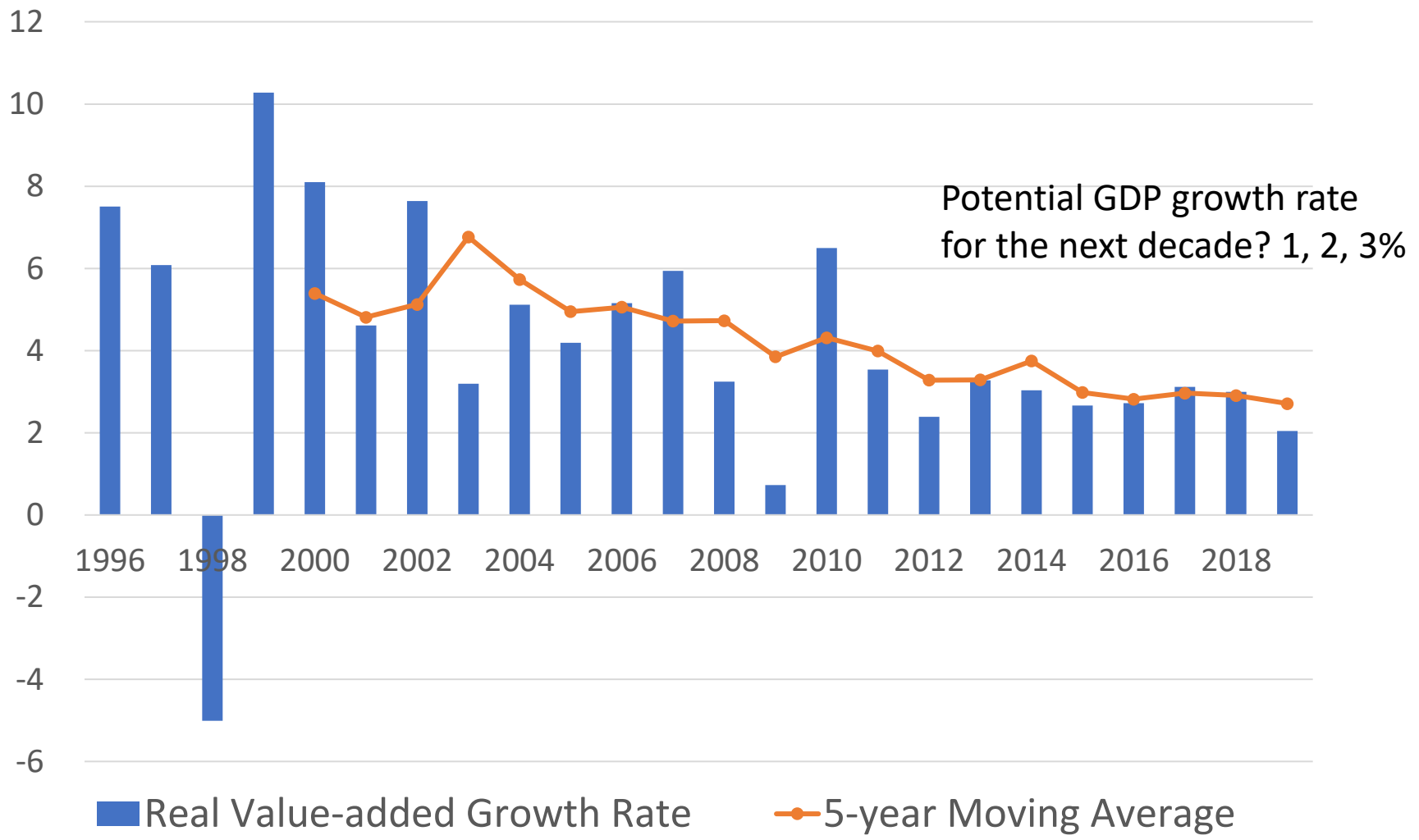
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- Sources of productivity growth in Korea
 - We examine the sources of aggregate productivity growth in Korea for the period of 1996-2018 using Korea Industrial Productivity (KIP) database
 - Industrial shift toward services and international trade: labor and material reallocation effects
 - Capital deepening and TFP
 - Intangibles

Slowdown in Economic Growth: Aggregate Real Value-Added Growth Rate (%), 1996-2019

Slowdown in real GDP growth rate: 1996-2010 (4.9%) vs. 2011-2019 (2.9%)



Changing Industrial Sources of Productivity Growth

- Following Stiroh (2002), we decompose aggregate (value-added) labor productivity (ALP) growth into
 - The sum of industry **gross** output productivity growth,
 - Material reallocation, and
 - Hours (labor) reallocation

- 2020 KIP DB
 - 38 Industries (2 Agr-Min; 19 Mfg; 3 Utl-Con, 14 Ser)
 - Period: 1996-2018
 - 2008 SNA and ISIC Rev. 4

KIP DB 38 Industry Classification

	38 IND	KIP DB 38-Industry
	1	Agriculture, forestry and fishing
	2	Mining and quarrying
19 MFG	3	Food, beverages and tobacco products
	4	Textile and leather products
	5	Wood and paper products, printing, reproduction of recorded media
	6	Petroleum and coal products
	7	Chemicals and chemical products
	8	Pharmaceutical products
	9	Rubber and plastics product
	10	Non-metallic mineral products
	11	Basic metal products
	12	Fabricated metal products
	13	Electronic components
	14	Computers and peripheral equipment
	15	Communication equipment
	16	Precision instruments
	17	Electrical equipment
	18	Machinery and equipment
	19	Motor vehicles, trailers and semi-trailers
	20	Other transport equipment
	21	Other manufactured products and outsourcing

KIP DB 38 Industry Classification

	38 IND	KIP DB 38-Industry
	22	Electricity, gas and water supply
	23	Water supply, waste management and remediation activities
	24	Construction
14 SER	25	Wholesale and retail trade
	26	Transportation and storage
	27	Restaurants and hotels
	28	Publishing, broadcasting, movie
	29	Telecommunication
	30	IT and other information services
	31	Finance and insurance
	32	Real estate and leasing
	33	Professional, scientific, and technical services
	34	Business support services
	35	Public administration and defence
	36	Education
	37	Health and social work
	38	Cultural and other services

- ALP growth decomposition

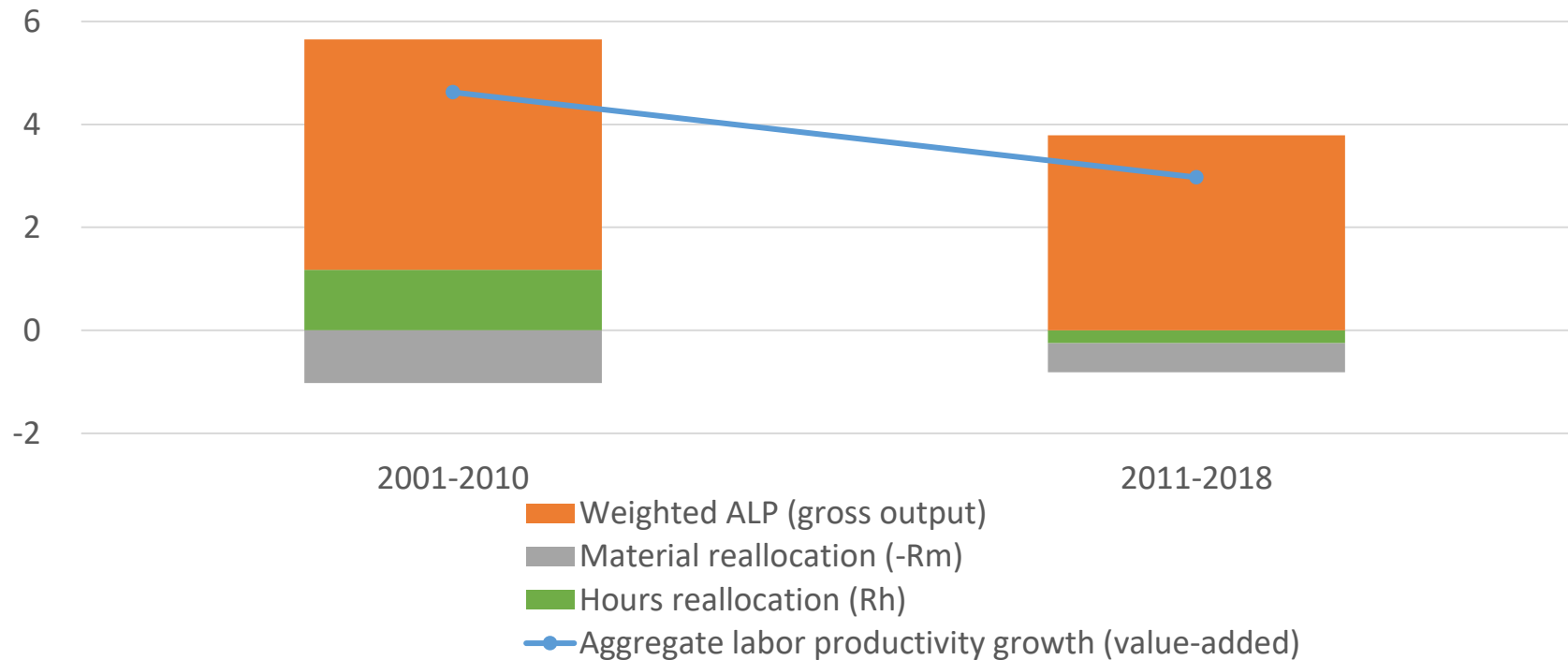
$$\begin{aligned}\Delta \ln \left(\frac{Y}{H} \right) &= \sum_i \bar{w}_i \Delta \ln \left(\frac{G_i}{H_i} \right) - \sum_i \bar{m}_i (\Delta \ln(M_i) - \Delta \ln(G_i)) + \sum_i \bar{w}_i \Delta \ln(H_i) - \Delta \ln(H) \\ &= \sum_i \bar{w}_i \Delta \ln \left(\frac{G_i}{H_i} \right) - R^M + R^H\end{aligned}$$

- Real value-added (Y), labor hours (H), gross output (G), materials (M), industry (i) VA and material weights (w, m) w.r.t. aggregate value-added

- The first term: The direct productivity effect
 - The sum of industry gross output productivity

- The second term: The material reallocation effect (R^M)
 - R^M has a negative effect on ALP (1) when more intermediate input (M) raises gross output (G); (2) when the ratio intermediate input to value-added (similar to Domar-weight) is high.
- The third term: Hours reallocation (R^H)
 - ALP rises if industries with VA shares above labor shares experiences growth in hours
 - In Korea, ALP falls because MFG industries (with VA shares above labor shares) reduce hours

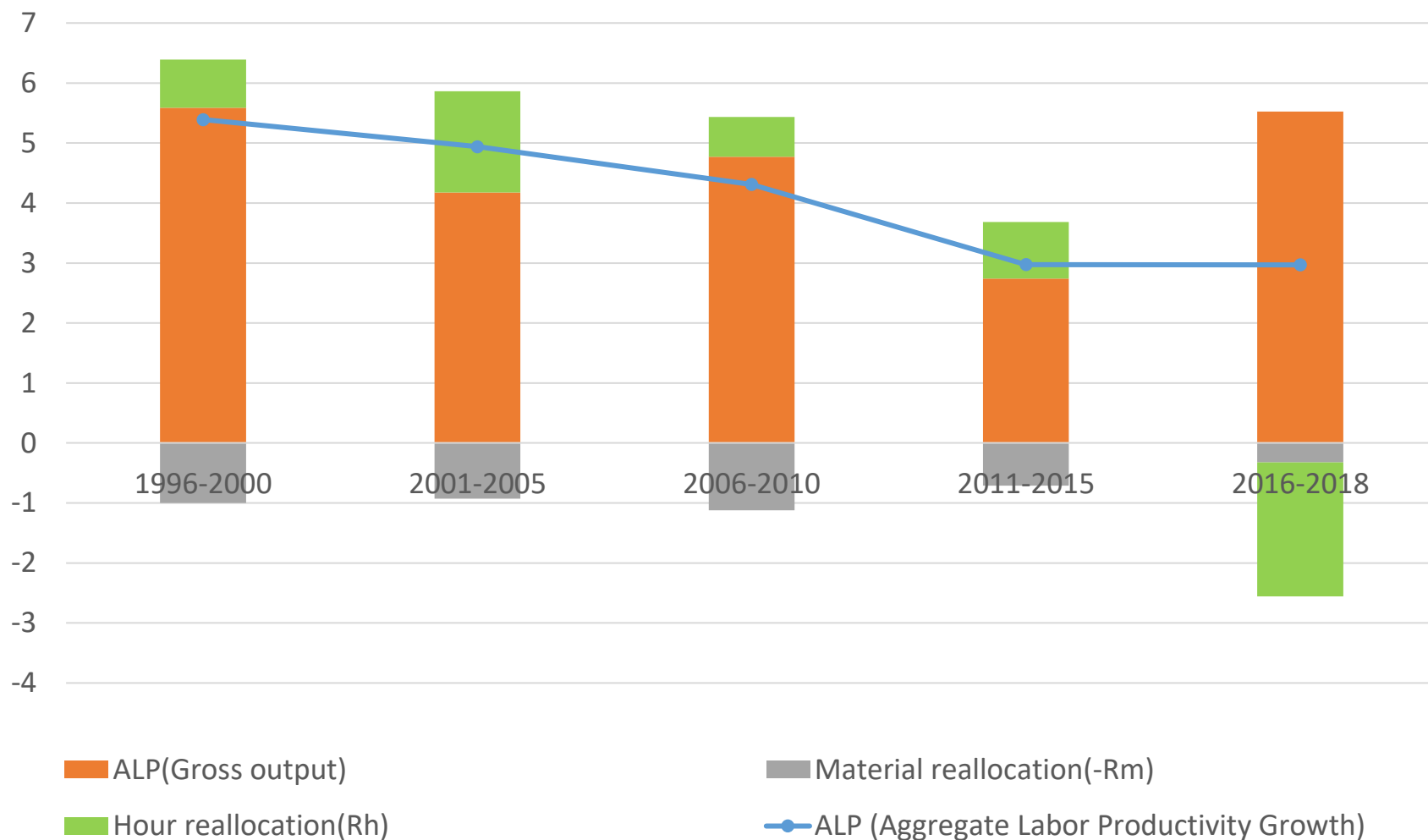
ALP Decomposition: Using Industry Gross Output Productivity



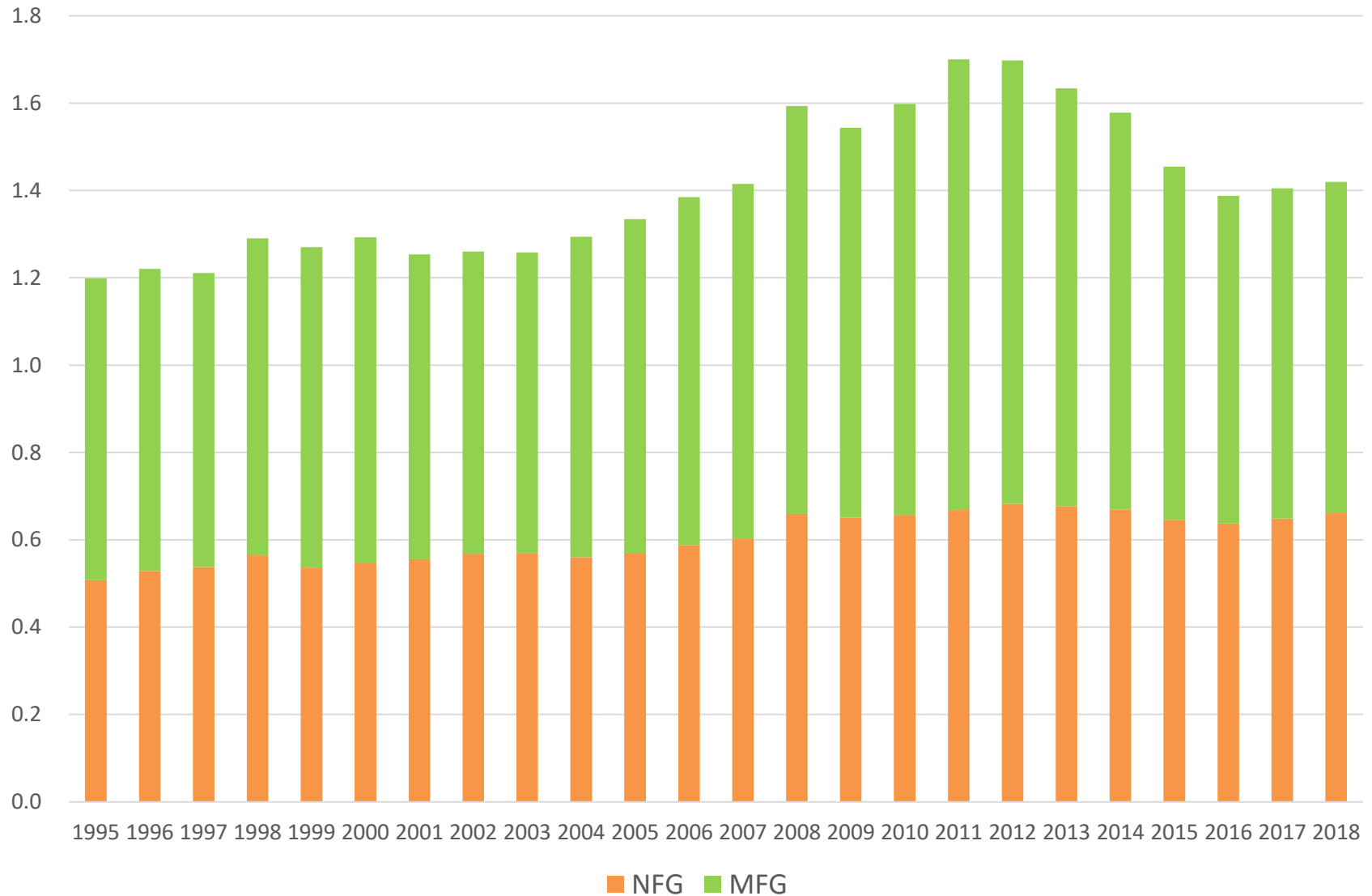
	1996-2018	(A) 1996-2010	(B) 2011-2018	(B) – (A)
Aggregate labor productivity growth (value-added) = (1) + (2) +(3)	3.9	4.6	3.0	-1.7
Decomposition using industry gross output productivity				
(1) Weighted ALP (gross output)	4.2	4.5	3.8	-0.7
(2) Material reallocation (-RM)	-0.8	-1.0	-0.6	0.5
(3) Hours reallocation (RH)	0.5	1.2	-0.2	-1.4

- ALP growth slowdown (-1.7%) from 1996-2010 to 2011-2018 is attributable to
 - Slowdown in GO labor productivity (-0.7%); and worsened hours reallocation (-1.4%)
 - Material reallocation (0.5%) raises ALP; But the magnitude is too small to offset the worsened hours reallocation.

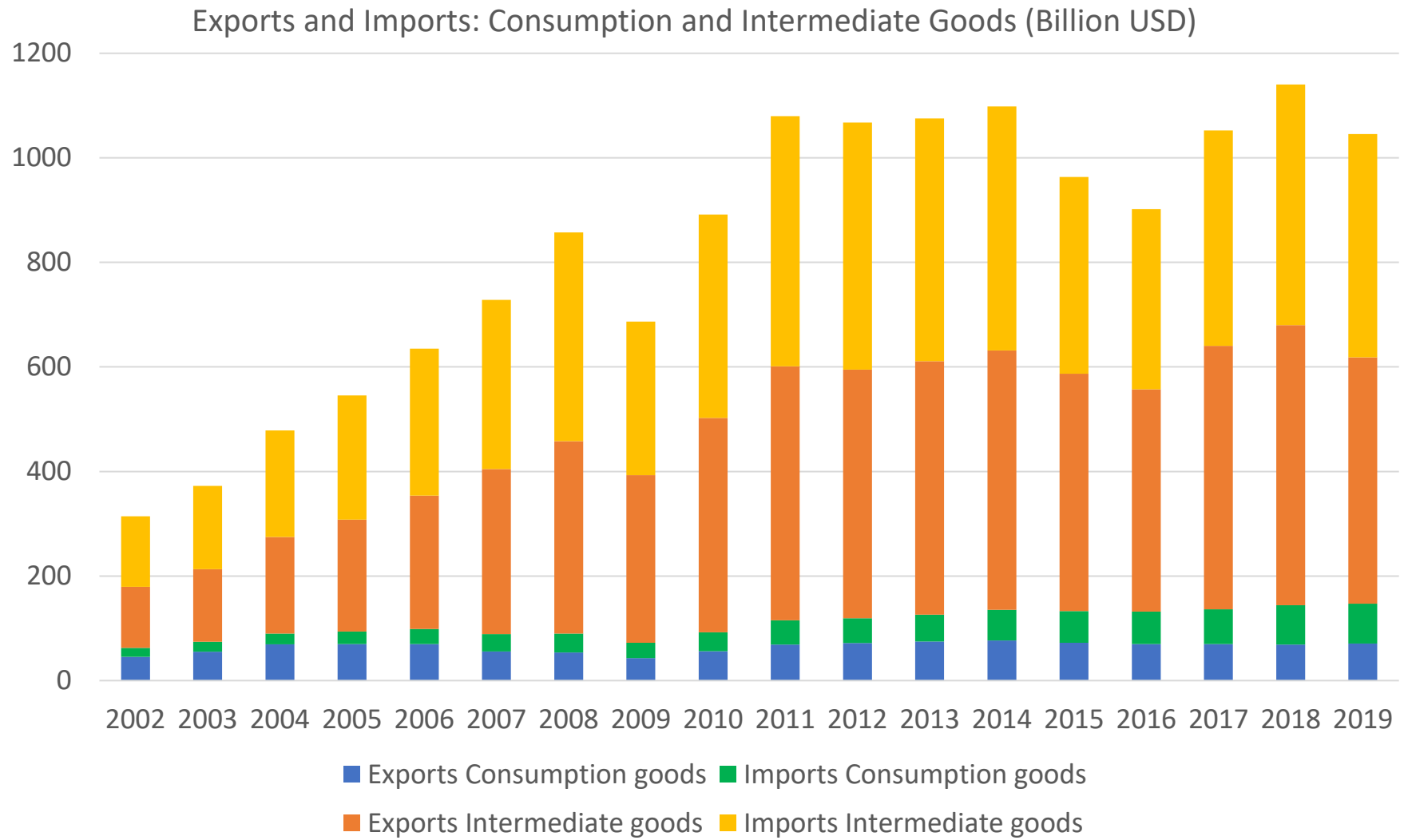
ALP Growth Decomposition: 5-year Period



Ratio of Intermediate Input to Value-added (m): Sectoral Contributions

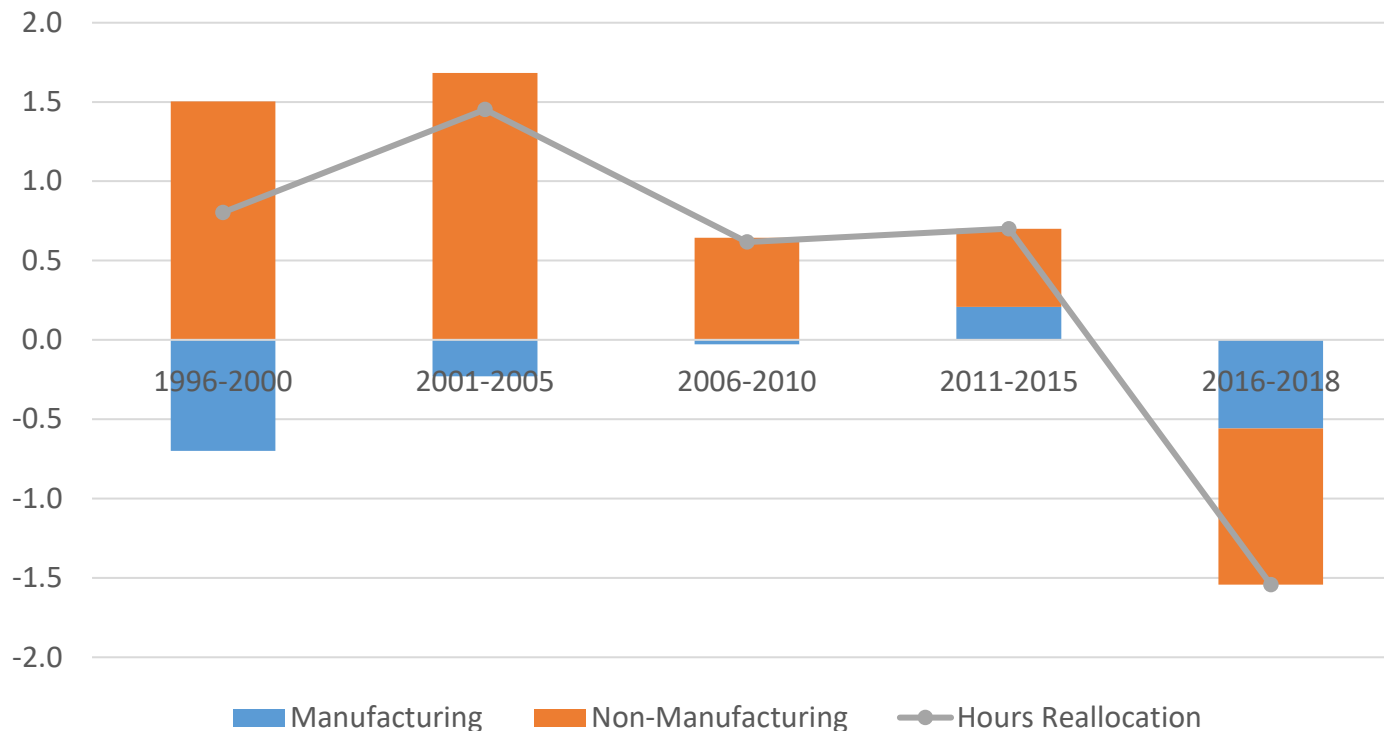


The Rise and Fall of International Trade of Intermediate Inputs



Source: Korea Custom Service

Worsened Hours Reallocation



- Slowdown in employment growth in industries with VA shares above labor shares (e.g., manufacturing; especially, electronics)
- Speedup in employment growth in industries with VA shares below labor share (e.g., labor-intensive services; especially, health and social work (public sector), retail trade (self-employment))

- ALP growth decomposition

$$\begin{aligned}\Delta \ln \left(\frac{Y}{H} \right) &= \sum_i \bar{w}_i \Delta \ln \left(\frac{Y_i}{H_i} \right) + \sum_i \bar{w}_i \Delta \ln(H_i) - \Delta \ln(H) \\ &= \sum_i \bar{w}_i \Delta \ln \left(\frac{Y_i}{H_i} \right) + R^H\end{aligned}$$

- The first term: the sum of industry VA productivity
- The second term: hours reallocation

- Further decomposition of Industry VA LP growth
 - Capital deepening, labor quality, and TFP growth

$$\sum_i \bar{w}_i \Delta \ln \left(\frac{Y_i}{H_i} \right) = \sum_i \bar{w}_i \bar{v}_{K,i} \Delta \ln \left(\frac{K_i}{H_i} \right) + \sum_i \bar{w}_i \bar{v}_{L,i} \Delta \ln(Q_i) + \sum_i \bar{w}_i \Delta \ln(TFP_i)$$

- Two groups of industries: MFG & NMFG

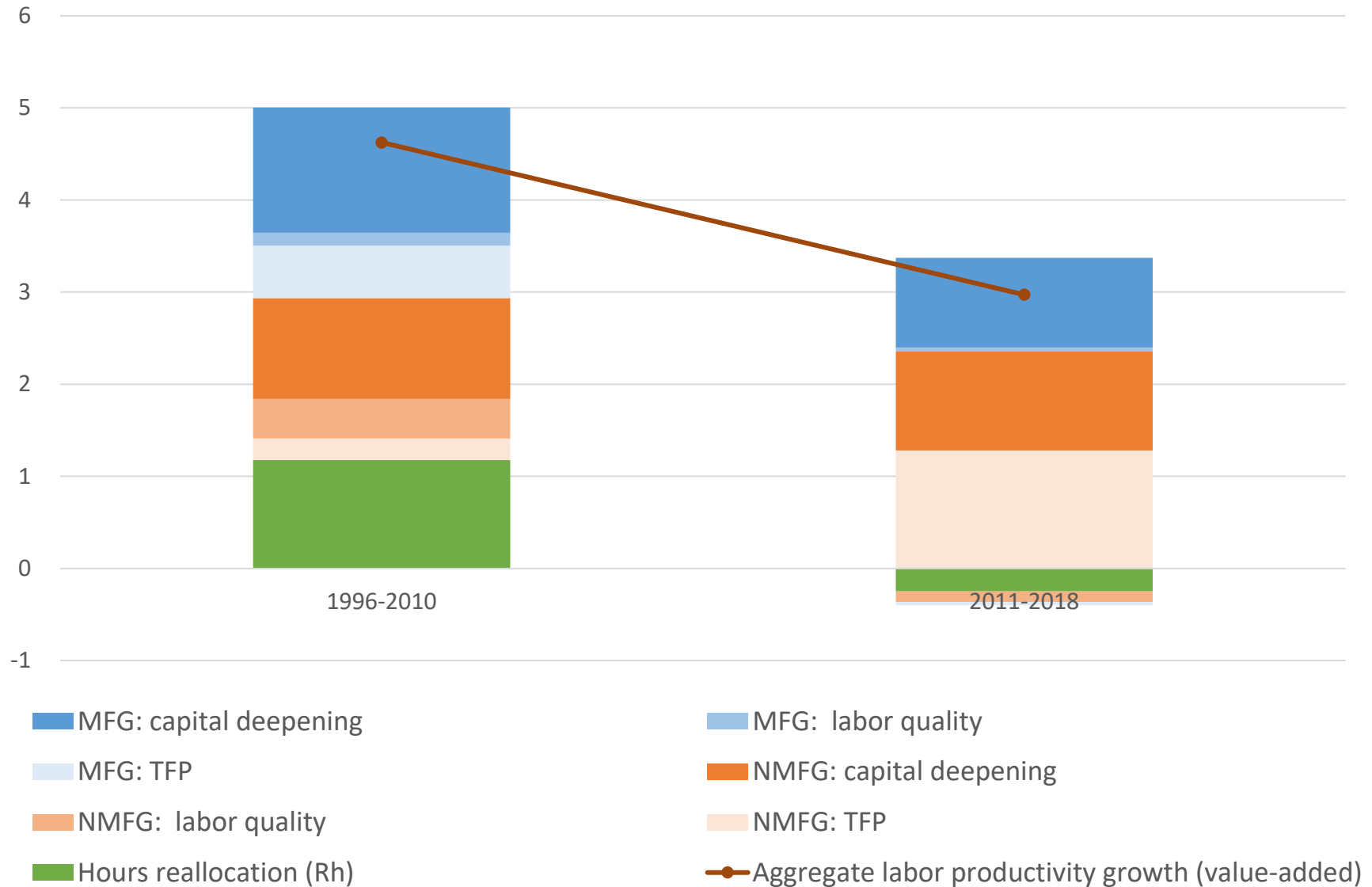
ALP Decomposition

Using Industry Value-added Productivity

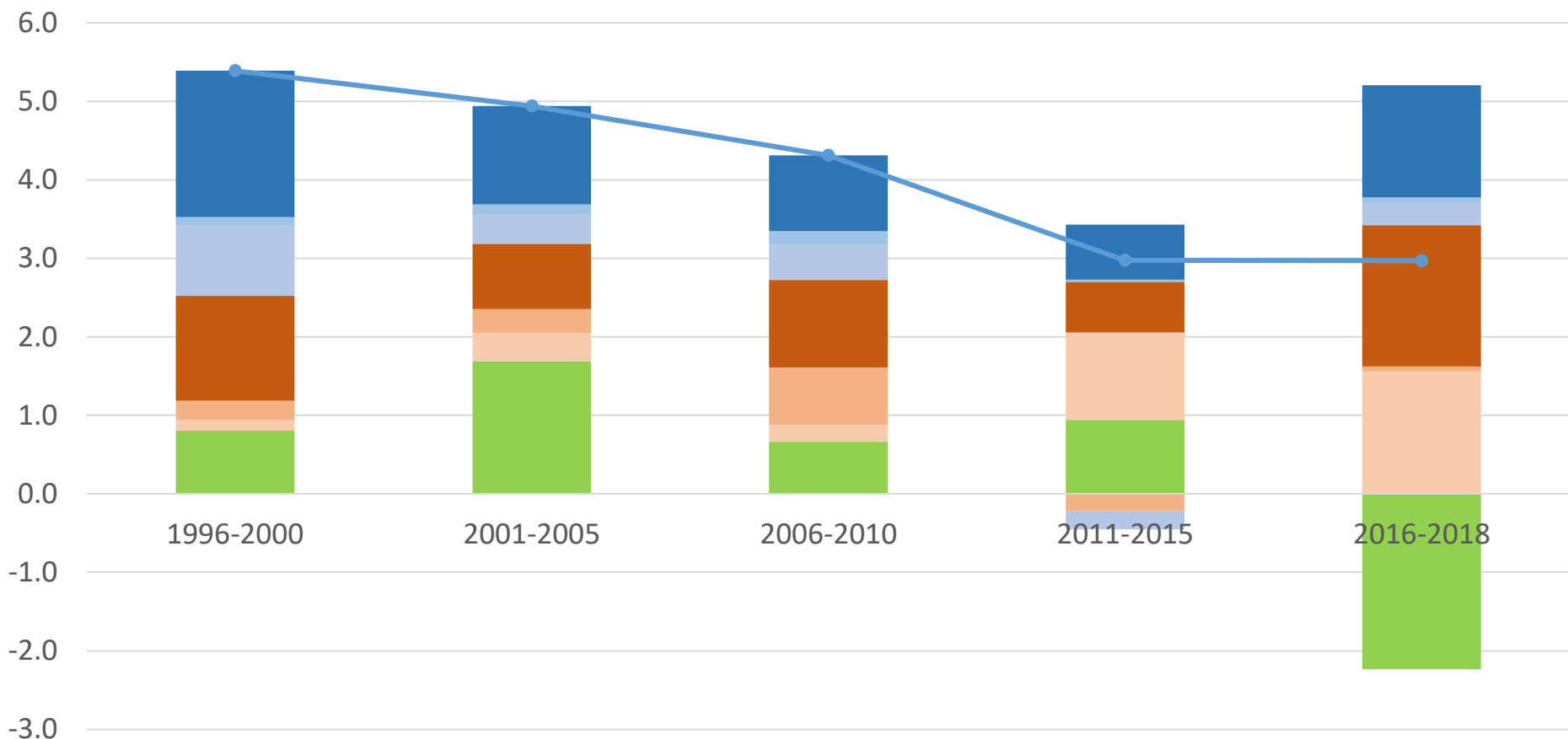
	1996-2018	(A) 1996-2010	(B) 2011-2018	(B) – (A)
Aggregate labor productivity growth (value-added) = (1) + (2)	3.9	4.6	3.0	-1.7
Decomposition using industry value-added productivity				
(1) Weighted ALP (VA)	3.3	3.8	3.2	-0.6
(1A) ALP (VA) Manufacturing	1.6	2.1	1.0	-1.1
(1A1) capital deepening	1.2	1.4	1.0	-0.4
(1A2) labor quality	0.1	0.1	0.0	-0.1
(1A3) TFP	0.3	0.6	0.0	-0.6
(1B) ALP (VA) Non-manufacturing	1.7	1.8	2.2	0.5
(1B1) capital deepening	1.0	1.1	1.1	0.0
(1B2) labor quality	0.2	0.4	-0.1	-0.5
(1B3) TFP	0.5	0.2	1.3	1.0
(2) Hours reallocation (RH)	0.5	1.2	-0.2	-1.4

ALP Decomposition

Using Industry Value-added Productivity



ALP Decomposition: 5-year Periods



■ Hours reallocation (Rh)

■ NMFG: labor quality

■ MFG: TFP

■ MFG: capital deepening

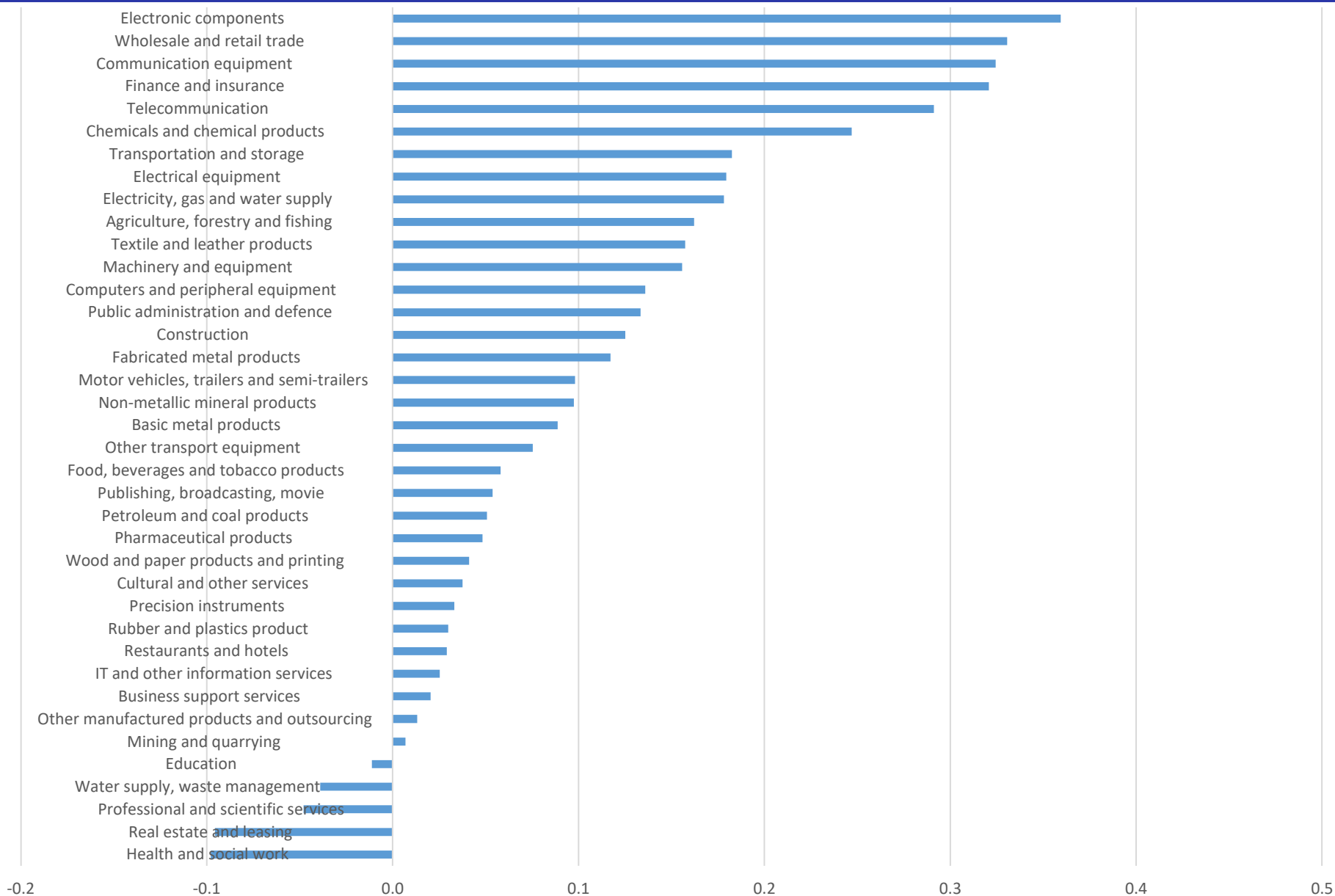
■ NMFG: TFP

■ NMFG: capital deepening

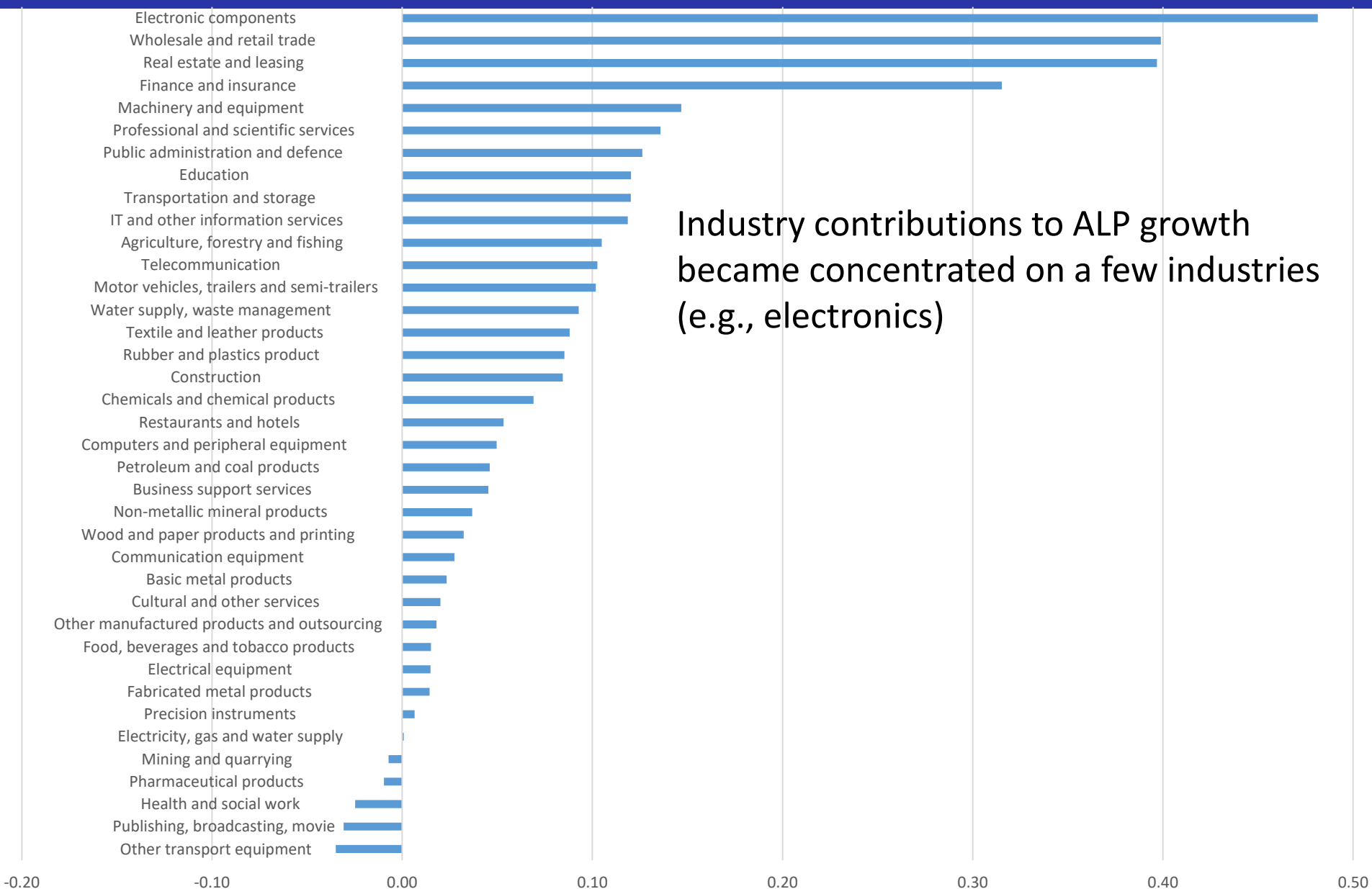
■ MFG: labor quality

—●— Aggregate labor productivity growth (value-added)

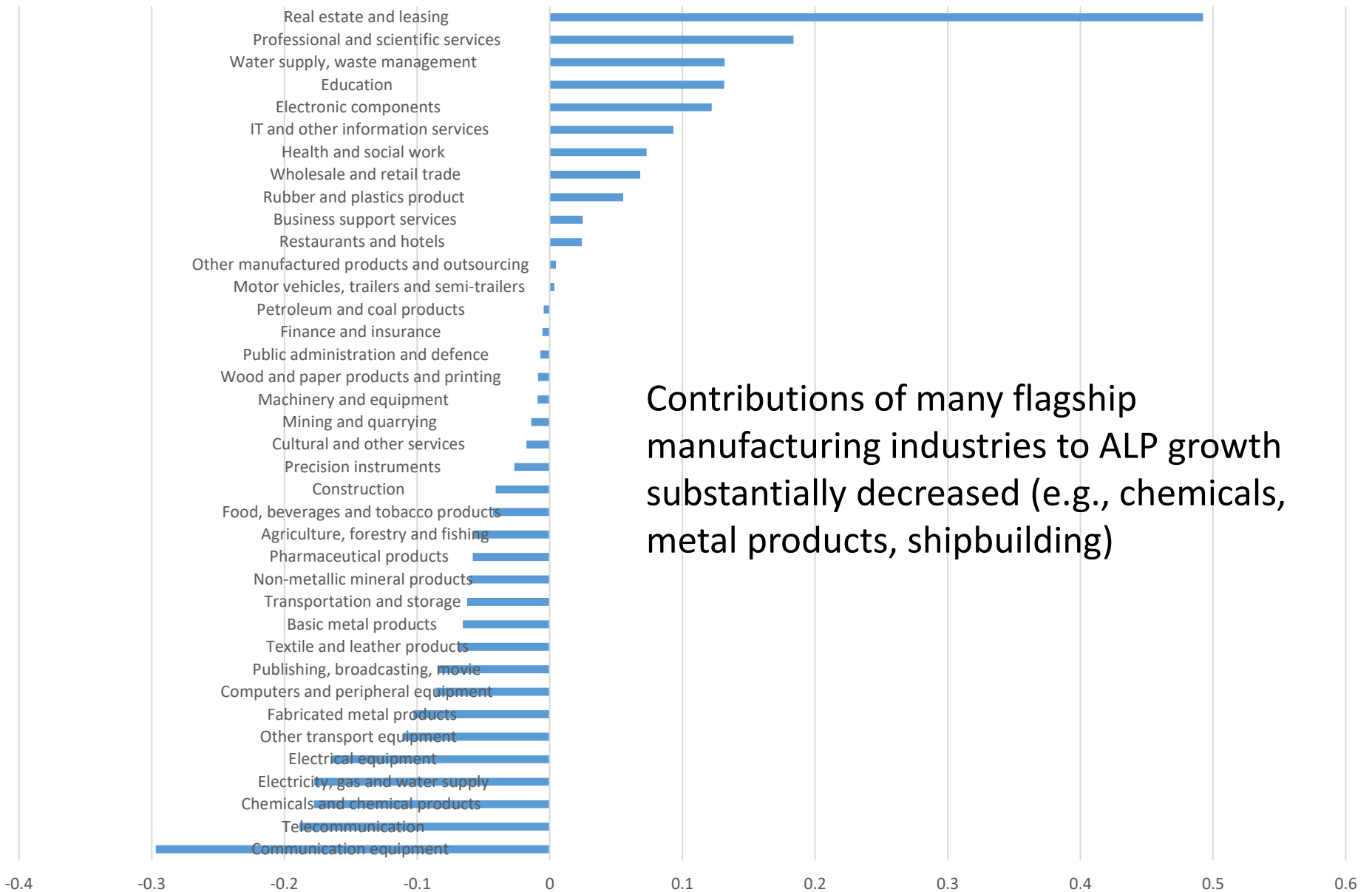
Industry VA LP Contributions to ALP, 1996-2010



Industry VA LP Contributions to ALP, 2011-2018

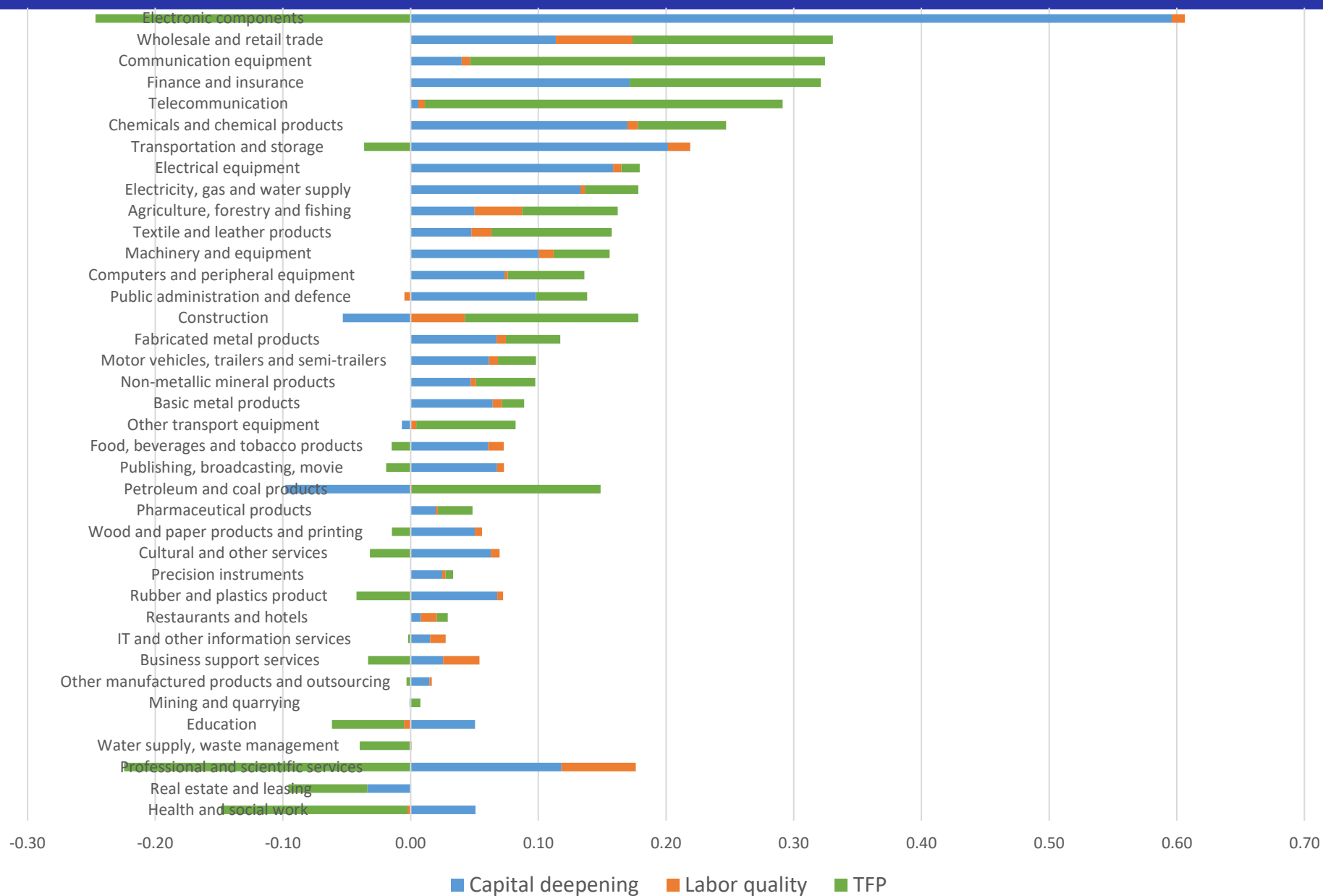


Industry VA LP Contributions to ALP, (2011-2018) –(1996-2010)

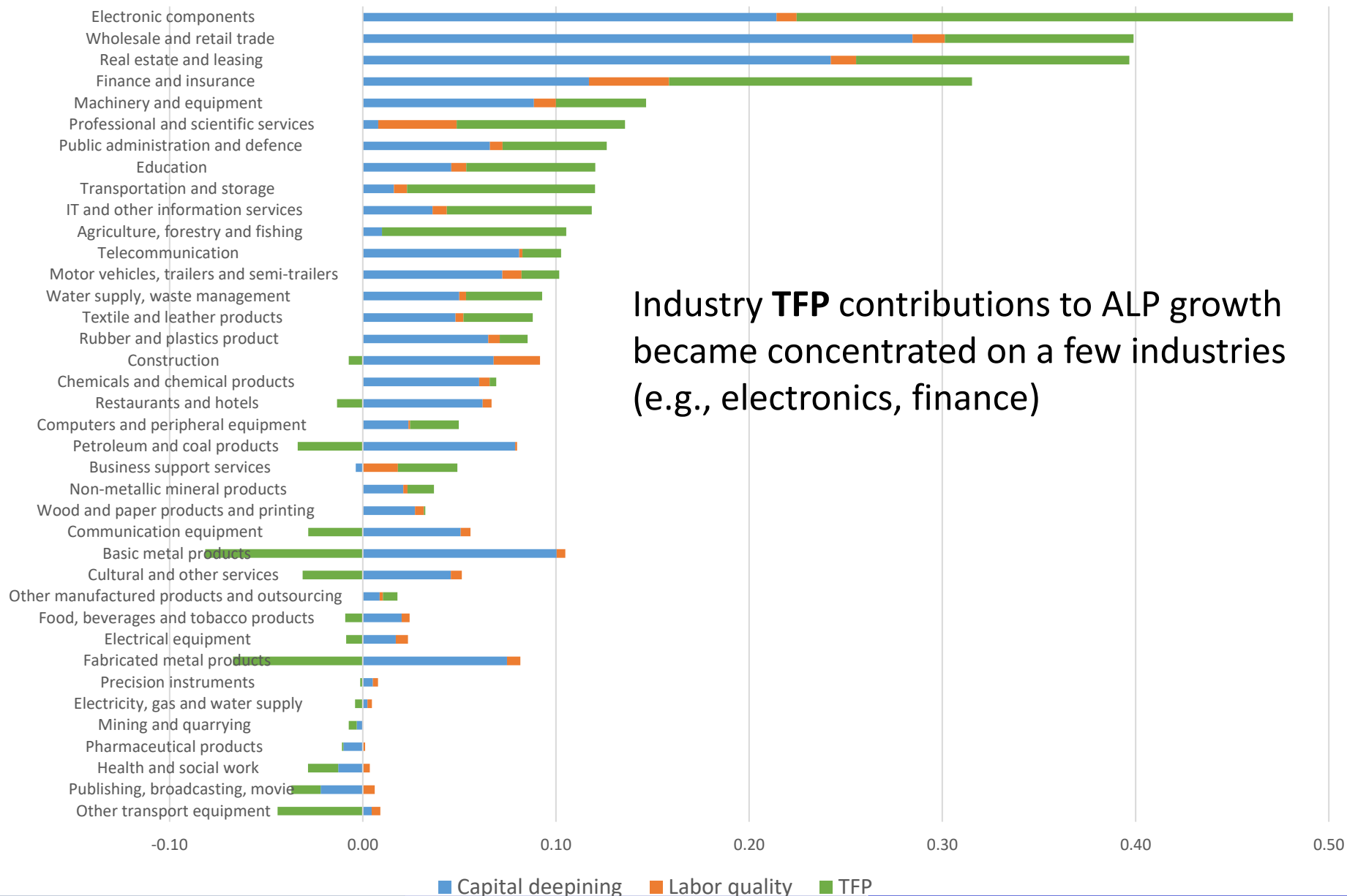


Contributions of many flagship manufacturing industries to ALP growth substantially decreased (e.g., chemicals, metal products, shipbuilding)

Industry VA LP Contributions to ALP, 1996-2010



Industry VA LP Contributions to ALP, 2011-2018

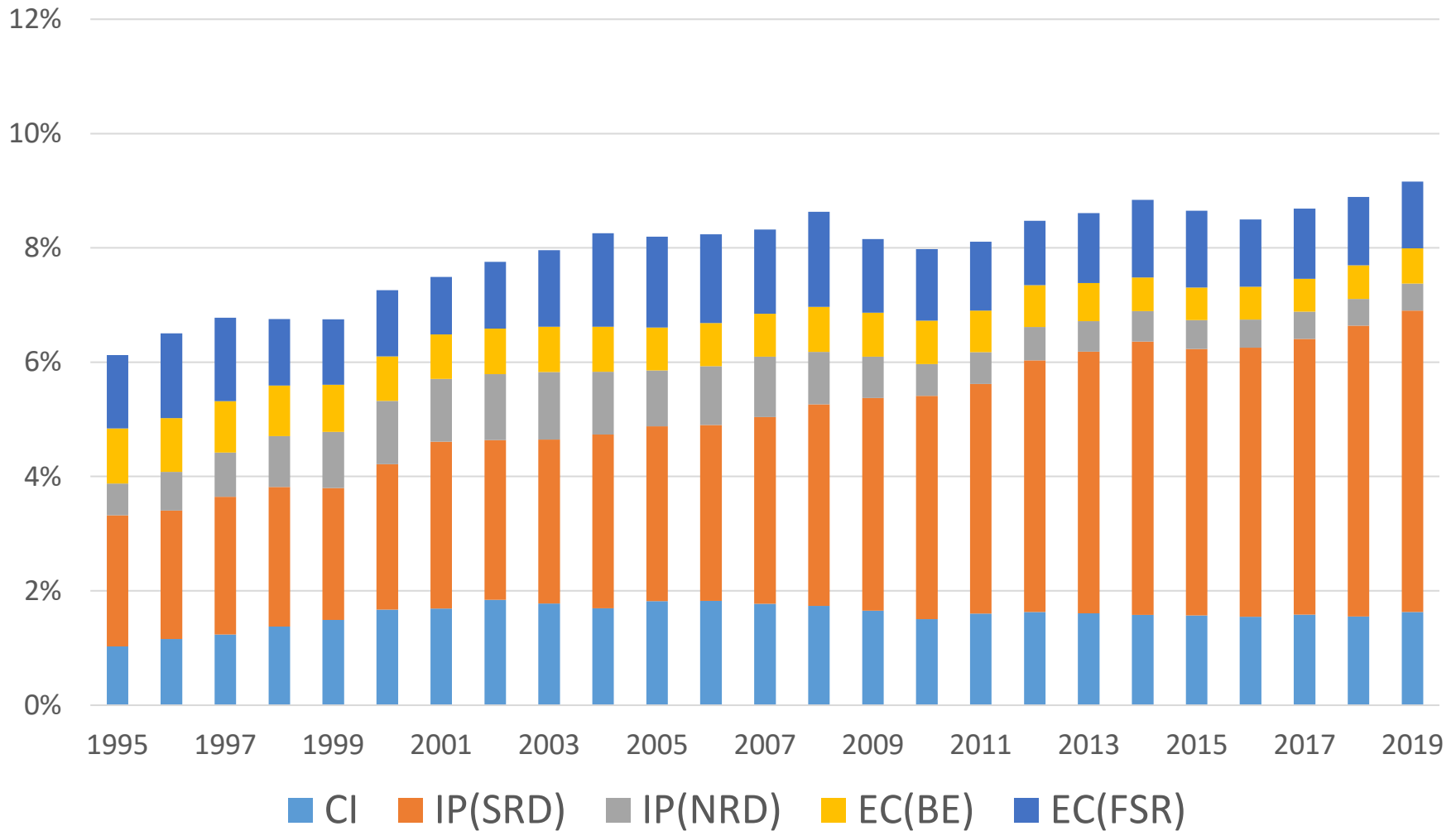


- ALP growth slowdown (-1.7%) from 1996-2010 to 2011-2018 is attributable to
 - Worsened hours reallocation (-1.4%) due to a decrease in hours in MFG and an increase in hours in Non-MFG
 - Slowdown in MFG TFP growth (-0.6%) and speedup in Non-MFG TFP (0.5%) raises ALP
 - Fall in capital deepening in MFG (-0.4%)

- Changing sources of productivity growth in Korea, 1996-2010 to 2011-2018
 - Contributions of MFG to ALP has substantially decreased, (productivity slowdown in several MFG flagship industries) while those of Non-MFG to ALP has increased.
 - The worsened hours reallocation due to industrial shift toward services has lowered ALP.

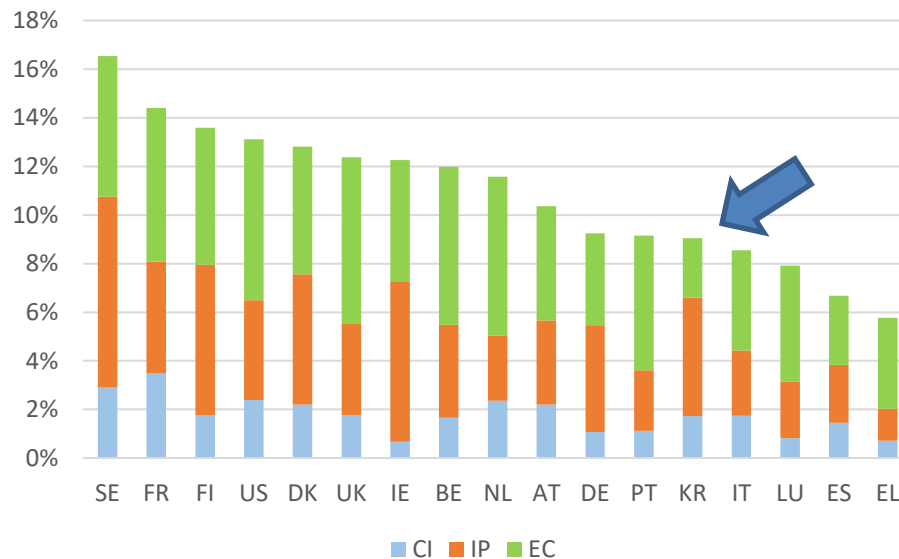
Low Intangible Investment after the GFC?

CHS Intangible Investment as % of GDP in Korea, 1995-2019

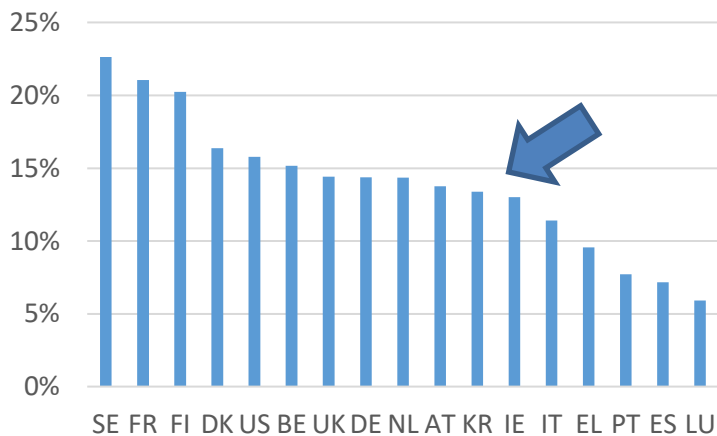


Low Intangible Investment in Services

Market Economy, 2001-2015



Manufacturing



Wholesale and Retail Trade

