Economic Growth in Japan and the United States in the Information Age

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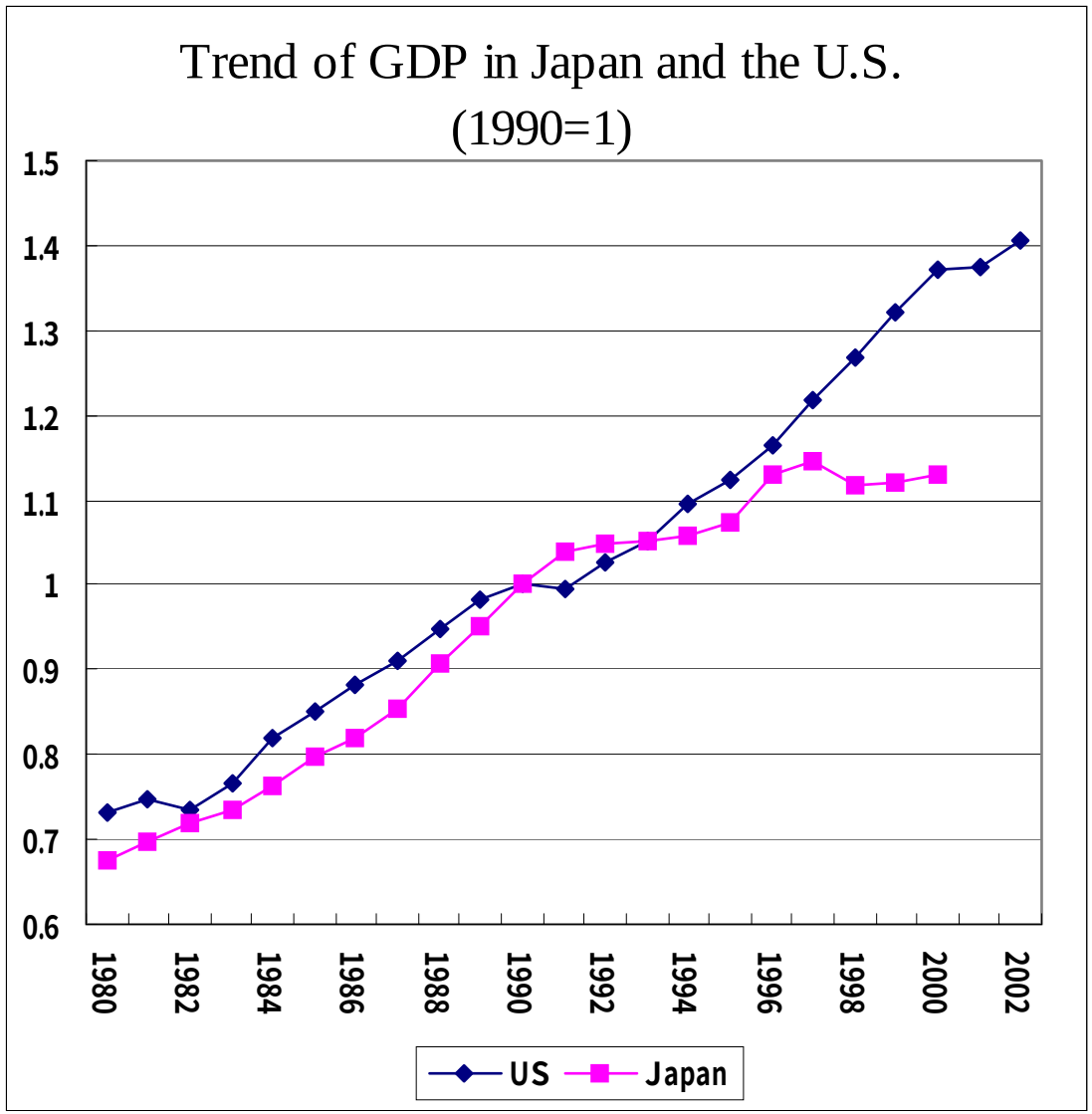
Sharp contrast of economic growth in 90's



Economic Growth in the Information Age

- US Economic Resurgence and the role of IT
  - Strong labor productivity performance by IT capital deepening
  - Raising the speed limit? Speed up of TFP growth
  - Positive relationship between IT and productivity at the firm level
- Divergence of economic growth rates of OECD countries, and potential role of IT (OECD's growth projects, studies on EU countries)
- What happened in Japan?

Methodology
-production possibility frontier approach-

$$\overline{w}_{I,n}\Delta \ln I_n + \overline{w}_{I,c}\Delta \ln I_c + \overline{w}_{I,s}\Delta \ln I_s + \overline{w}_{I,t}\Delta \ln I_t + \overline{w}_{c,n}\Delta \ln C_n + \overline{w}_{c,c}\Delta \ln C_c =$$
$$\overline{v}_{K,n}\Delta \ln K_n + \overline{v}_{K,c}\Delta \ln K_c + \overline{v}_{K,s}\Delta \ln K_s + \overline{v}_{K,t}\Delta \ln K_t + \overline{v}_L \Delta \ln L + \Delta \ln A$$

Output: Ic: Investment in computers
Is: Investment in software
It: Investment in communications equipment
Cc: Consumption of IT products
In, Cn: investment and consumption of non-IT

Input: Kc: Capital service flow from computers
Ks: Capital service flow from software
Kt: Capital service flow from communications equipment
Kn: Capital service from non-IT
L: Labor service

Total Factor Productivity: A

Dataset for analysis (Japanese data)

	Business sector	Public sector	Household sector
Output	93SNA Official GDP + software adjustments	93SNA Official GDP + software adjustmsnts	93SNA Official GDP + capital service from household
Capital Input	(Depreciable Assets) - Based on investment series by 62 types of asset (5 types of IT), capital stock and capital service are estimated. (Land) - The stock of land is assumed to be constant at macro level. Capital service price is estimated from land price (Inventory) - Use SNA base aggregated inventory stock and price to estimate capital service		Based on investment series by 20 types of asset (3 types of IT), capital stock and capital service are estimated.
Labor	KEO data for labor inputs by type of labor		—

Dataset Issues (1)- Output

- Difference in Official GDP
  - Japanese GDP (93SNA base) only includes “custom made software in investment”, while US NIPA includes “prepackaged” and “own account software” as well.
- Addition of capital service flows from consumer durables
- Impact of these adjustments is about 20 trillion yen

(in billion yen)

Official GDP 93SNA	513,377
+Software Adjustment	4,154
+Consumer Durables Adjustment	15,338
Adjusted Output data	532,868
Reference: Official GDP 68SNA base	490,518

Dataset Issues (2)- IT Price (1)

- Significant Difference in deflator for IT prices

	Japan (WPI, BOJ)		US (BEA)	US (case1)	US (case2)
	1980-90	1990-00	1990-98	1990-98	1990-98
Computer	-7.0%	-7.2%	-19.5%	-19.5%	-19.5%
Comm. Equip.	-2.8%	-3.1%	-2.0%	-10.7%	-17.9%
Software	4.1%	1.1%	-1.7%	-10.1%	-16.0%

Dataset Issues (2)- IT Price (2)

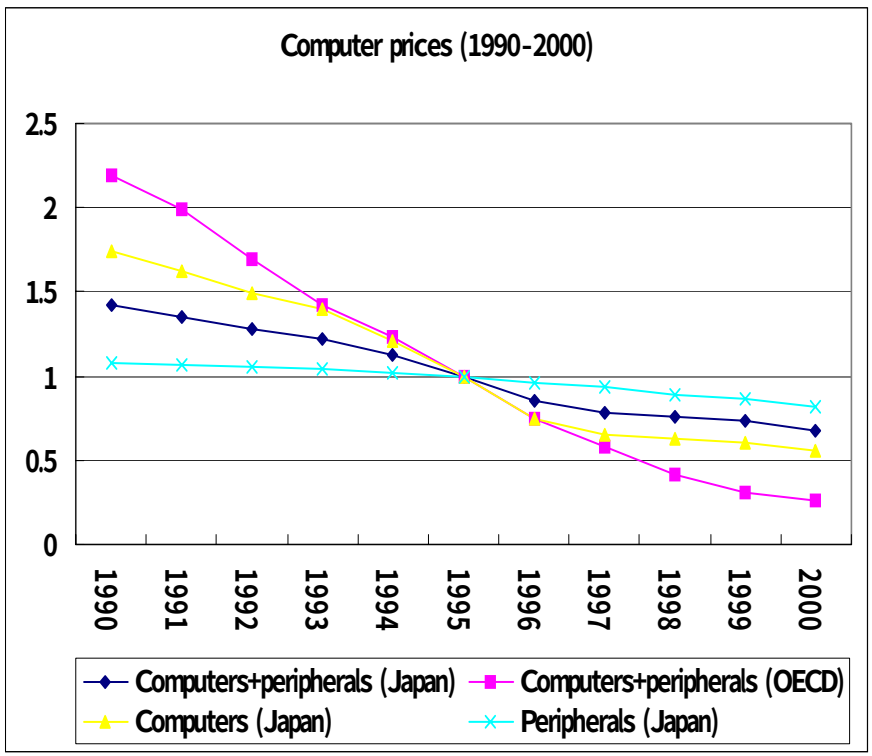
- Needs for quality constant price deflator instead of unit price
- Hedonic model deflators are used for computers in both countries: Substantial new goods bias associated with “matched model price index”
- Example: Quality upgrading in PCs

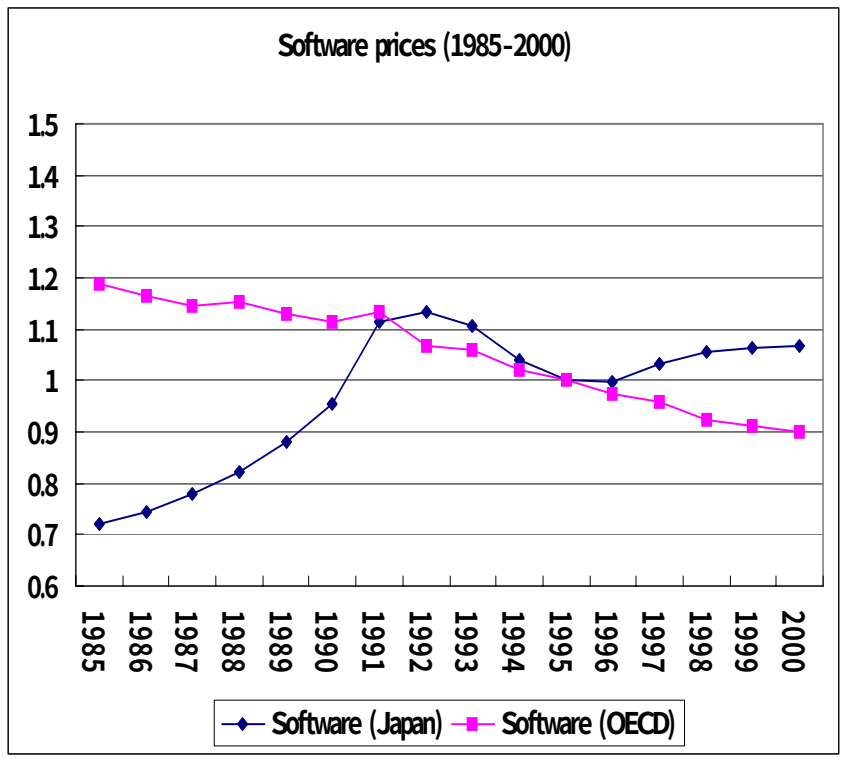
	NEC9801RA51 (1990)	ValueStar VT900/5D (2003)	Rate of Progress
CPU	Intel 386 20MHz	Intel Pentium 4 2.8Ghz	140 (1.5)
Main Memory	1.6MB	512MB	320 (1.6)
VRAM etc.	Text 12KB Graphic 256KB	Video RAM 32MB Cache memory + α	
Memory device	5 inches FDD×2	CD/DVD-R/RW	
HDD	40MB	250GB	6250 (2.0)
Communicatior	None	56Kbps modem LAN port	
Price	668,000 yen	350,000 yen	

Dataset Issues (2)- IT Price (3)

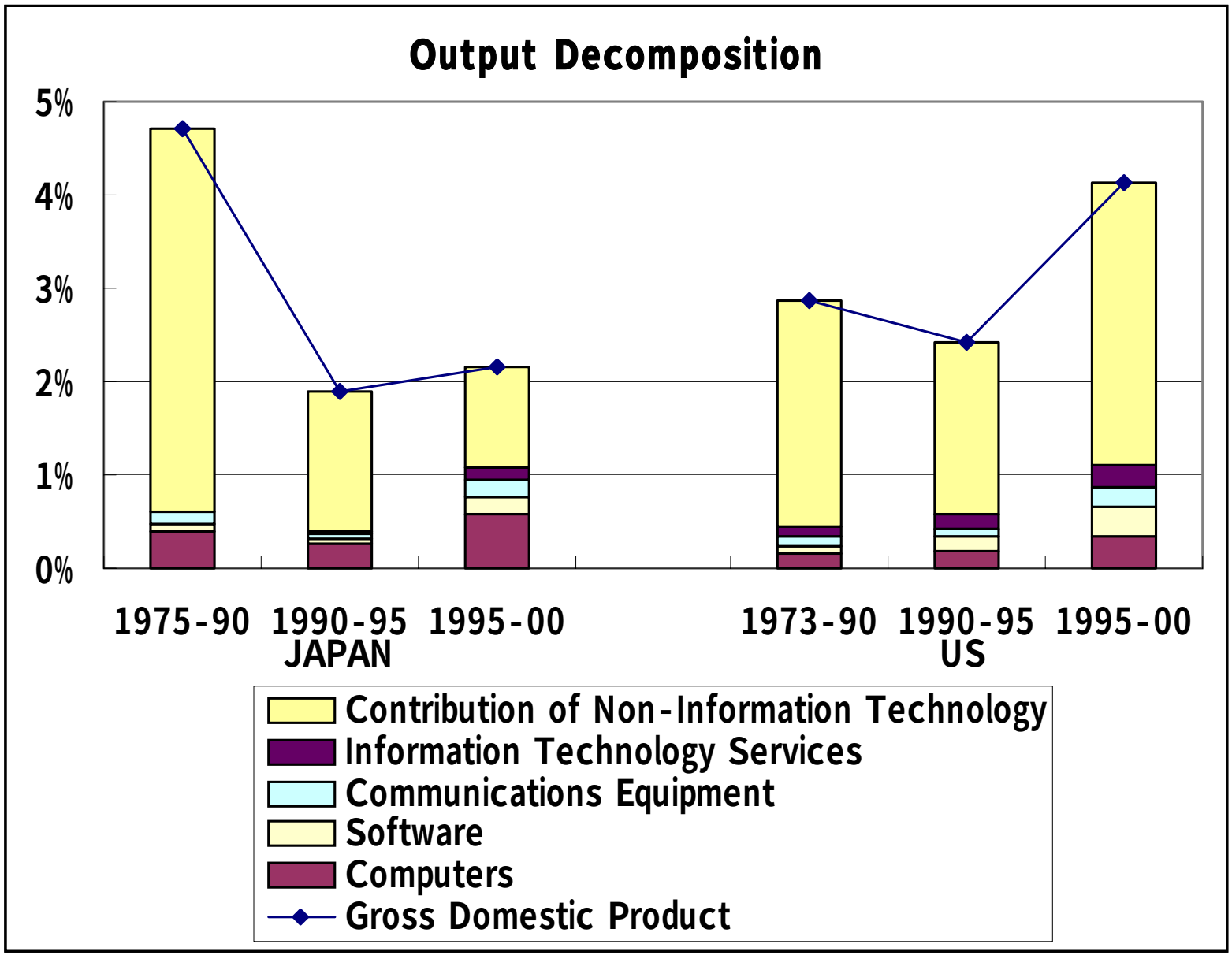
- Harmonized IT Prices a la OECD

  IT Price = US IT price relative non-IT+domestic non IT price
- Differences are as follows;

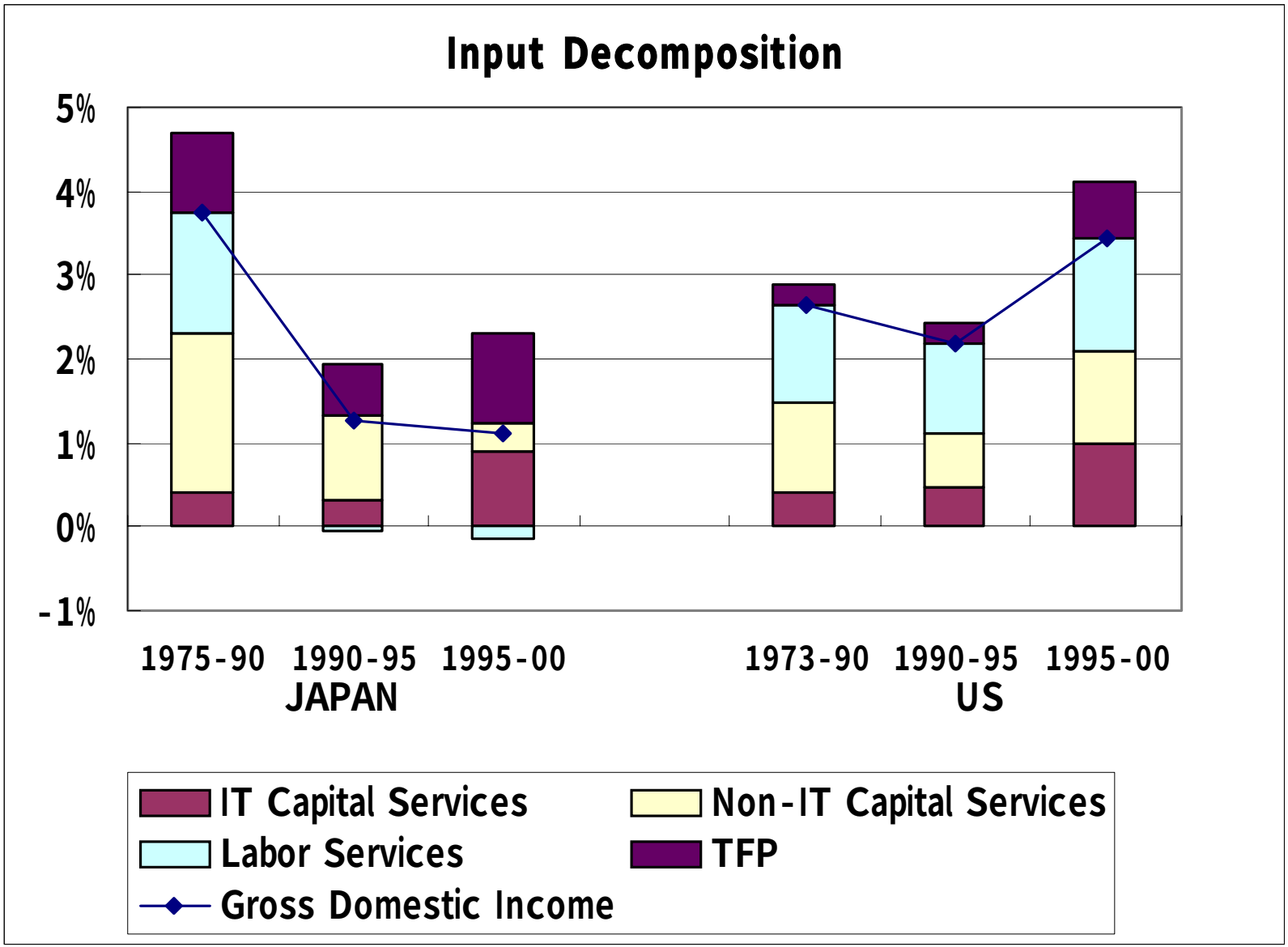




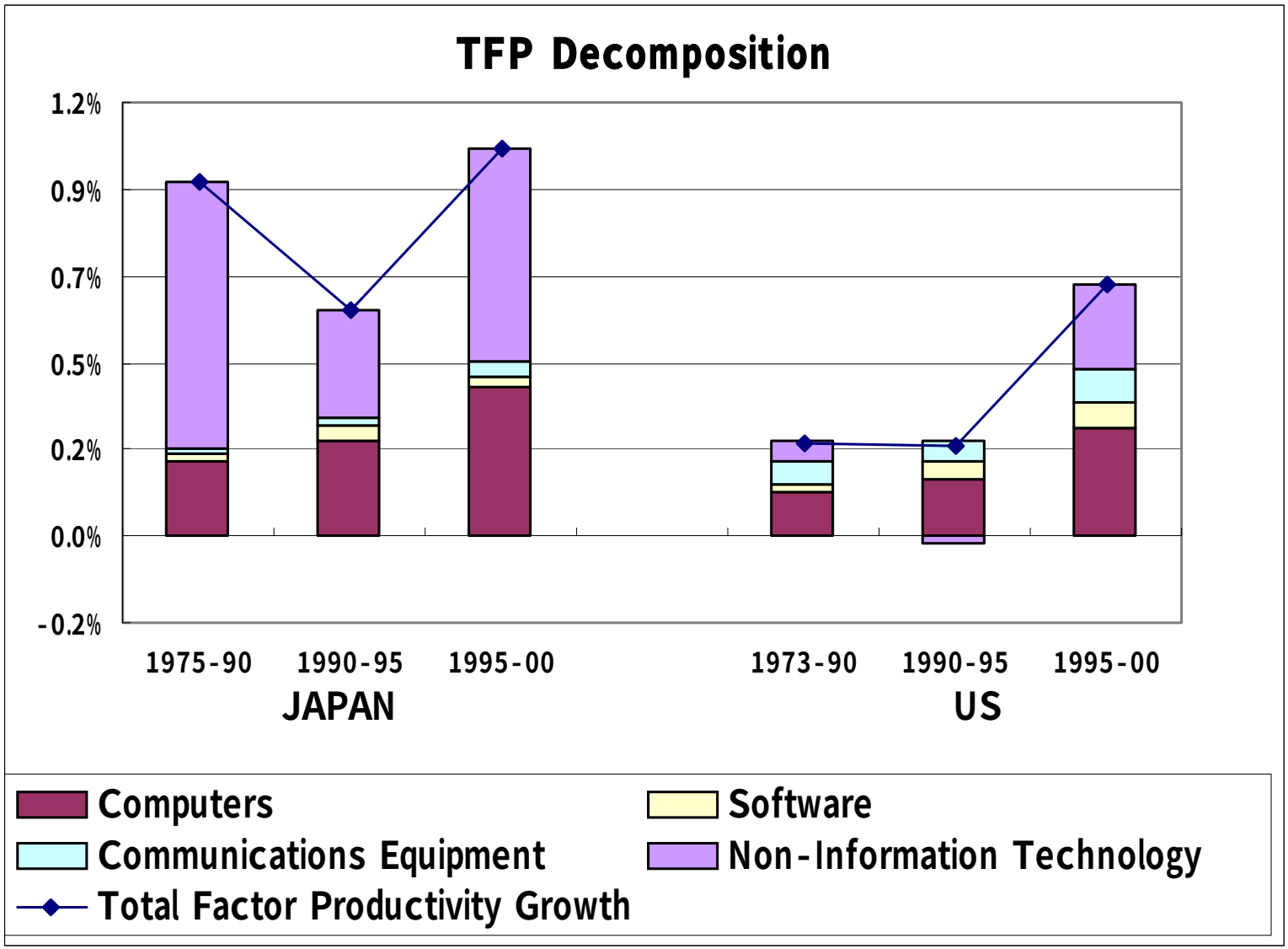
Result (1): Output Decomposition



Result (2): Input Decomposition



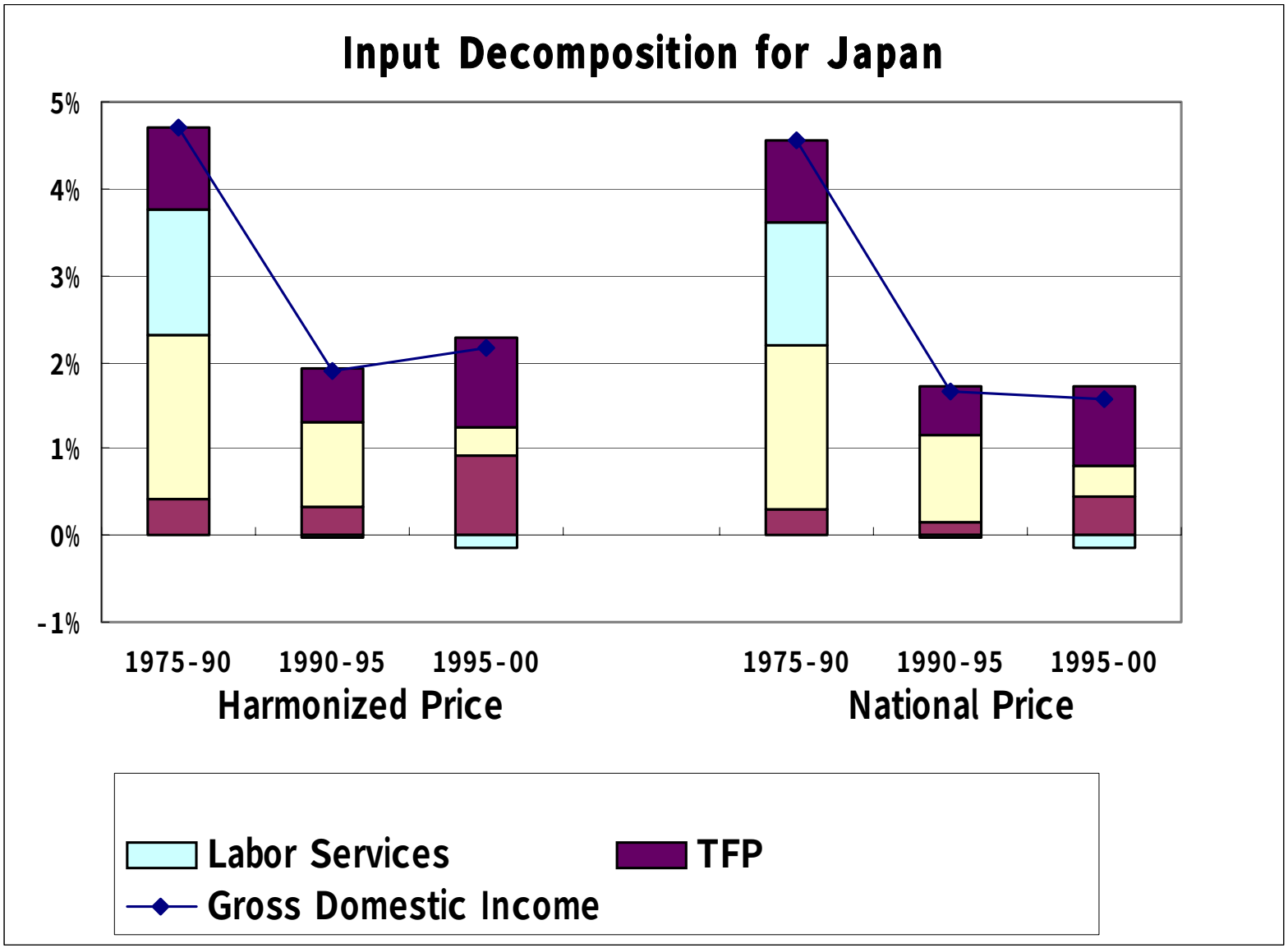
TFP decomposition



Sensitivity Analysis by price (1)

	1975-90	**1990-95**	**1995-00**
Official Statistics (93SNA)	4.19	1.49	1.39
(68SNA GDP series)	(4.13)	(1.44)	(1.02)
+Software Adjustment	0.11	-0.01	0.02
+IT consumer durables	0.01	0.02	0.06
+Non-IT consumer durables	0.24	0.17	0.10
Adjusted by national statistics	4.54	1.67	1.58
+price adjustment (Computer)	0.14	0.16	0.42
+price adjustment (Software)	0.04	0.04	0.06
+price adjustment (Comm. Equip)	-0.02	0.00	0.01
+price adjustment (IT services)	0.00	0.02	0.09
Adjusted by harmonized price	4.70	1.89	2.15

Sensitivity Analysis by price (2)



Conclusion

- Contribution of IT to both output and input of economic growth is about same for Japan and the U.S. in 1990's
- TFP growth rate increased in the late 90's in Japan, higher rate of growth than that of the U.S.
- Large difference in economic growth rate can be explained by non-IT capital and labor
- Changes in IT deflator makes significant impact on macro economic growth