

Progress on Measuring the Industry Origins of the Japan-U.S. Productivity Gap



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The views expressed in this paper are solely those of the authors and not necessarily those of the Research Institute of Economy, Trade and Industry (RIETI) or the U.S. Bureau of Economic Analysis (BEA).

Introduction



- Objective: analyze the competition between Japanese and U.S. industries from 1955-2015.
- Industry price level indices.
- Industry productivity gaps.
- Within the framework of the national accounts.
- Discuss how this relates to a new U.N. effort on Global Integrated Productivity Accounts.

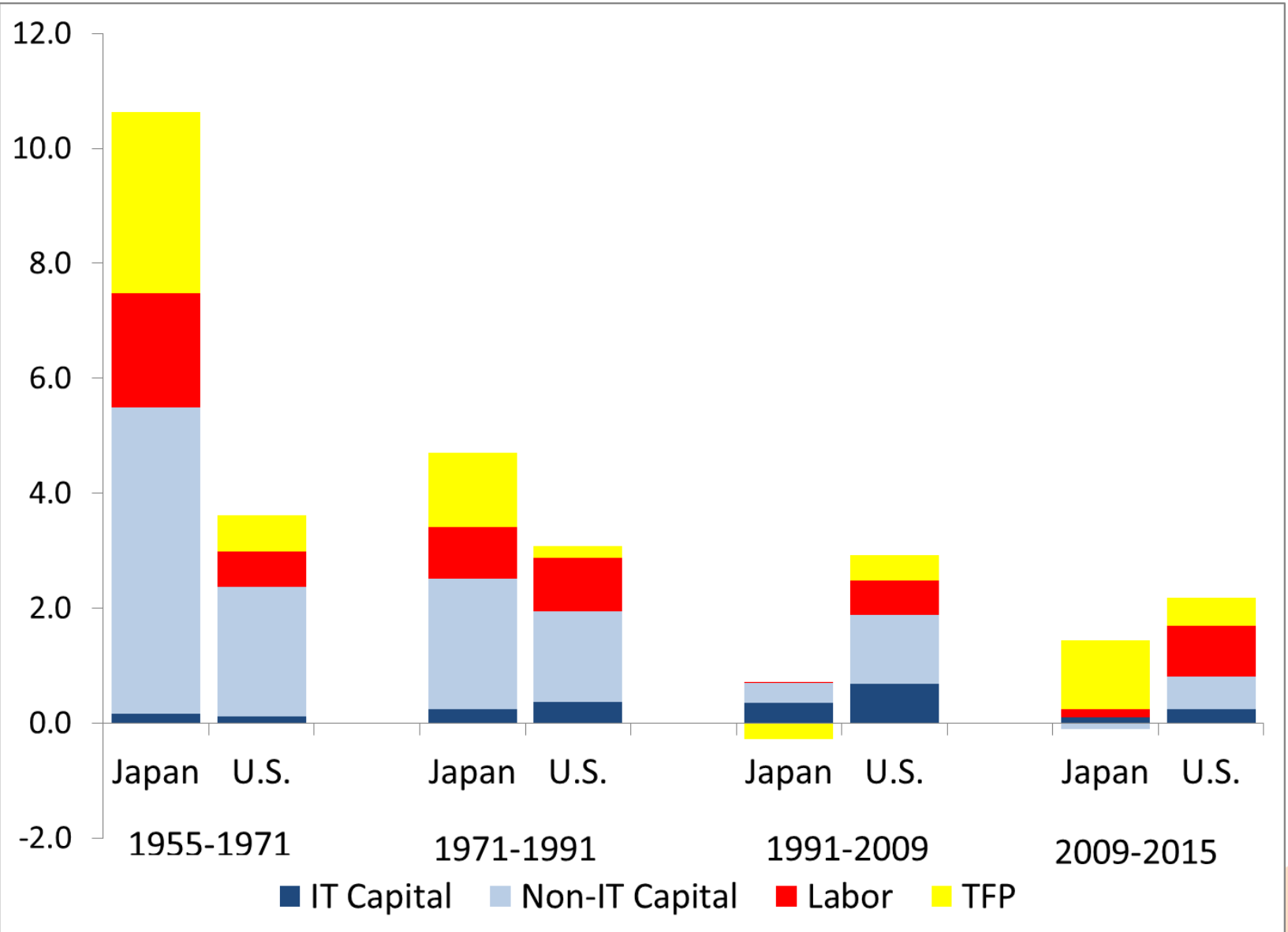
- U.S. KLEMS database and Integrated Japan-U.S. KLEMS.
- Industry-level Purchasing Power Parities.
- Price Competitiveness Measures.
- TFP Gap Results.
- Next Steps.

U.S. and Japan-U.S. Integrated KLEMS

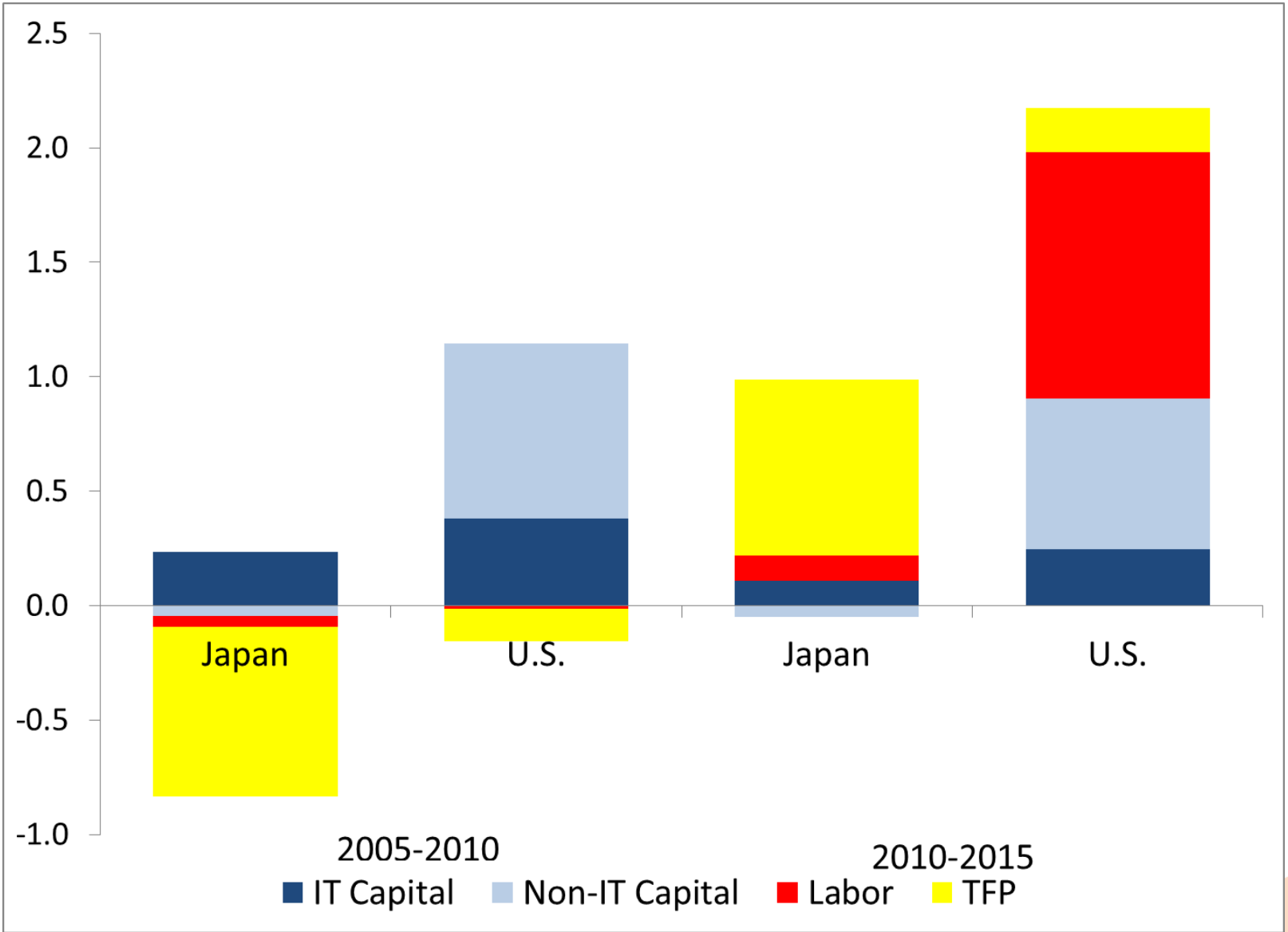


- US KLEMS:
 - Integrated BEA-BLS Industry-level production account, 1998-2015.
 - Jorgenson, Ho, Samuels (2016), 1947-1997.
 - Consistent with the U.S. National Accounts.
- Japan KLEMS (Koji Nomura):
 - Consistent with national accounts, 1955-2015.
 - Newly developed depreciation rates. (Nomura 2013)
- Integrated Japan and US KLEMS.
 - 1955-2015; 36 common industries.
 - Imputations for household consumer durables and government capital services (TFP gap assumed to be zero).

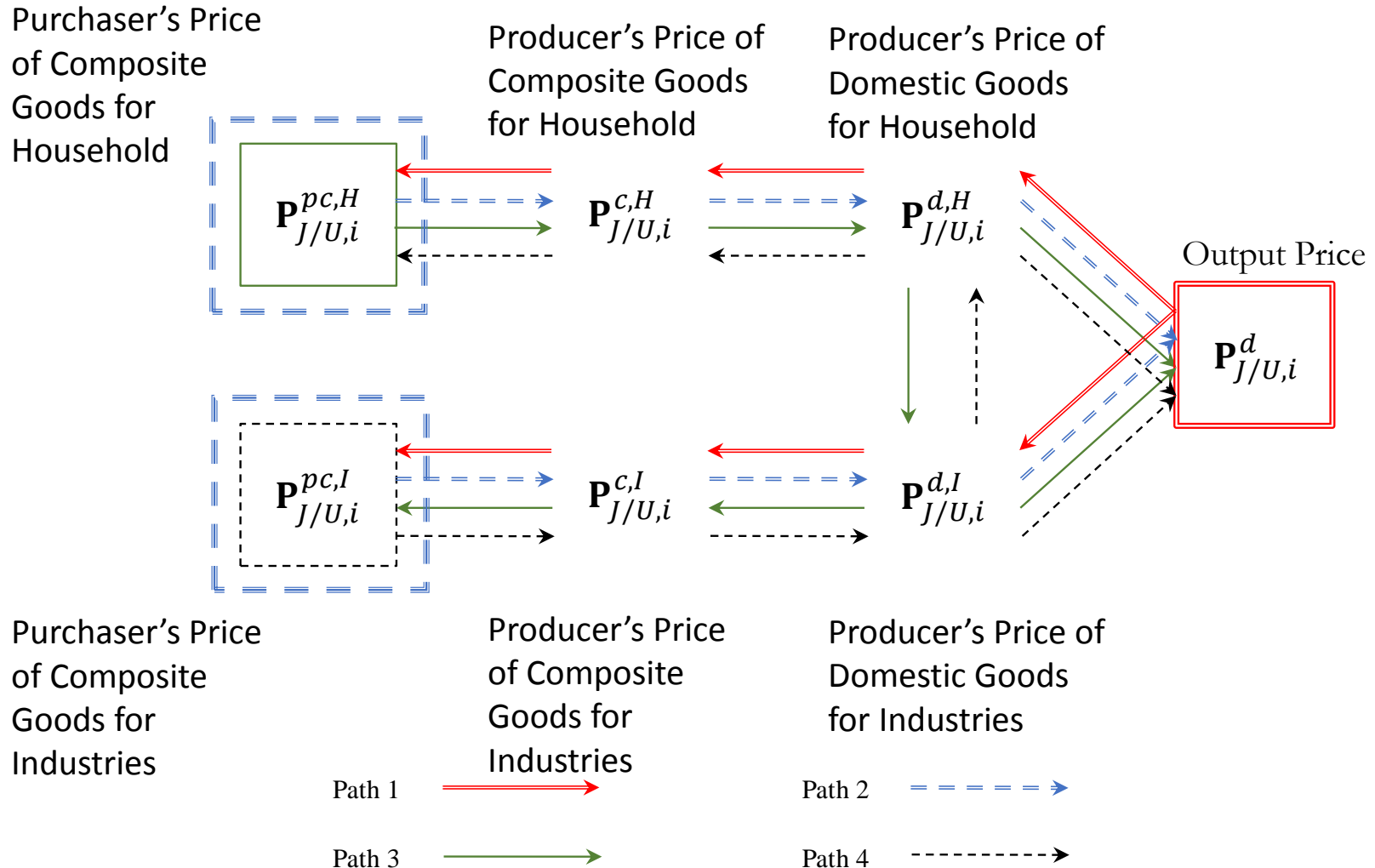
Sources of Economic Growth in Japan and the U.S.



Sources of Economic Growth in Japan and the U.S.



PPPs: Price Model Approach, 2011



Source: Nomura and Miyagawa (2015).

Four Paths of Price Derivation

Type 1	Type 2	Type 3	Type 4
Producer's price	Purchaser's price		
	Household & Industry use	Household use	Industry use

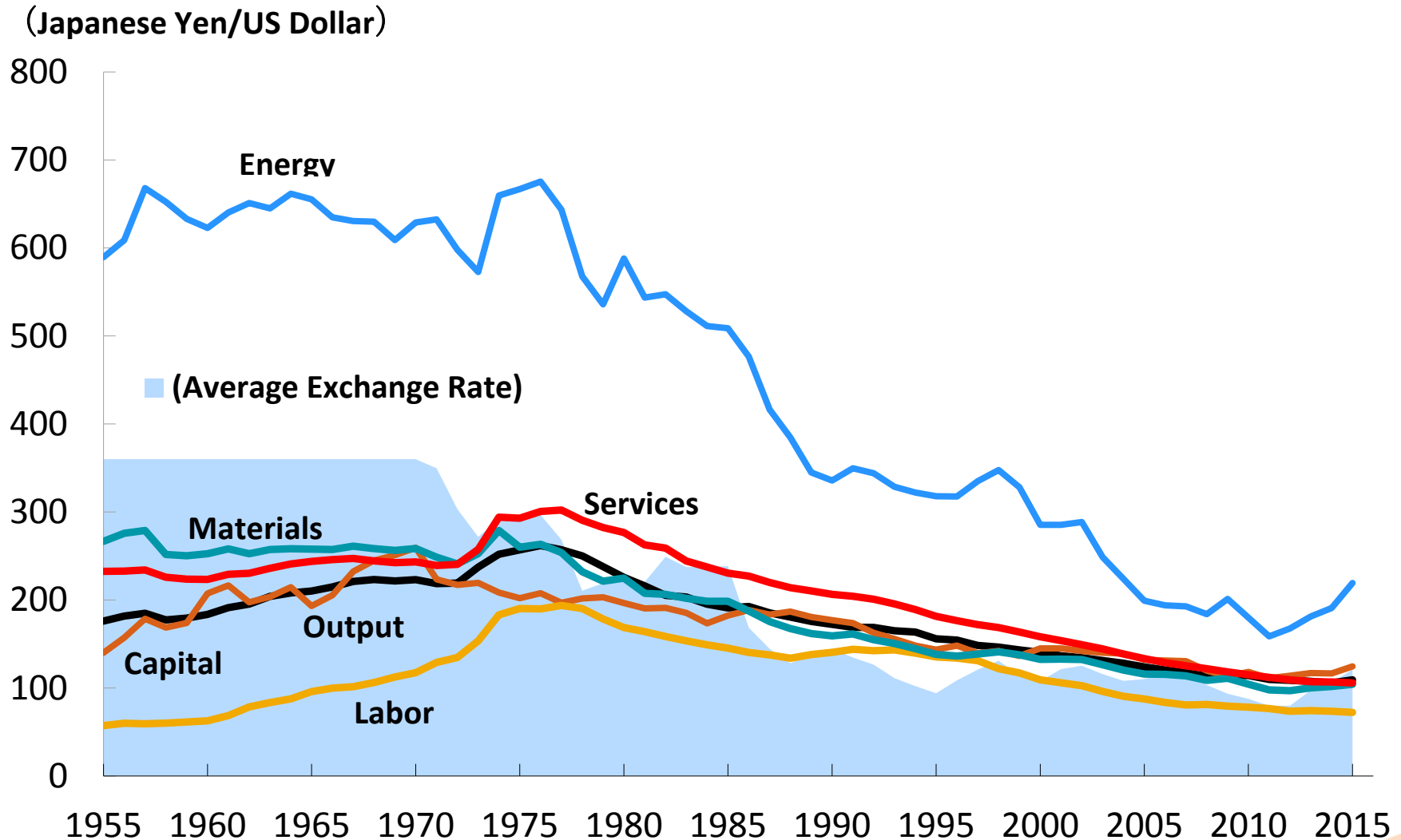
Source: Nomura and Miyagawa (2015).

CPC code	$P_{j/u,t}^d$	$P_{j/u,t}^{pc,H}$ $P_{j/u,t}^{pc,I}$	$P_{j/u,t}^{pc,H}$	$P_{j/u,t}^{pc,I}$
0 Agriculture, forestry and fishery	8		4	
1 Ores and minerals; electricity, gas and water	5	1		3
2 Food, beverages and tobacco; textiles, apparel and leather	1	3	20	1
3 Other transportable goods, except metal products, machinery, equipment	4	8	8	14
4 Metal products, machinery and equipment	1	6	10	28
5 Constructions and construction services			1	3
6 Trade; accommodation, food and beverage serving; transport	2	8	3	1
7 Financial and related services; real estate; rental and leasing services	1	3	2	1
8 Business and production services	3	4	3	1
9 Community, social and personal services	2	2	6	3
Total	27	35	57	55

- **Output:** Translog aggregate of output PPPs.
 - (Nomura and Miyagawa, 2015).
- **Intermediate:** Translog aggregate of intermediate PPPs.
 - Composite of domestically produced and imported purchases.
- **Capital:** Translog aggregate of capital services price PPP.
 - 33 common assets by industry.
- **Labor:** Translog aggregate of labor services price PPP.
 - Comp. per hour by gender*educ(4 groups) * age (6 groups) by ind.
- **Value added:** “reverse” translog; “double deflation”.
 - Using PPP for output and intermediate input.

- Price level index: $PLI_{\theta ijT} = PPP_{\theta ijT} / e_T$,
- Interpretation: PPP relative to the exchange rate provides measure of competitiveness.
 - price barrier faced by Japanese producers in competing with their U.S. counterparts in international markets.
- Time series: **Benchmark 2011 PPP** extrapolated with relative prices from country-level KLEMS data.
- Consistent with country-level national accounts.

Aggregate PPPs and the Exchange Rate

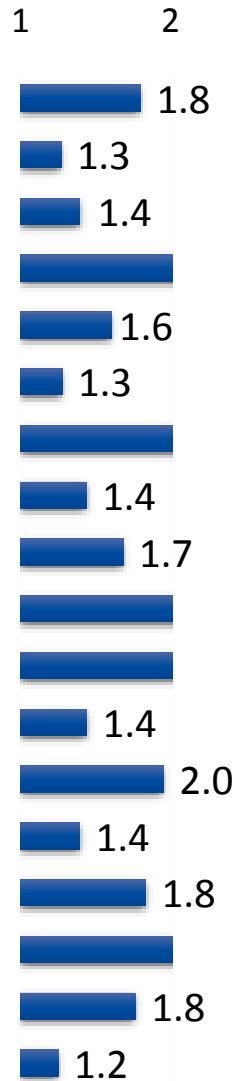


Note: Production based estimate is constructed as a translog aggregate of industry value added PPPs.

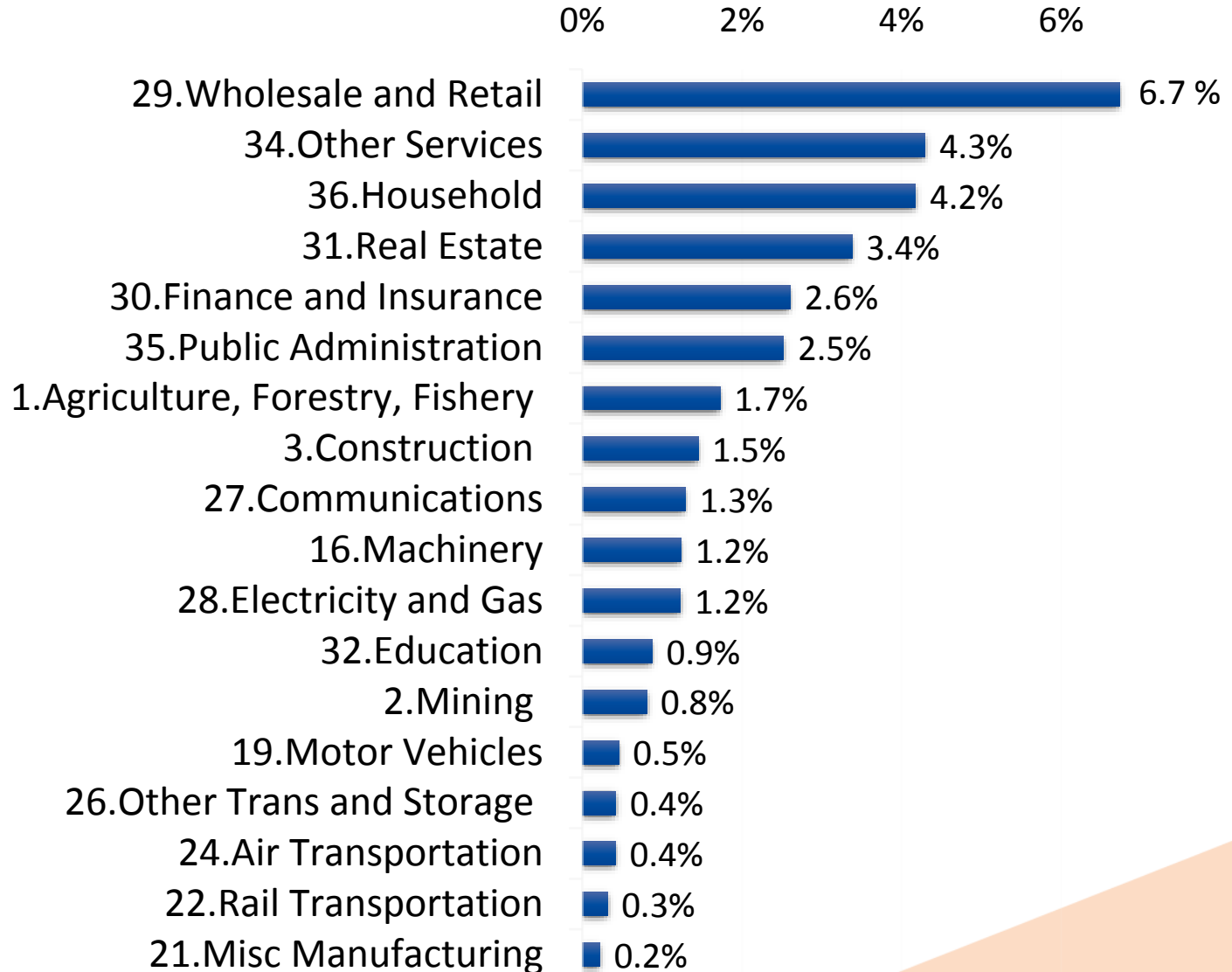
Industry Sources of Aggregate GDP PLI Gap, 2011



Price Index Level for Value Added



Industry Contributions



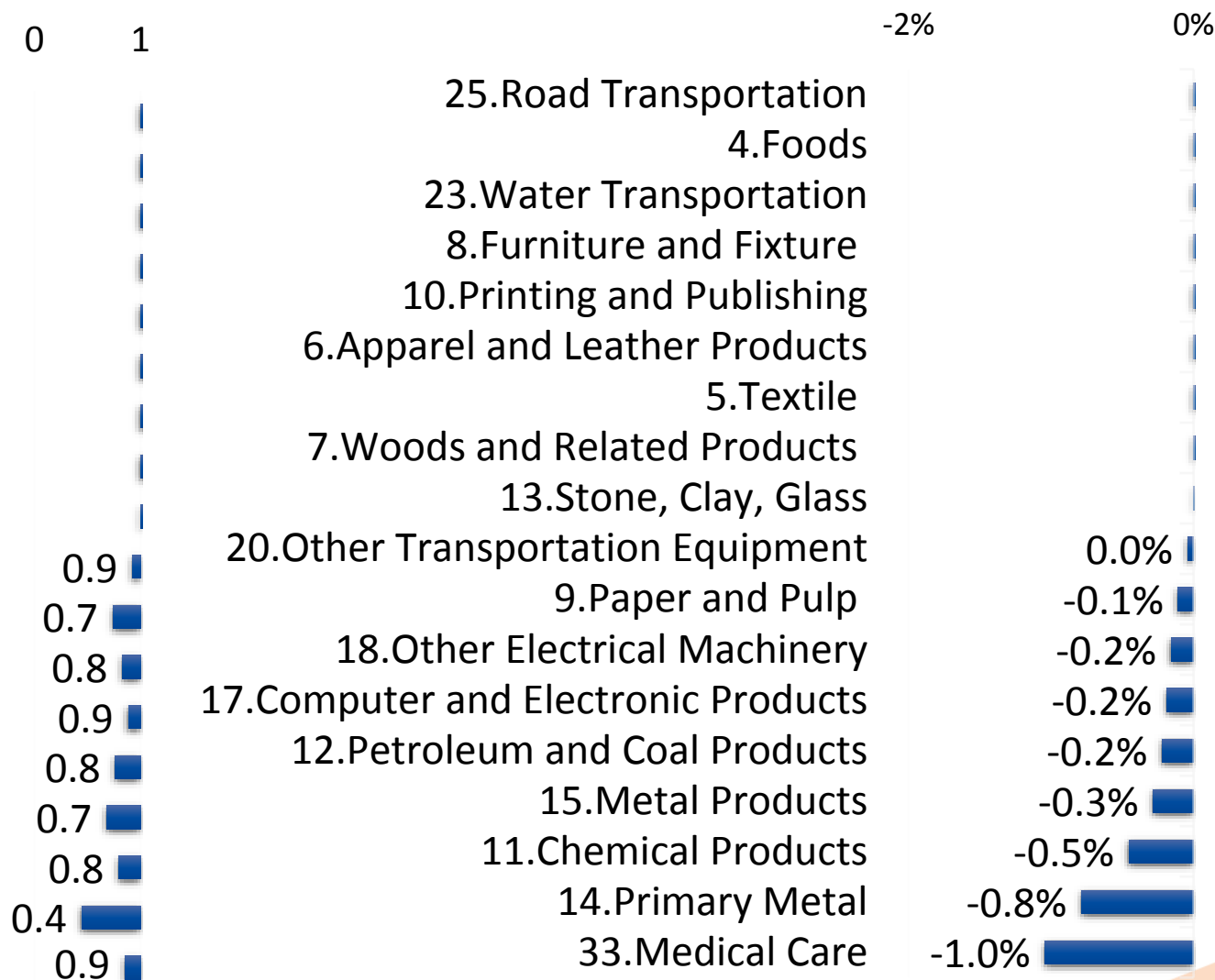
Industry Sources of Aggregate GDP PLI Gap, 2015

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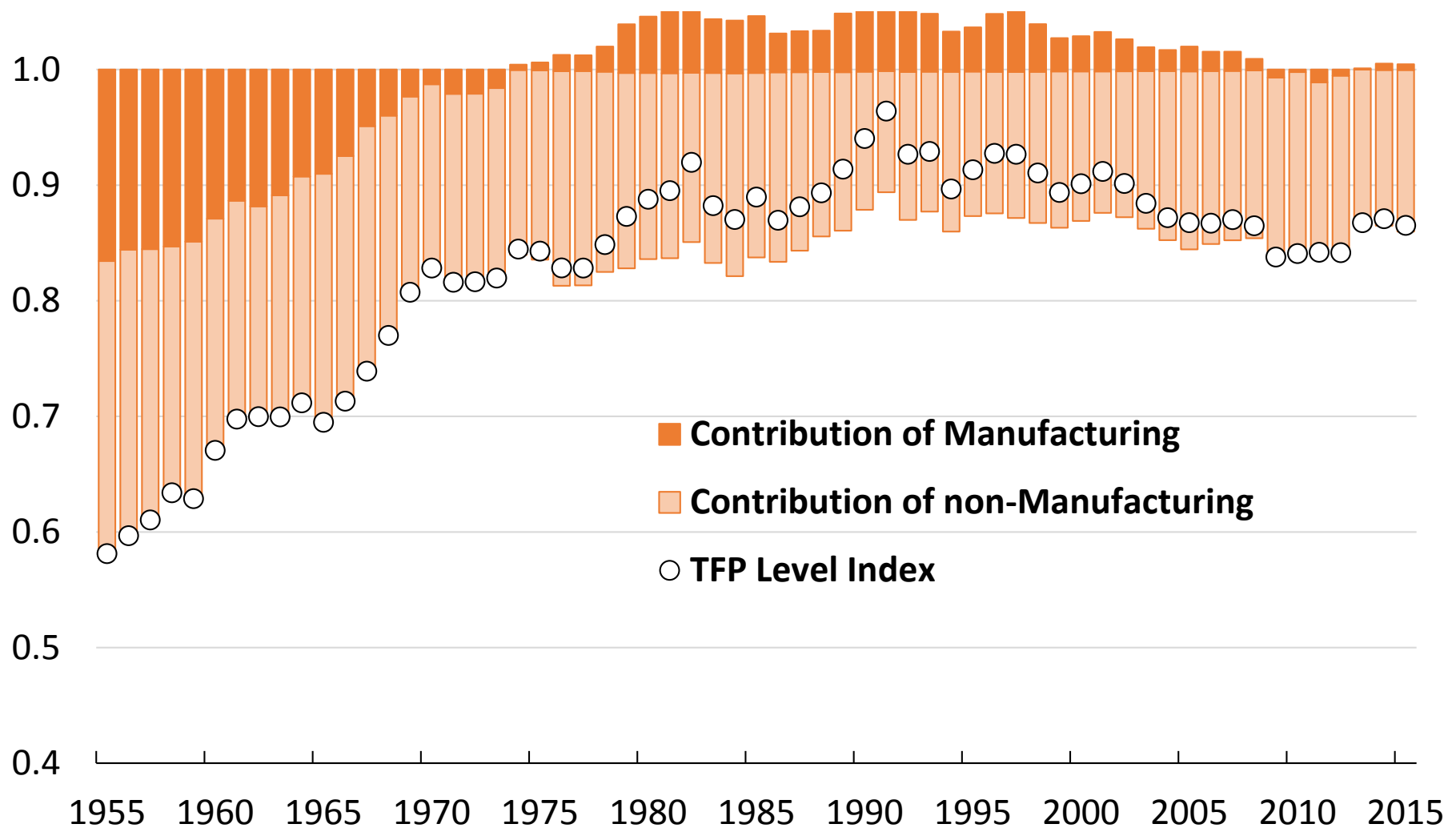
Price Index Level for Value Added

Industry Contributions



- Volume level index: $VLI_{\thetaijt} = X_{\thetaijtJ} / X_{\thetaijtU}$.
- Productivity level index: $\ln TLI_{jt} = (\ln VLI_{yjt} - \sum_{\theta} w_{\theta jt} \ln VLI_{\theta jt})$.
- Interpretation: relative efficiency with which inputs are transformed into output in the two economies; productivity gap.
- Price dual: input prices less output prices.
- Industry sources of aggregate TFP gap (Domar weights).
- Consistent with country-level national accounts.

Japan-U.S. Aggregate TFP Gap

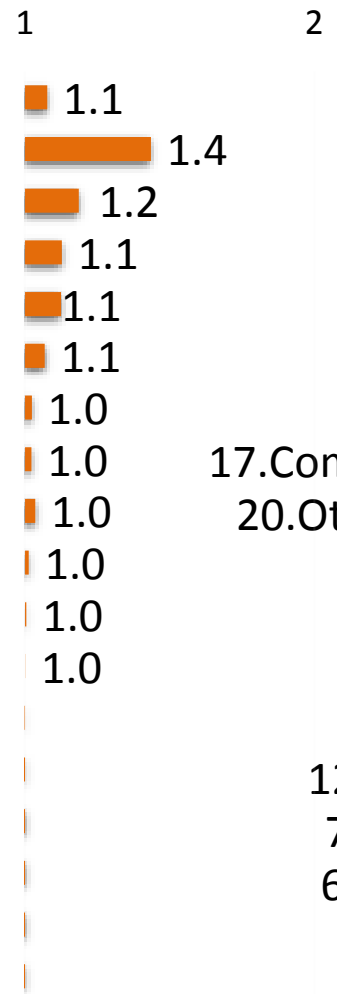


Note: Aggregate TFP is Domar-weighted sum of industry TFP gaps, grouped into Manufacturing (Mnf) and Non-Manufacturing (Non-Mnf)

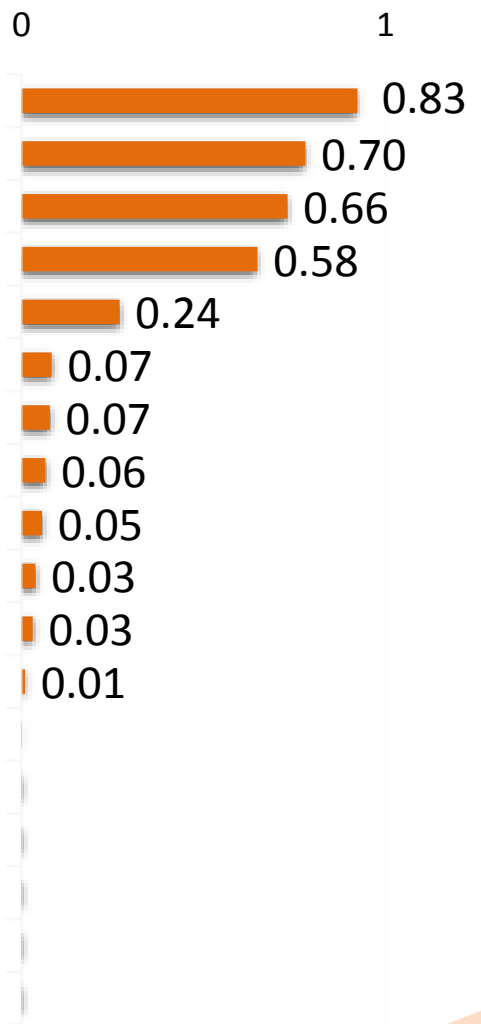
Industry Origins of Japan-U.S. Aggregate TFP Gap, 2015



TFP Level Index



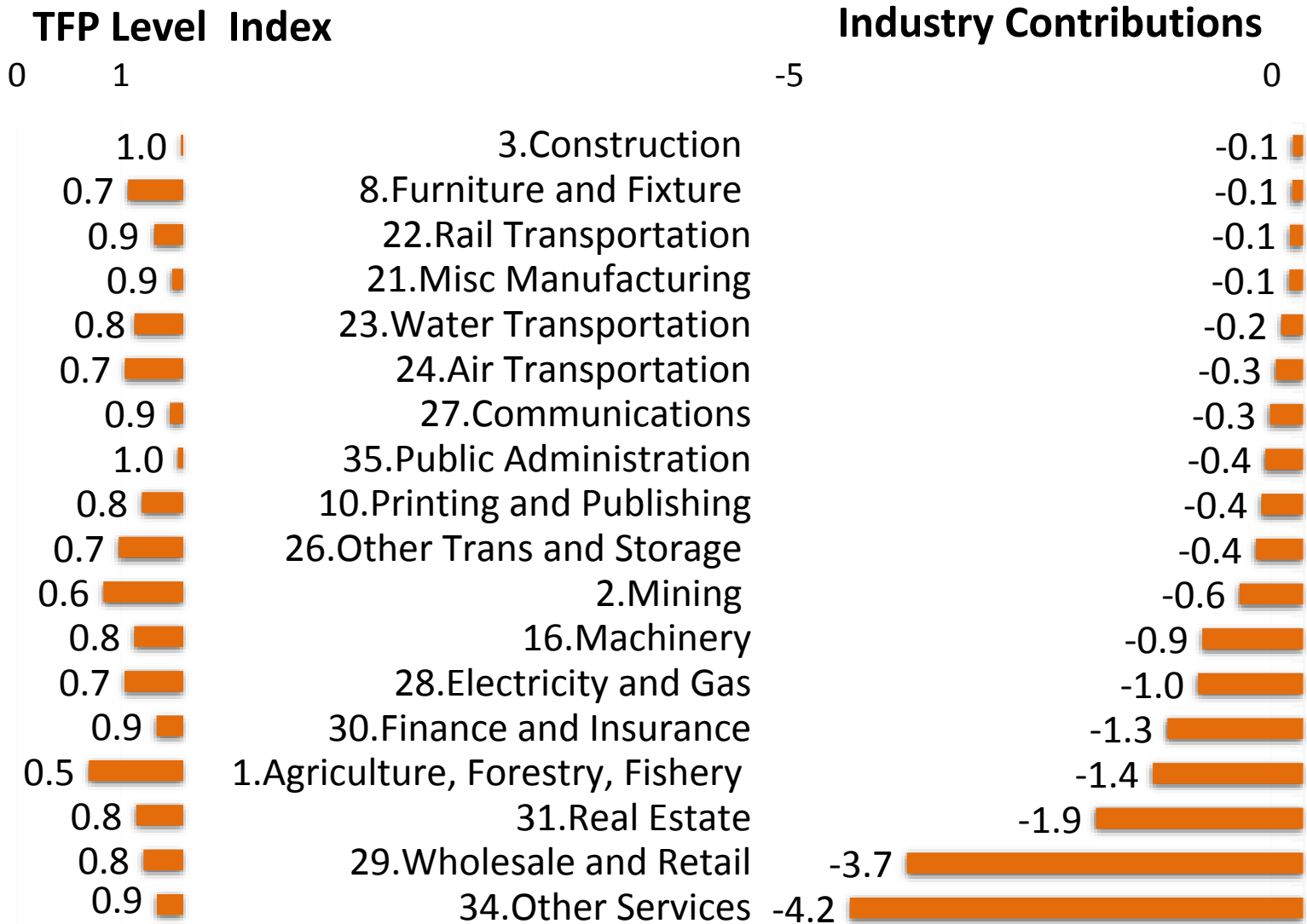
Industry Contributions



Note: Industry contribution is Domar-weighted TFP gap.

Industry Origins of Japan-U.S. Aggregate TFP Gap, 2015

Continued



Note: Industry contribution is Domar-weighted TFP gap.

- U.N. Manual *in progress*: “Handbook on Accounting for Global Value Chains.”
- Section: Global Integrated Productivity (KLEMS) Accounts
 - Objective: Industry-level production account for the world economy.
 - Moves from World KLEMS (individual countries) to Integrated Global Production Account.
- No existing framework covers this for the world economy.
 - But Nomura and Miyagawa (2015) and Jorgenson, Nomura, and Samuels (2018) provide a proof of concept for Japan and the U.S.
 - Section advocates for extending these to cover the world economy.
- Will require collaboration and coordination.

Conclusions



- Provided price and productivity level indices covering 1955-2015.
- Price competitiveness versus U.S. has evolved over time:
 - Japan lost price competitiveness in the mid 1970s.
 - Regained in 2015.
- Technological catchup has evolved as well:
 - Manufacturing TFP gap eliminated by early 1970s.
 - Through 2015, small gap in Manuf. and relatively large gap in non-Manuf.
 - Large contributions from Other services, Wholesale and retail, Real estate, counterbalanced by Metal, Chemicals, Medical care.
- Data challenges remain: Margin prices, IT prices, factoryless goods manufacturing, health outcomes.
- Framework provides blueprint for Integrated World Production Account at the industry level.