追加資料

Harmonizing Japan’s Current National Accounts with the 1993 SNA Recommendation:

(1) Own-Account Software and
(2) WiP Inventory for Cultivated Assets

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1.Capitalizing Own-Account Software

(Nomura, Koji: “Capitalizing Own-Account Software in Japan”, Program on Technology and Economic Policy (PTEP), JFK School of Government, Harvard University, 2004)

a. Intangible Assets in the 1993 SNA

b. Intangible Assets in Japan’s National Accounts

c. Internationally Harmonized Method
(OECD Task Force on Software Measurement /BEA approach)

d. Estimated results by the modified BEA approach

Intangible Assets in the 1993 SNA

Intangible Assets (AN.112)

- Mineral Exploration (AN.1121)
- Computer Software (An.1122）

  :Computer programs, program descriptions and supporting materials for both systems and applications software. Included are purchased software and software developed on own account, if the expenditure is large. Large expenditures on the purchase, development or extension of computer database that are expected to be for more than one year, whether marked or not, are also included.
- Entertainment, Literary, or Artistic Originals（AN.1123）
- Other Intangible Fixed Assets（AN.1129）

Intangible Assets in the Japanese National Accounts

Japanese National Accounts

- 1995 Benchmark Revision:
  Custom Software, Mineral Exploration, and Plant Engineering
- 2000 Benchmark Revision:
  Custom Software, Prepackaged Software, Mineral Exploration, and Plant Engineering
- Toward 2005 Benchmark Revision
  - Mineral Exploration: should be measured as stock.
  - Plant Engineering: should be defined as tangible assets.
  - Own-Account Software: should be capitalized.
    - 2005 Benchmark Input-Output Table?

Capitalizing Own-Account Software

Methodology

- Survey on corporate accounts: Does it work well?
- Production cost (imputation) approach
  - Every OECD country estimates own-account software using production cost approach (Ahmad, 2003)

Internationally Harmonized Method

- Recommendations by the OECD Task Force on Software Measurement in the National Accounts:
  - Lequiller, Francois, Ahmad, Nadim, Varjonen, Seppo, Cave, William and Ahn, Kil-Hyo(2003) “Report of the OECD Task Force on Software Measurement in the National Accounts”, OECD Statistics Working Paper Series, OECD, March.
- Aggregate harmonized estimate
  - Ahmad, Nadim (2003) “Measuring Investment in Software”, STI Working Paper Series, OECD, May.
- BEA’s approach to estimate own-account software by industry
  - Grimm, Bruce T., Moulton, Brent R. and Wasshausen, David B.: “Information Processing Equipment and Software in the National Accounts”, Revision of the paper prepared for Conference on Measuring Capital in the New Economy, sponsored by the NBER/CRIW, April 26-27, 2002, Federal Reserve Board, Washington, D.C., March 2003.
  - Revised in 1997, 1999, 2003

Conceptual Viewpoints for Defining Own-Account Software

- Originals and Copies
  - e.g. Reproduced games are not treated as GFCF, since they are not used in the production process. However, the games' originals should be treated as GFCF, since they are used for producing the reproductions of the games.
- Identification of two different production processes
  - Prepackaged software used in production process for more than one accounting period is treated as GFCF by the purchasers. Also, the originals should be treated as GFCF by the producers to reproduce the copies.
- Work-in-progress?
  - In practice, most own-account software WiP would ultimately be recorded as investment.
- Unsuccessful software development?
  - e.g. analogy of mineral exploration

Stages of the Production Process of Own-Account Software

OECD Task Force (2003) describes the eight stages:

(1) Feasibility analysis

(2) Functional analysis

(3) Detailed analysis

(4) Programming

(5) Test

(6) Documentation

(7) Training

(8) Maintenance

They recommend that own-account software should include compensation of all staff and all internal overheads cost incurred in own-account production on stages (2)-(6) above (Recommendation 1(3)).

Processes and Assumptions

The modified BEA approach

(1) Number of workers of software professionals

(1) Excluding workers linked to custom software and reproduction software to be sold

(non-software industry) BEA's limiting factor (0.2 percent) in each non-software industry (Grimm, Moulton, and Wasshausen, 2003)

→ No limiting factor is assumed

(software industry) 66.4 percent of software professionals in software industry is deducted in 2000 as they engage in production of custom software.

(2) Excluding working time linked to other activities

e.g. BEA's 50 percent deduction rule (this rule is also recommended by the OECD Task Force as an upper limit) –originates form a study on the share of software development and maintenance costs in 487 business organizations reported by Barry Boehm (1981).

(2) Wages/labor cost for software professionals

(3) Non-labor cost for own-account software

ISCO and JSCO for Software Professionals

ISCO 1988	JSCO 1997
213. Computing Professionals 2131. Computer systems designers, analyst, and programmers 2139. Computing professionals not elsewhere classified)	06. Computing Professionals 061. System engineers 062. Programmers
312. Computer associate professionals 3121.Computer assistants 3122.Computer equipment operators 3123. Industrial robot controllers	31. Office machinery operators 311. Stenographers, typists, and word processor operators 312. Key punchers 313. Computer operators 319. Other office machinery operators

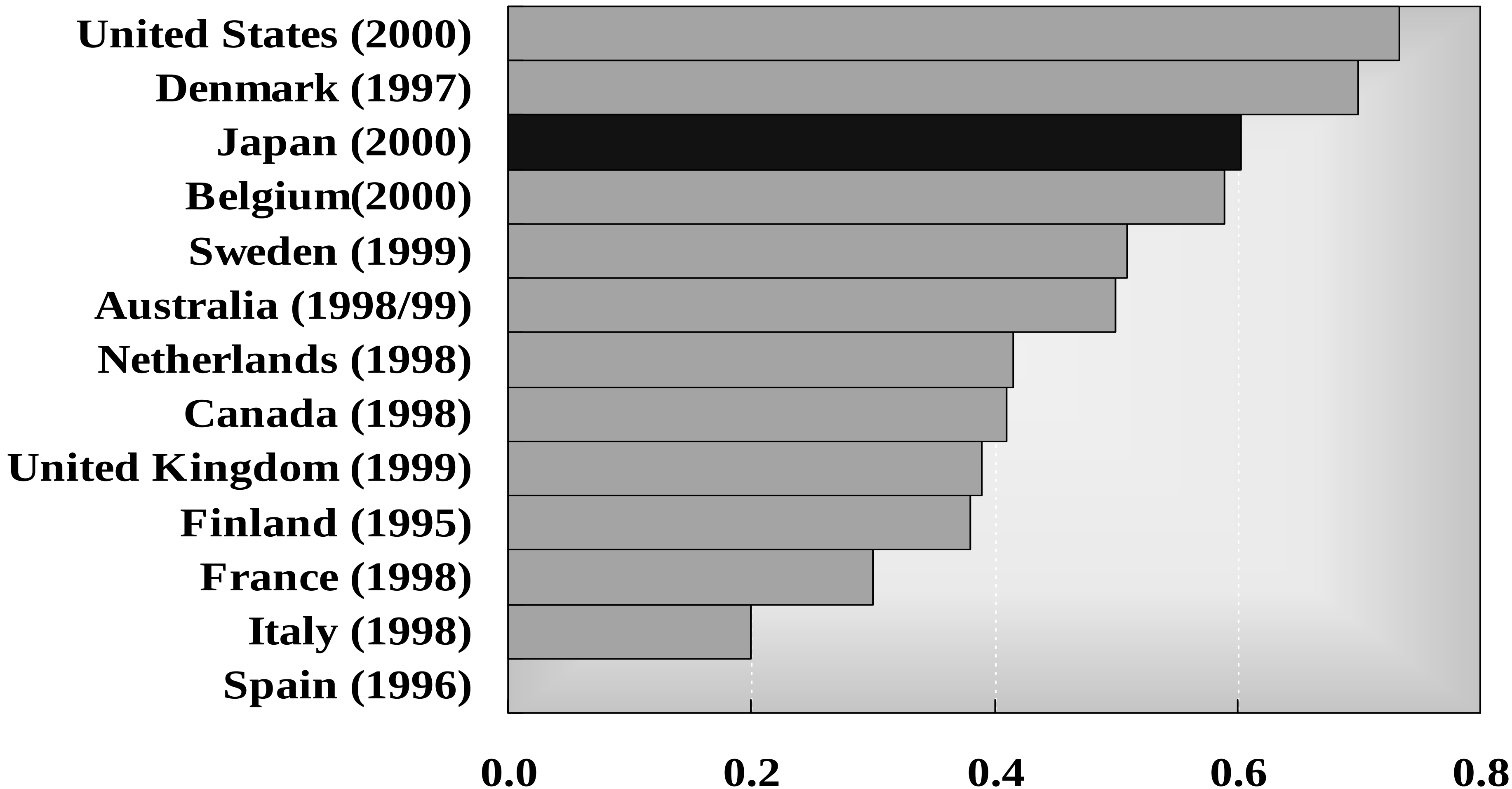
ISCO: International Standard Classification of Occupation
JSCO: Japan Standard Classification of Occupation

International Comparison of Software Professionals

	Year	Share to total employees	ISCO-213	ISCO-312	ISCO-213/ (213+312)
Greece	1998	0.2	7444	7196	50.8
Spain	1998	0.3	44026	34107	56.3
France	1998	0.4	196705	99011	66.5
Netherlands	1998	0.9	100765	82144	55.1
U.S.	2000	1.3	1633280		
Sweden	1999	1.3	75881	24474	75.6
Japan	2000	1.4	753493	363753	67.4

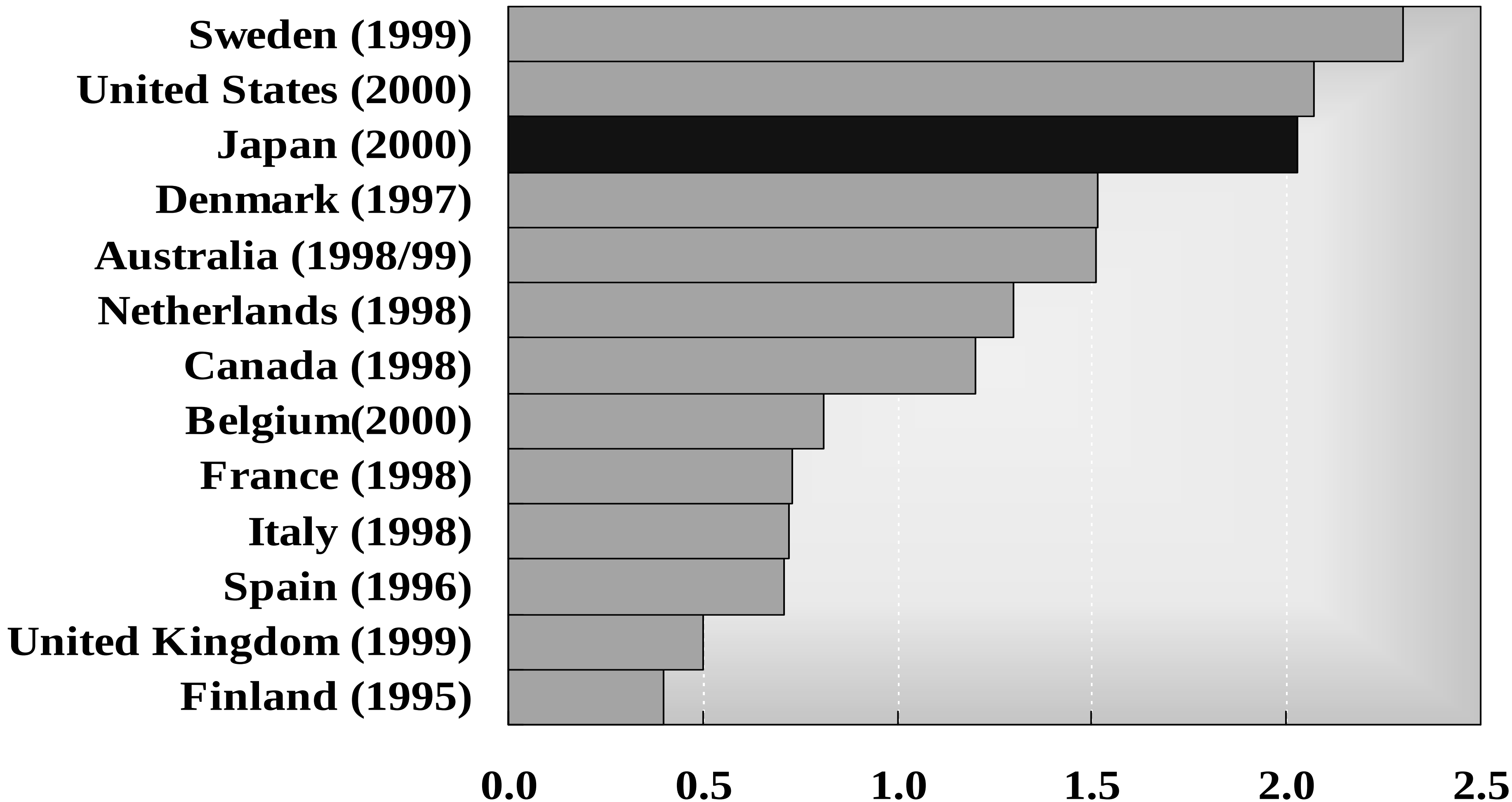
Data: Employee Base, U.S.(Occupational Employment and Wages, BLS), Japan (Nomura, 2004), Others(OECD, Ahmad, 2003)
Classification: U.S. SOC-15-1020,30, 50 and JSCO-06 correspond to ISCO-213

International Comparison of Own-Account Software Investment Share to GDP



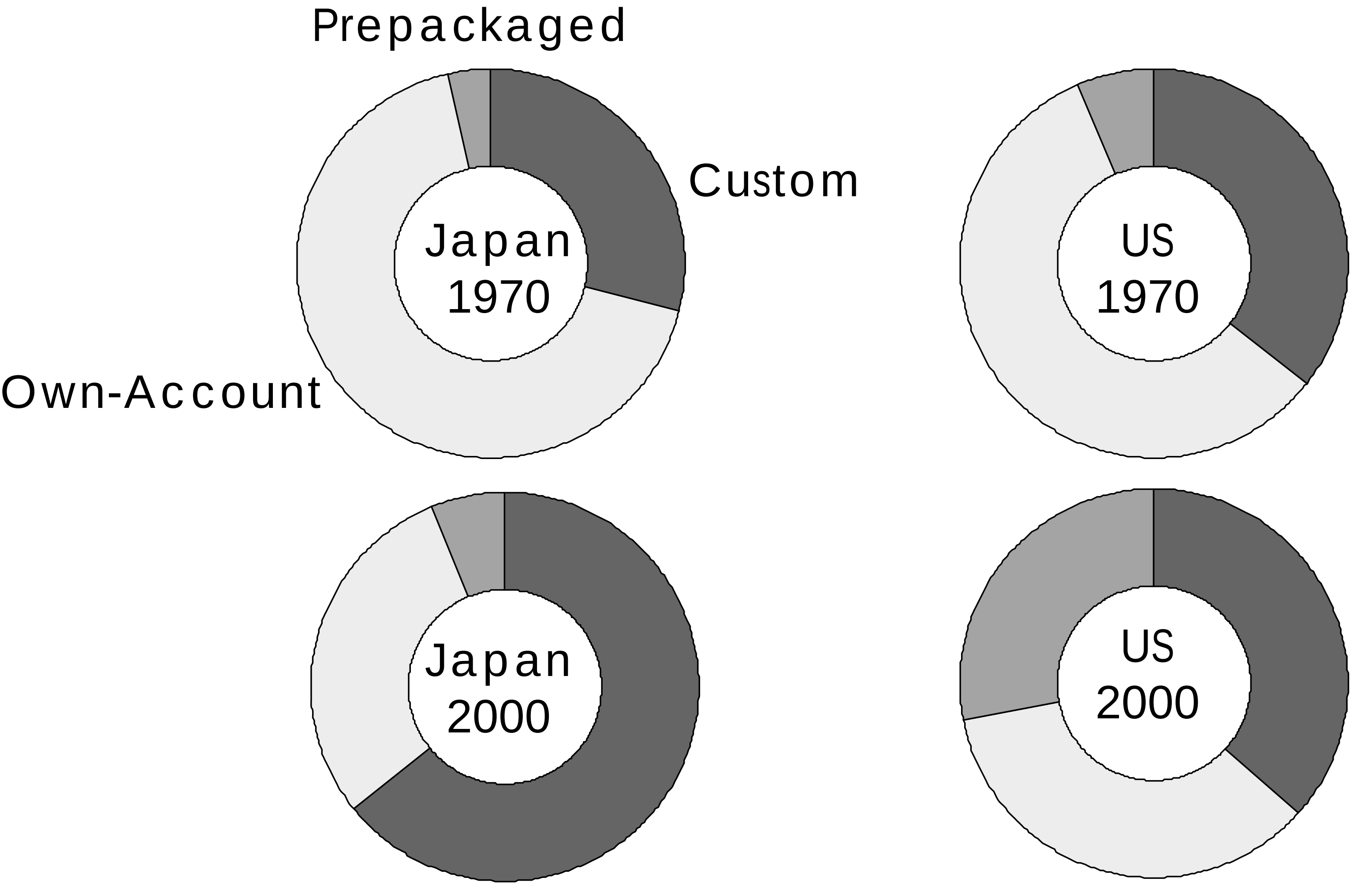
Source: Japan (Nomura,2004), U.S. (BEA), Belgium (Hermans, 2002), others (Ahmad, 2003)

International Comparison of Total Software Investment Share to GDP



Source: Japan (Nomura,2004), U.S. (BEA), Belgium (Hermans, 2002), others (Ahmad, 2003)

Composition of Software: Comparison between the U.S. and Japan



Source: Japan (Nomura,2004), U.S. (BEA)

Conclusion

- Japanese government does not have particular substantial difficulties preventing from capitalizing, based on similar data and methodology used in other countries.
- The scale of own-account software investment in Japan is 0.60 percent of GDP in 2000. This share is 0.13 percent point lower than that in the U.S.
- The share of total software investment to GDP is 2.03 percent, which is the almost same as that in the U.S. (2.07 percent), reflecting the larger share of custom software in Japan relative to other countries.
- When we use 33 percent depreciation rates, Japan's own-account software stock is 7.6 trillion yen (evaluated by the 1995 constant prices) estimated using the cost index in 2000, which amounts to about 0.4 percent of fixed capital stock and about 0.2 percent of total capital stock including land and inventories.
- Total software stock in Japan is 25.2 trillion yen estimated using the cost index in 2000.

2. Cultivated Assets

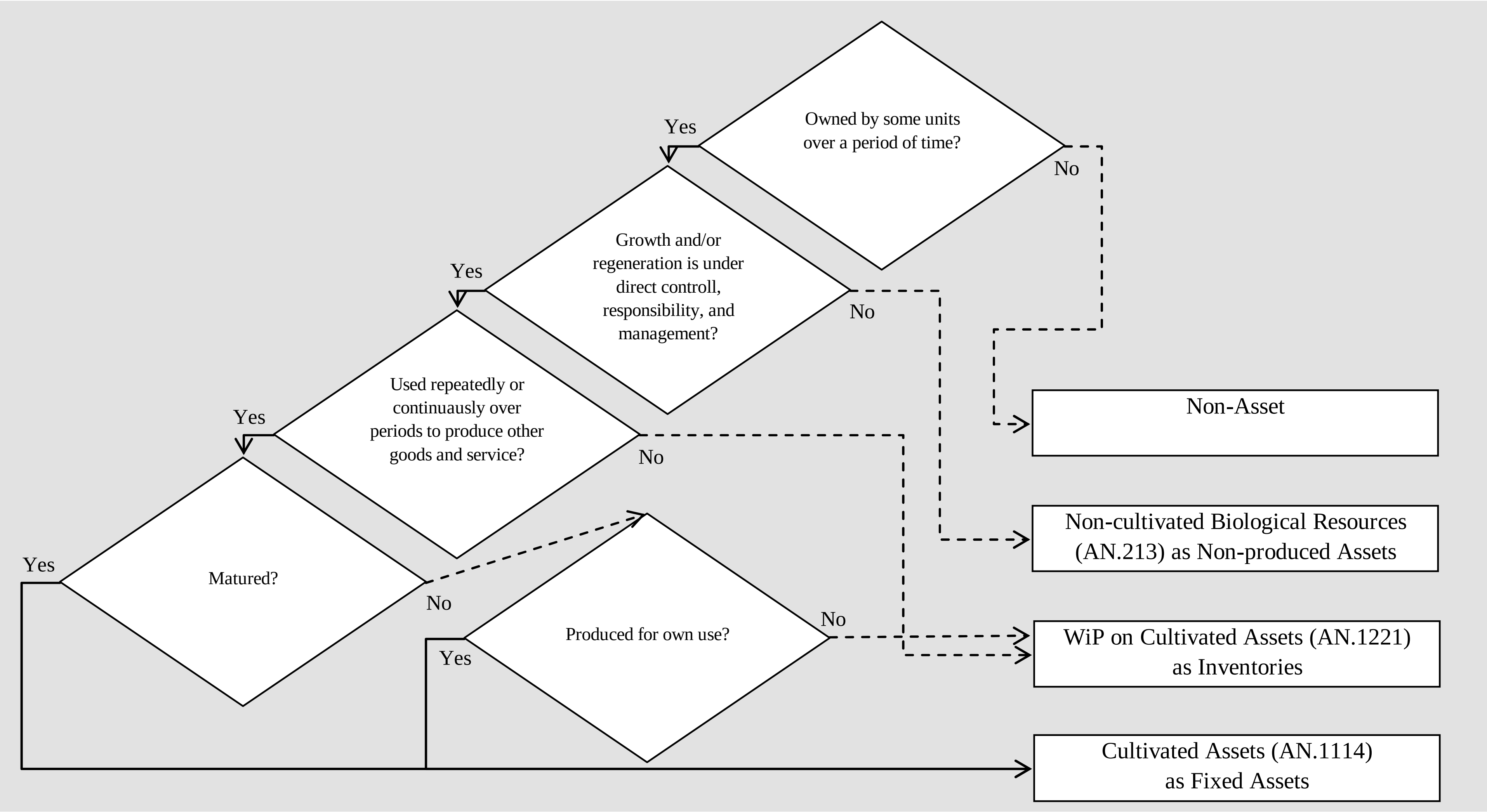
(Nomura, Koji: “An Alternative Method to Estimate WiP Inventory for Cultivated Assets”, KEO Discussion Paper No.101, 2006)

a. Why cultivated assets?
b. Cultivated assets in SNA
c. Problems in production account
d. Problems in wealth account
e. An alternative approach: RIM
f. Estimated results

1993 SNA: WiP (work-in-progress) Inventory on Cultivated Assets

- WiP Inventories on Cultivated Assets
  - 1993 SNA recommends that "livestock raised for products yielded only on slaughter, such as fowl and fish raised commercially, trees and other vegetation yielding once-only products on destruction" should be treated as WiP inventories (AN.1221).
- The natural growth of cultivated assets yielding once-only products is counted as WiP inventories.
- Based on 1993 SNA, biologicals can be classified into four categories,
  - Non-assets (that are not recorded in SNA)
  - Non-cultivated biological resources (non-produced assets)
  - WiP inventories (cultivated assets)
  - Fixed assets (cultivated assets)

Classifying Biologicals: Based on the 1993 SNA



Distinction of Shipment and Output

The 1993-SNA-view on cultivated assets requires the distinction of shipment and output. (In the 1968-SNA-view, they were the same)

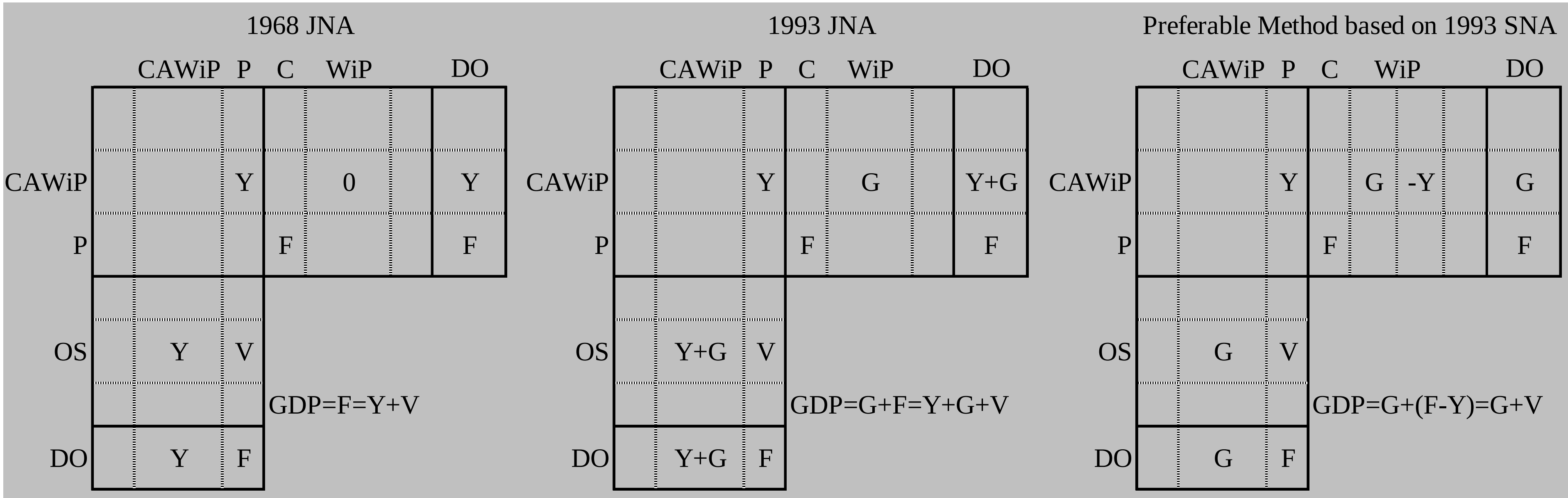
Identities

- $X=Y+\Delta Z$
  - X: quantity of output
  - Y: quantity of shipment
  - ΔZ: quantity of net inventory change
- $\Delta Z=(B+G)-(S+D)$
  - (B+G): quantity of inventory addition
    - B: quantity of purchased inventory
    - G: quantity of natural growth on inventory
  - (S+D): quantity of inventory withdrawal
    - S: quantity of sold inventory
    - D: quantity of disposals of inventory

Problems in Production Account (1) Input-Output Framework

- The Japan's benchmark Input-Output table is based on an inappropriate framework to describe the shipment and output of cultivated assets (except for afforestation) .
- ΔZ in the Benchmark Input-Output Table are all positive! (= inventory changes are defined as the value of natural growth G, rather than inventory change ΔZ).

Input-Output Framework for Describing WiP Inventory on Cultivated Assets



CAWiP: Cultivated assets, which can be WiP inventories based on 1993 SNA.

P: Processing sector of cultivated assets

C: Consumption

WiP: WiP inventory chnage (natural growth of CAWiP is denoted by G)

OS: Operating surplus

DO: Domestic output (CAWiP sector's shipment is Y and Processing sector's output and operating surplus are F and V, where F=Y+V)

For simplification, intermediate inputs except for processing sector's input of CAWiP are ignored in this figure

Problems in Production Account (2) Difficulty to Estimate Growth Value

- The inventory change ΔZ (or growth value G) may be not directly observable, since immature cultivating assets may be not frequently transacted in market.
- They are estimated by the imprecise methodologies using physical data on cultivated assets coupled with growth assumptions.

Problems in Production Account (3a) In the case of Forest

- Only in afforestation, the output is properly defined by the growth value in the Benchmark IO.
- In afforestation, it is also difficult to determine the coverage of forest (more than 60 percent of Japan’s land is occupied by forest). In 2000 Benchmark IO Table, the estimated value of annual growth (G) is 849.8 billion yen. This is more than 5 times larger than the actual annual shipment (161.5 billion yen).
- Considering the actual intermediate and labor costs in the forest industry, the operating surplus is unreasonably large (614.5 billion yen). (In fact, deficit spending is quite common in Japan’s forestry and logging)…
- It may overestimate the Japanese GDP…

Problems in Production Account

(3b) Comparison between Canada and Japan

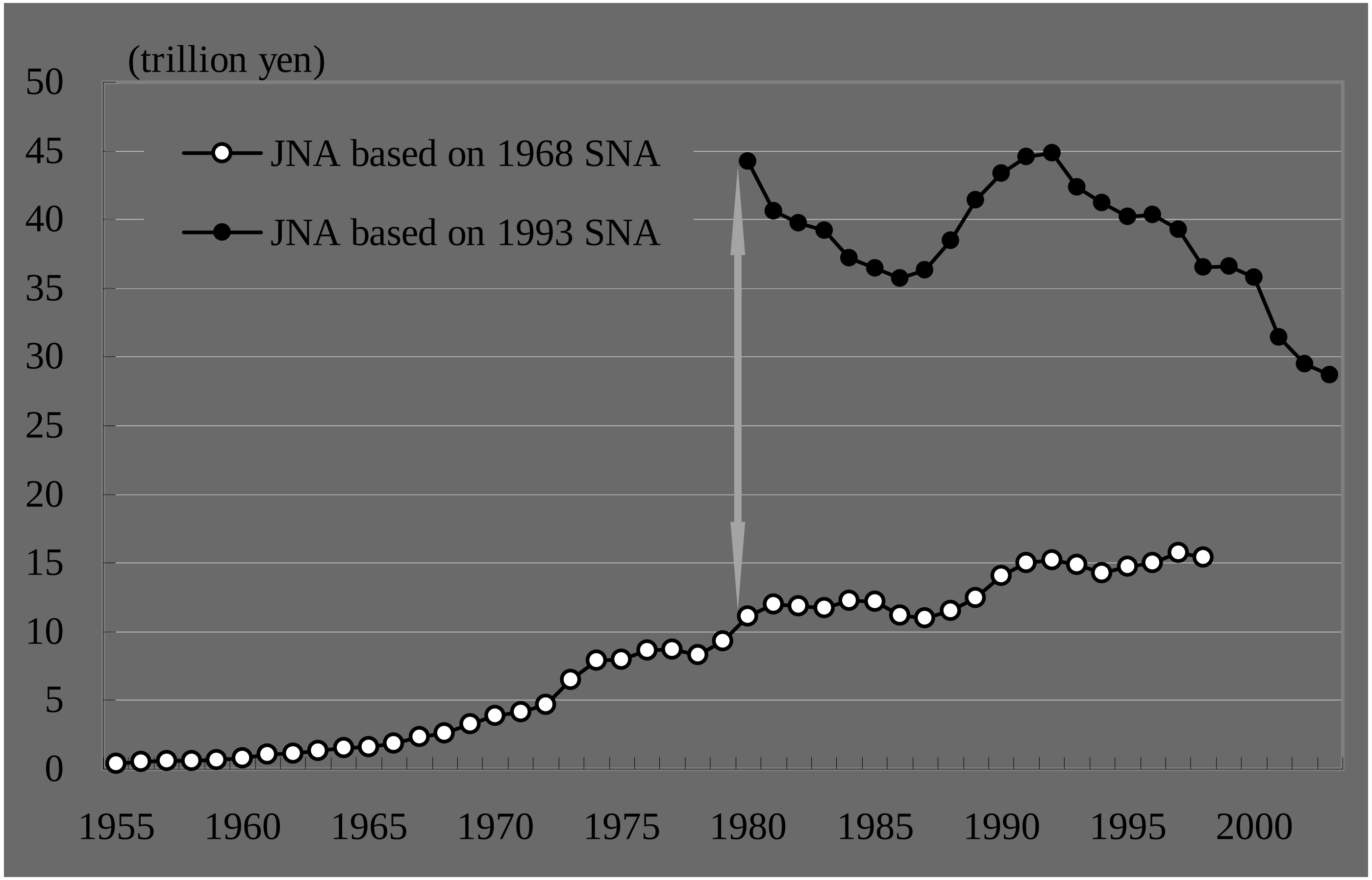
	Canada (million $)	Japan (million $)	Japan (billion ¥)
Shipment: Y	7312	2225	161.5
WiP: ΔZ	369	9357	679.0
Output: X	7681	11710	849.8
Rate of VA	43.7%	92.6%	
Rate of OS	19.4%	72.3%	

- Canada: 2000 Input-Output Table, 0.249.Logs for WiP, Output, and Shipment, 113000.Forestry and Logging for the rates of VA and OS.
- Japan: 2000 Benchmark Input-Output Table
- The Canadian shipment is 3.3 times larger than that in Japan (this relative scale is almost consistent with physical production data for the forest production statistics by FAO, UN.)

Problems in Wealth Account
(1) Huge difference in stock estimates

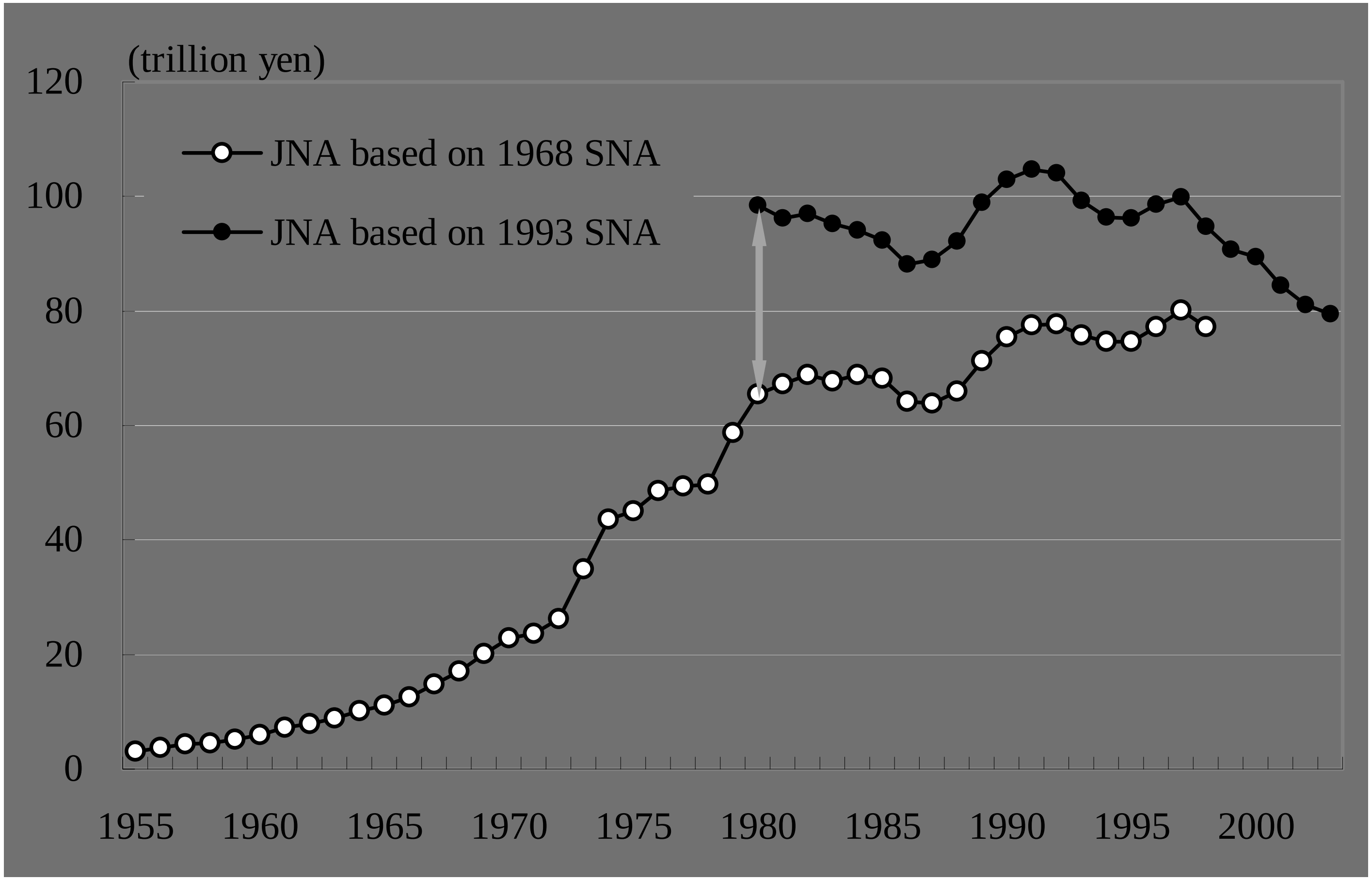
- A huge difference between inventory stock measurement that are compiled according to the 1968 SNA versus the 1993 SNA for Japan’s national accounts.
- Especially, all forest stock (29.6 trillion yen as of the end of 1980) was shifted into WiP inventory stock (there is zero for “non-cultivated biological resources” in the 1993 JSNA)

Revision of WiP Inventory Stock



- WiP inventory stock in 1993 JNA is more than four times larger than the 1968 JNA estimate as of the end of 1980.

Revision of Total Inventory Stock



- Total inventory stock in the 1993 JNA is 33.0 trillion yen (about 50 percent) larger than the estimate in the 1968 JNA as of the end of 1980.

Problems in Wealth Account
(2) Inappropriate stock estimates

- The current estimates for WiP inventory stock estimated by PIM ($Z=\Sigma \triangle Z$) don’t make any sense in each asset.. (Typically, Z increases monotonously since $\triangle Z$ invariably are positive).
- As a non-depreciable asset, measurement errors will not be automatically reduced over multiple time periods.

An Alternative Approach: RIM

Identities for cultivated assets

- Assumptions: B=0, S=Y
- $\Delta Z=(G-D)-Y$, $X=(G-D)$
  - X: output, Y: shipment, ΔZ: inventory change, G: growth, D: disposals

RIM (Realized Inventory Method)

- In the case that it is not easy to directly observe ΔZ or G, PIM may not work well.
- The better-known information is shipment Y, that is evaluated in market.
- RIM depends on a simple fact that cultivated assets to be sold necessarily have growth over the past periods required for maturation.

Allocation of growth

- $Y(t) \rightarrow G(t), G(t-1), G(t-2), G(t-3), \ldots$ and $D(t), D(t-1), D(t-2), D(t-3), \ldots$
- If we can allocate the shipment value to the past growth and disposal with growth assumptions, X, ΔZ, and Z can be also defined by shipment Y.

PIM vs RIM

PIM (Perpetual Inventory Method)

- Stock Z is defined by the accumulated value of past inventory changes ΔZ.

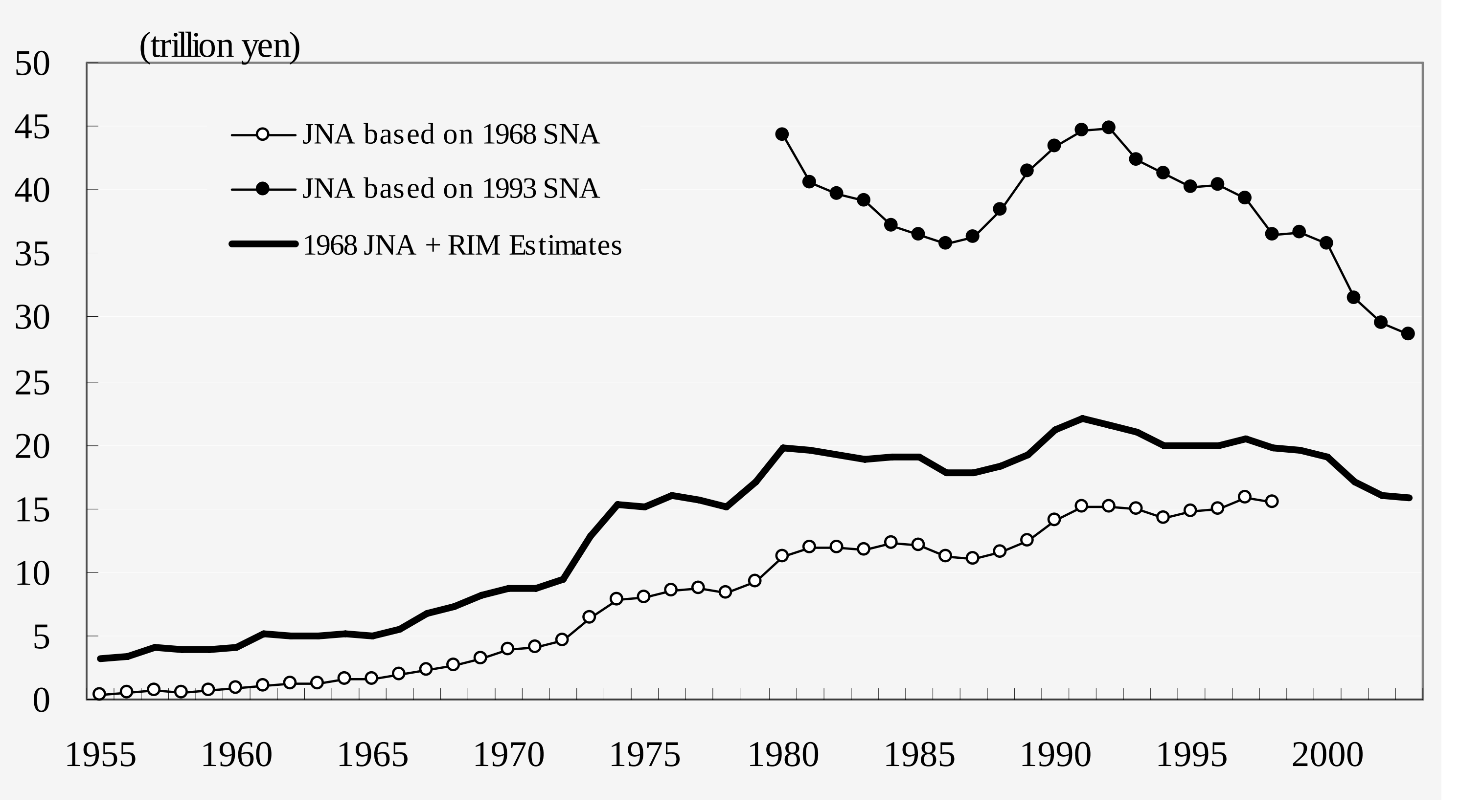
RIM (Realized Inventory Method)

- Stock Z over the past periods are backwardly estimated based on the realized values of the cultivated assets to be sold.
- The factual shipment information may be better-known than the value of the natural growth is not directly observable.
- RIM estimates have the advantages of being consistent with the actual shipments over time.

Classification of Cultivated Assets
and Parameters describing Growth and Disposal

		T	β	M
(1)	Seeds and seedlings	18	-5.0	0.20
(2)	Flowers and plants	24	0.3	0.20
(3)	Beef cattle	30	0.2	0.08
(4)	Racehorse	24	0.3	0.08
(5)	Saplings	36	-3.0	0.30
(6)	Japanese cedars	480	-1.3	0.10
(7)	Japanese cypresses	600	-1.3	0.10
(8)	Japanese red/black pines	420	-1.3	0.10
(9)	Larch, white or spruce firs	420	-1.3	0.10
(10)	Other conifers	480	-1.3	0.10
(11)	Broadleaf trees	720	-1.3	0.15
(12)	Yellowtails	24	0.2	0.30
(13)	Breams	27	0.1	0.30
(14)	Scallops	24	-5.0	0.70
(15)	Oysters	18	-5.0	0.70
(16)	Pearls	36	-7.0	0.50
(17)	Laver	14	-5.0	0.20

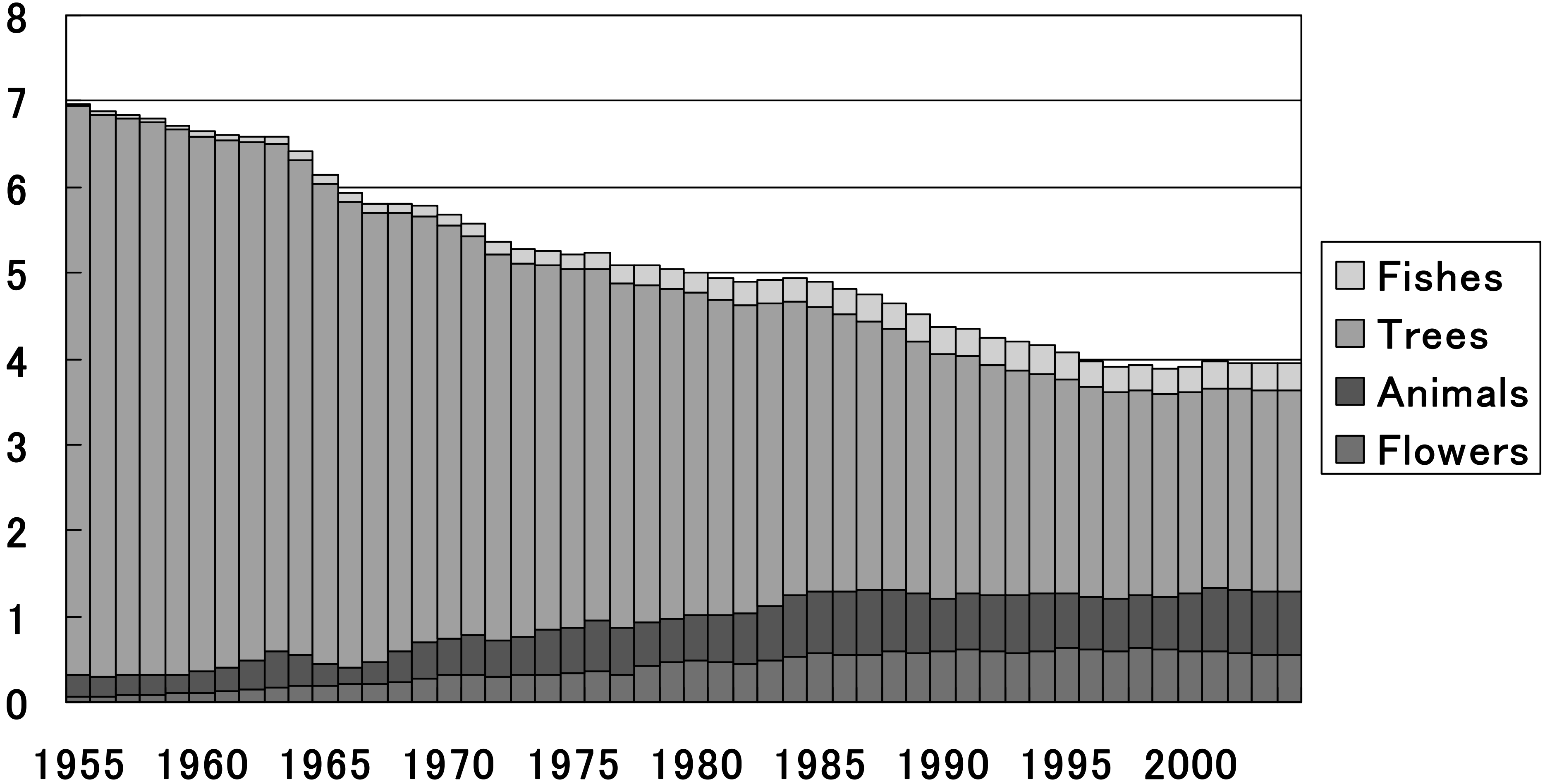
Estimated Results: WiP Inventory Stock



- As of the end of 1980, total inventory stock was increased by 33.0 trillion yen in 1993 JNA.

However, based on the RIM estimates, only 8.6 trillion yen should be increased.

Estimated WiP Inventory Stock for Cultivated Assets



(trillion yen/ 2000 constant prices)

Correction on GDP

	(G-D) in LIO	G by RIM	-D by RIM	Correction on (G-D)	Correction on (–Y)	Correction on GDP
1990	361	2303	-183	+1759	-2325	-566
1995	603	2013	-173	+1237	-1919	-682
2000	751	1908	-164	+993	-1714	-721

- Billion yen (in current prices)

Can history be written backwards?

"In following the paths of historical development [...] in the direction of time, the analyst finds himself, in most instances, engaged in the rather thankless task of trying to derive known from unknown or, at least, better-known from less well-known facts. Would it not be much more efficient to reverse this procedure? By establishing the base of his operations, i.e., the principal store of primary factual information in the present or a very recent past, and then moving on backward with the help of theoretical weapons step by step toward the more and more distant past, the analytical historian could make most effective use of the limited amount of direct factual information to which he usually has access."

(Wassily W. Leontief (1963) ”When should History be written backwards?”, *The Economic History Review)*

Conclusion

- The inventory stock in the current wealth account is considerably overestimated because it includes natural forest that should be treated as part of non-produced assets.
- The current estimate of WiP inventory change, which is evaluated based on imprecise methodologies using physical data on cultivated assets coupled with growth assumptions, is not consistent with the production scale of cultivated assets.
- RIM (realized inventory method) can consistently describe the relationship among shipment and inventory stock and change.
- The RIM estimates can provide alternative, and we argue better, current estimates for the value of natural growth and inventory stock.
- RIM also can be helpful for properly identifying non-cultivated biological resources as not-produced assets.