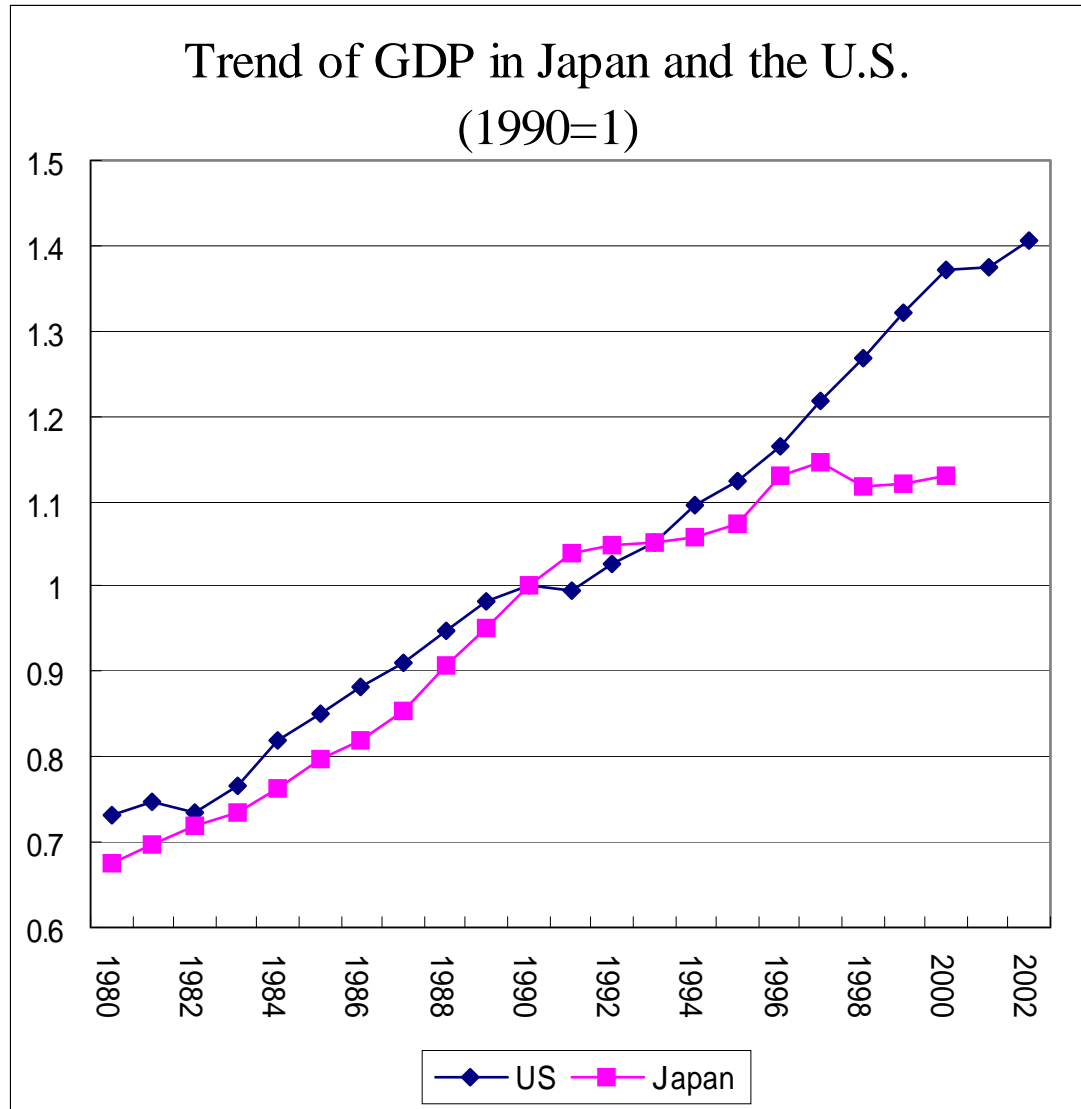




# Economic Growth in Japan and the United States in the Information Age

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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-

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

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)

	<b>Business sector</b>	<b>Public sector</b>	<b>Household sector</b>
<b>Output</b>	<b>93SNA Official GDP + software adjustments</b>	<b>93SNA Official GDP + software adjustments</b>	<b>93SNA Official GDP + capital service from household</b>
<b>Capital Input</b>	<p><b>(Depreciable Assets)</b></p> <ul style="list-style-type: none"> <li>- Based on investment series by 62 types of asset (5 types of IT), capital stock and capital service are estimated.</li> </ul> <p><b>(Land)</b></p> <ul style="list-style-type: none"> <li>- The stock of land is assumed to be constant at macro level. Capital service price is estimated from land price</li> </ul> <p><b>(Inventory)</b></p> <ul style="list-style-type: none"> <li>- Use SNA base aggregated inventory stock and price to estimate capital service</li> </ul>		<p><b>Based on investment series by 20 types of asset (3 types of IT), capital stock and capital service are estimated.</b></p>
<b>Labor</b>	<b>KEO data for labor inputs by type of labor</b>		<b>-</b>

# 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) (case1) (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 +	
Memory device	5 inches FDD × 2	CD/DVD-R/RW	
HDD	40MB	250GB	6250 (2.0)
Communication	None	56Kbps modem LAN port	
Price	668,000 yen	350,000 yen	

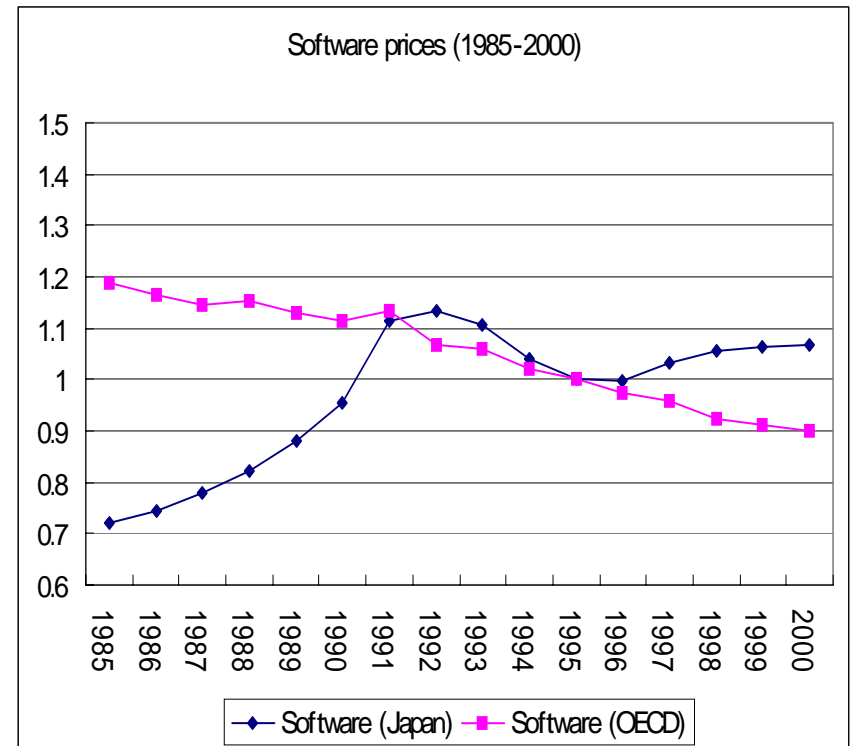
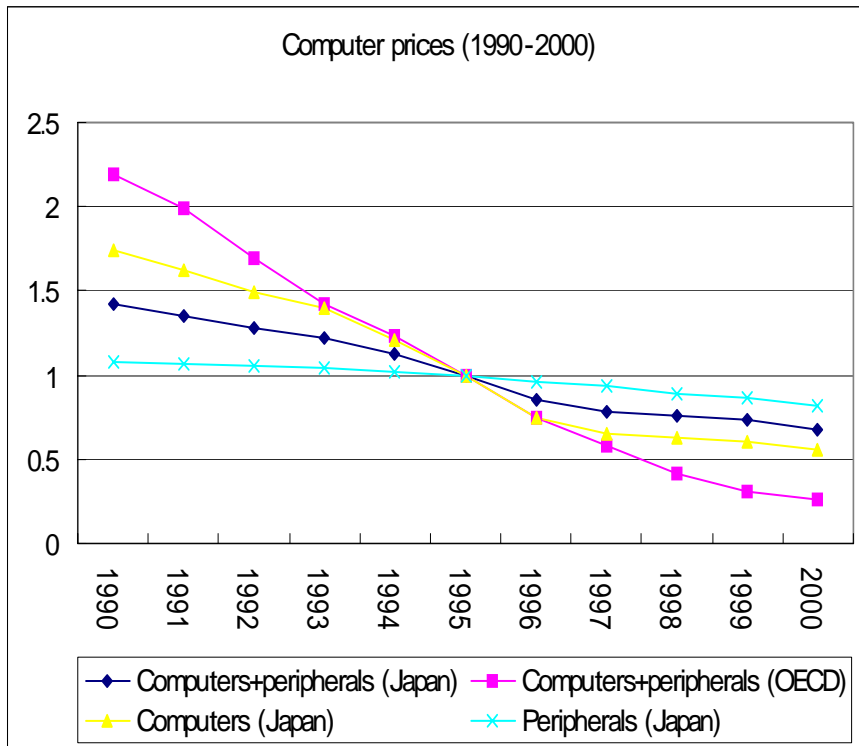


# Dataset Issues (2)- IT Price (3)

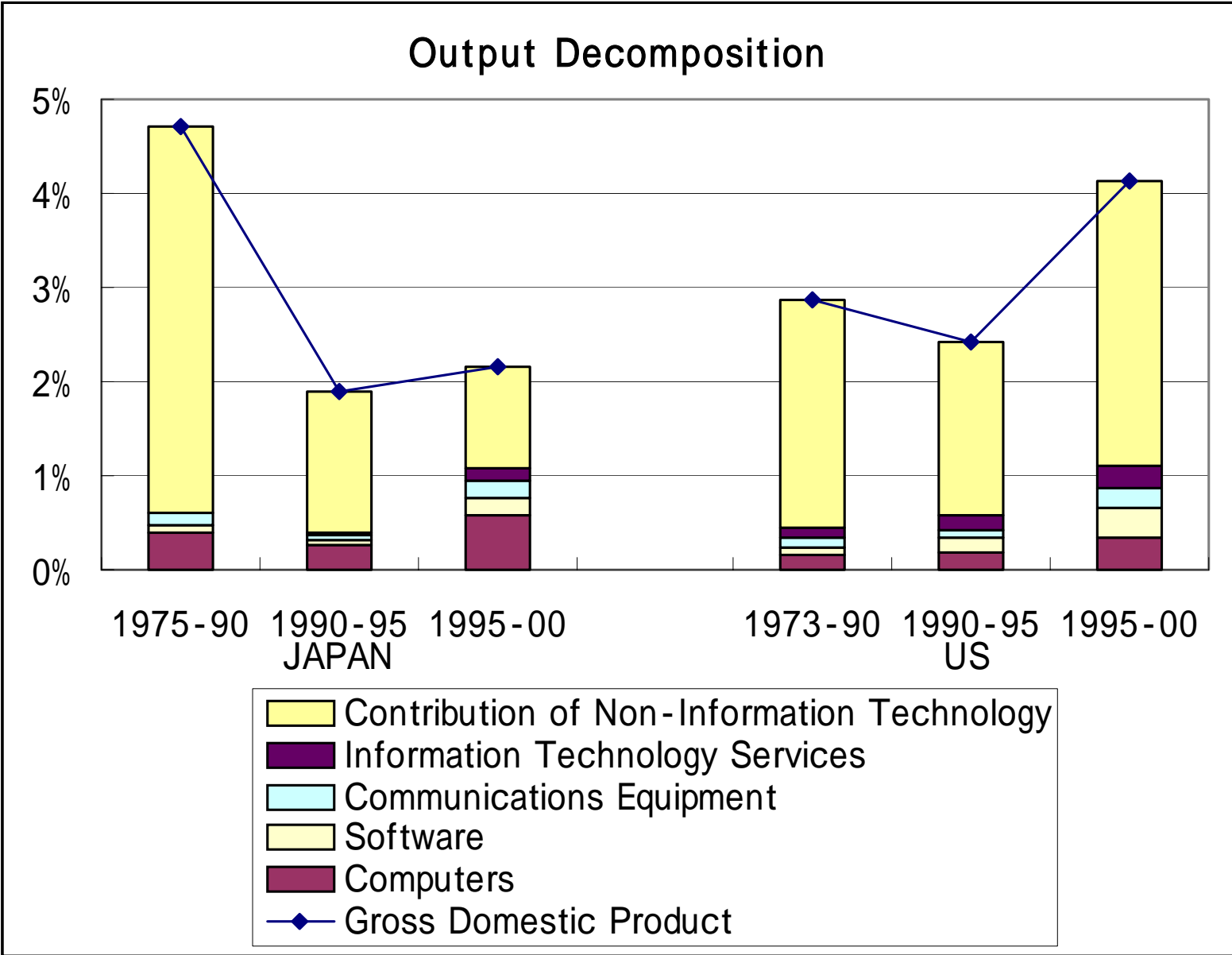
- Harmonized IT Prices a la OECD

IT Price = US IT price relative non-IT+domestic non IT price

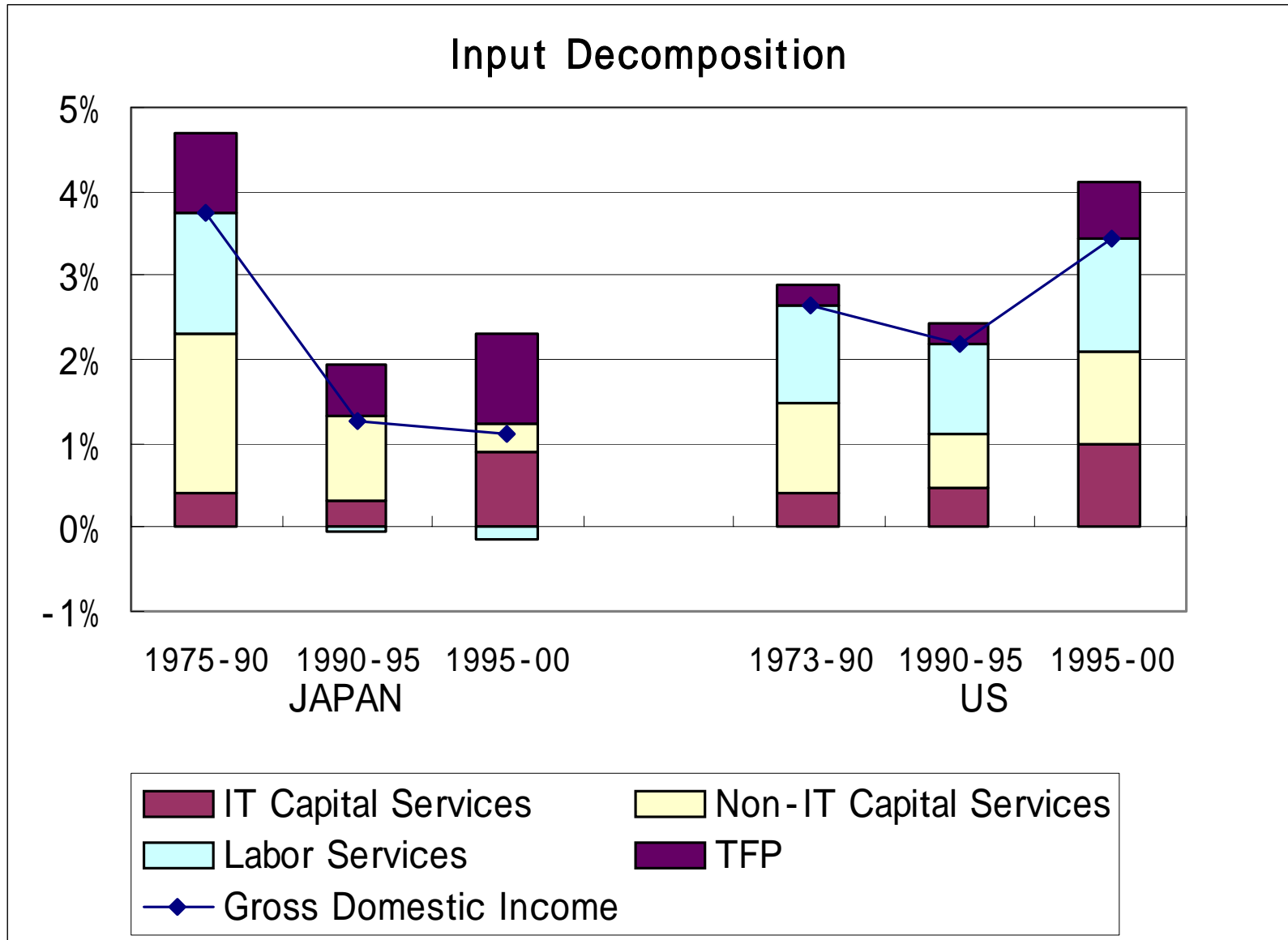
- Differences are as follows;



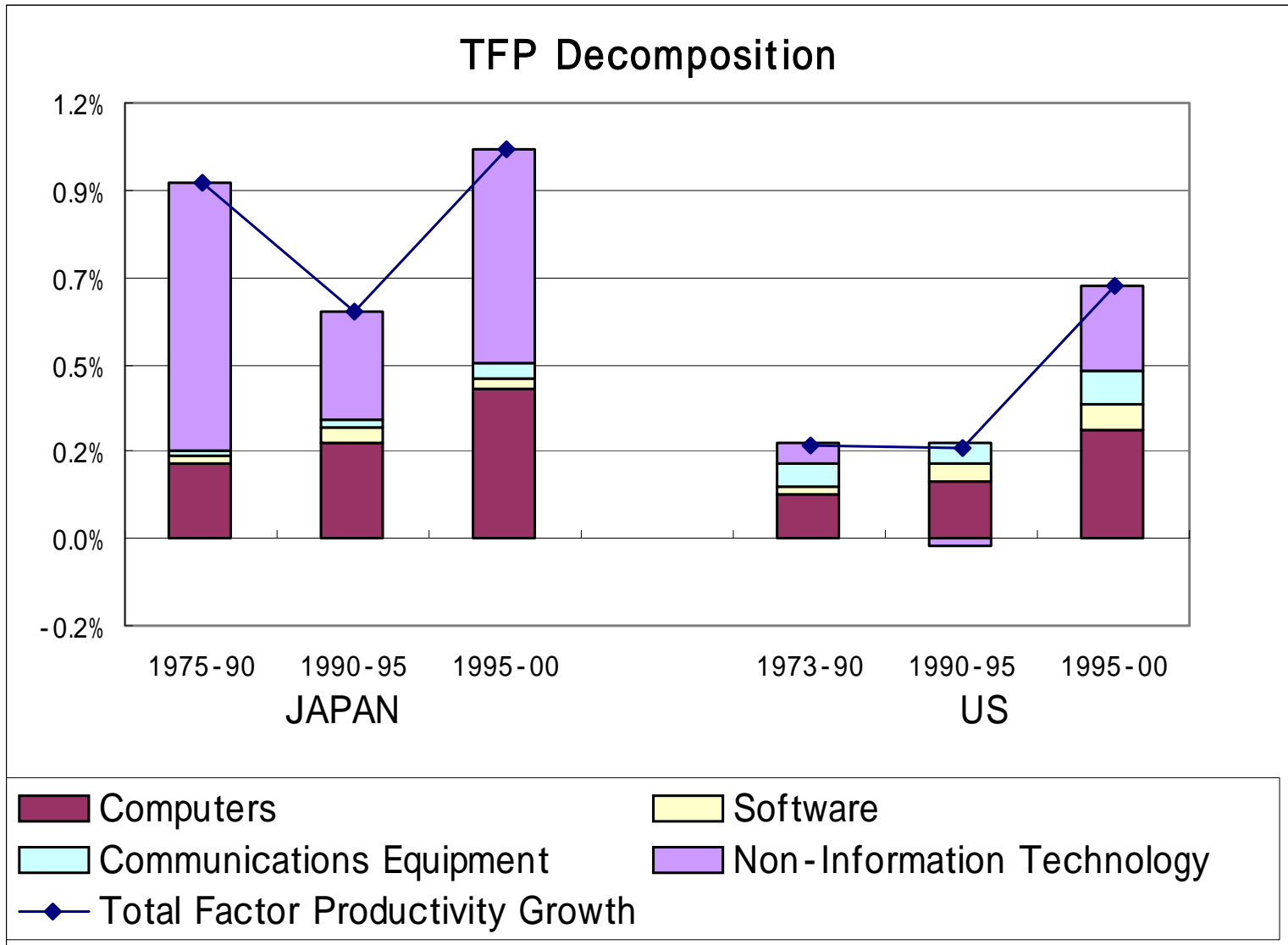
# Result (1): Output Decomposition



# Result (2): Input Decomposition



# TFP decomposition

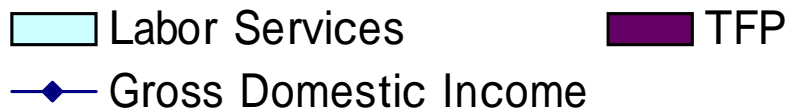
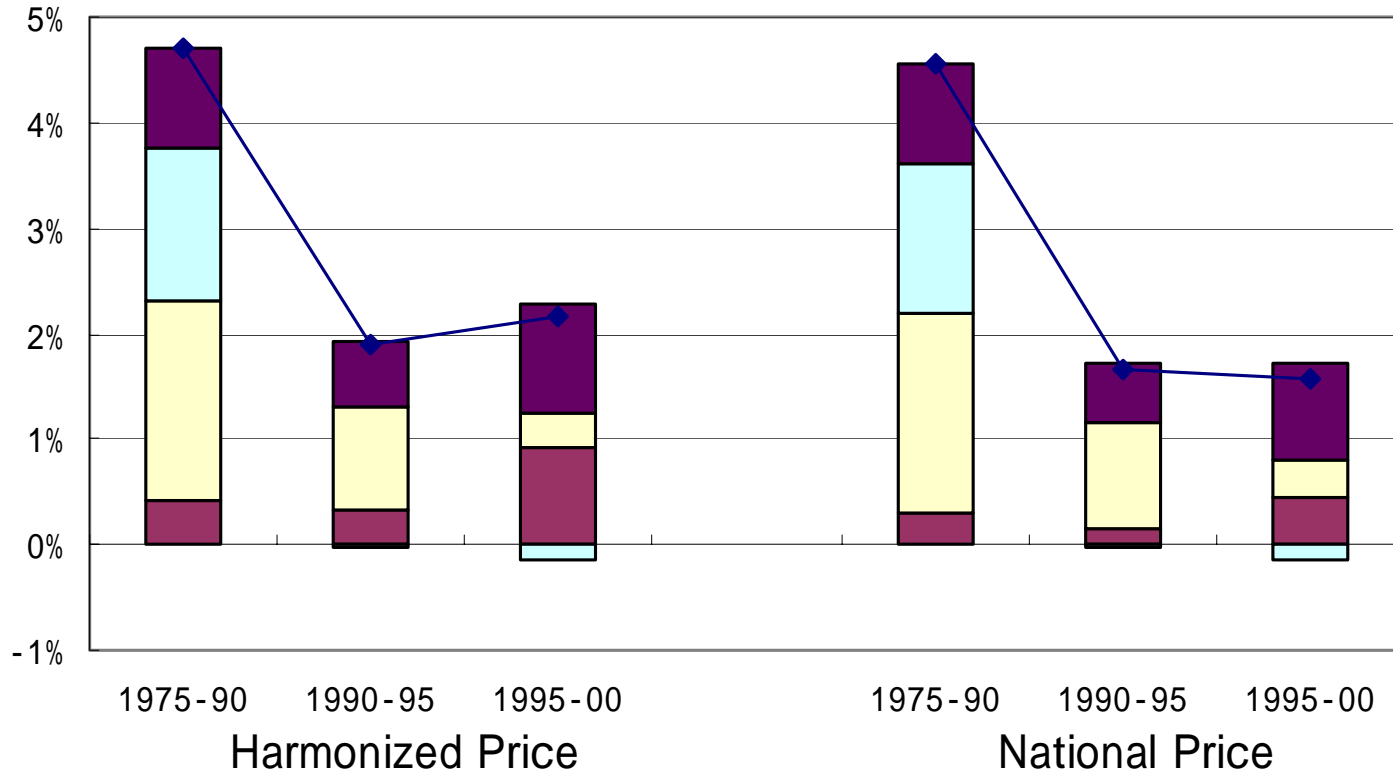


## Sensitivity Analysis by price (1)

	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)

## Input Decomposition for Japan



# 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