

Economic Growth and Information Technology in the U.S. and Japan

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Economic Growth in the Information Age

INTRODUCTION:

Prices of Information Technology

THE INFORMATION AGE:

Faster, Better, Cheaper!

ROLE OF INFORMATION TECHNOLOGY:

IT Prices and the Cost of Capital

ECONOMIC GROWTH in the U.S. and JAPAN:

IT Investment and Productivity Growth

ECONOMICS ON INTERNET TIME:

The New Research Agenda

The Information Age: Faster, Better, Cheaper!

Moore (1998): "If the automobile industry advanced as rapidly as the semiconductor industry, a Rolls Royce would get half a million miles per gallon, and it would be cheaper to throw it away than to park it."

Invention of the Transistor:

Development of Semiconductor Technology.

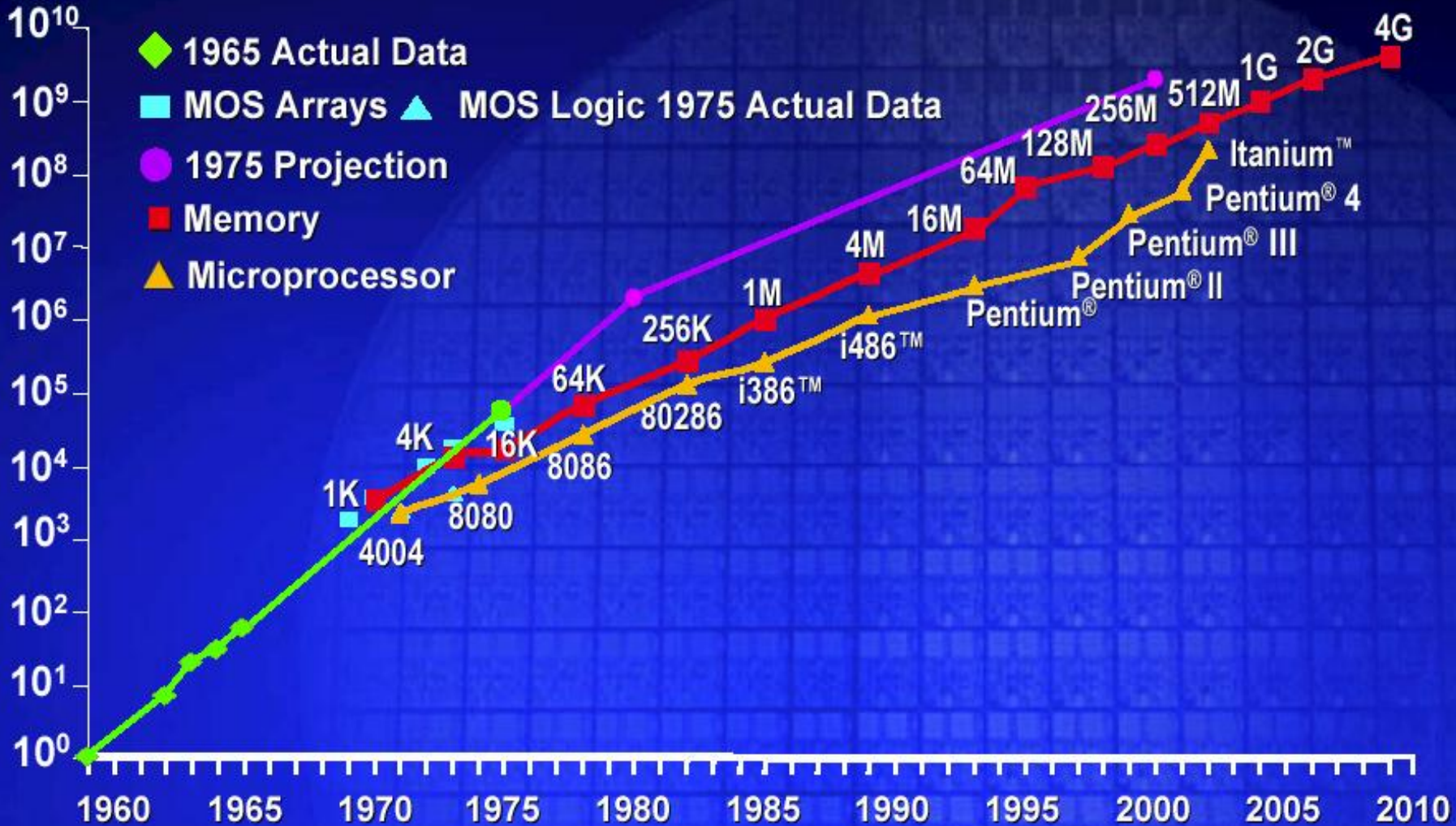
The Integrated Circuit:

Memory Chips; Logic Chips.

Moore's Law: The number of transistors on a chip doubles every 18-24 months (Pentium 4, released November 20, 2000, has 42 million transistors).

Integrated Circuit Complexity

Transistors
Per Die



Holding Quality Constant Matched Models and Hedonics

Semiconductor Price Indexes:

Memory and Logic Chips.

Computer Price Indexes:

The BEA-IBM Collaboration.

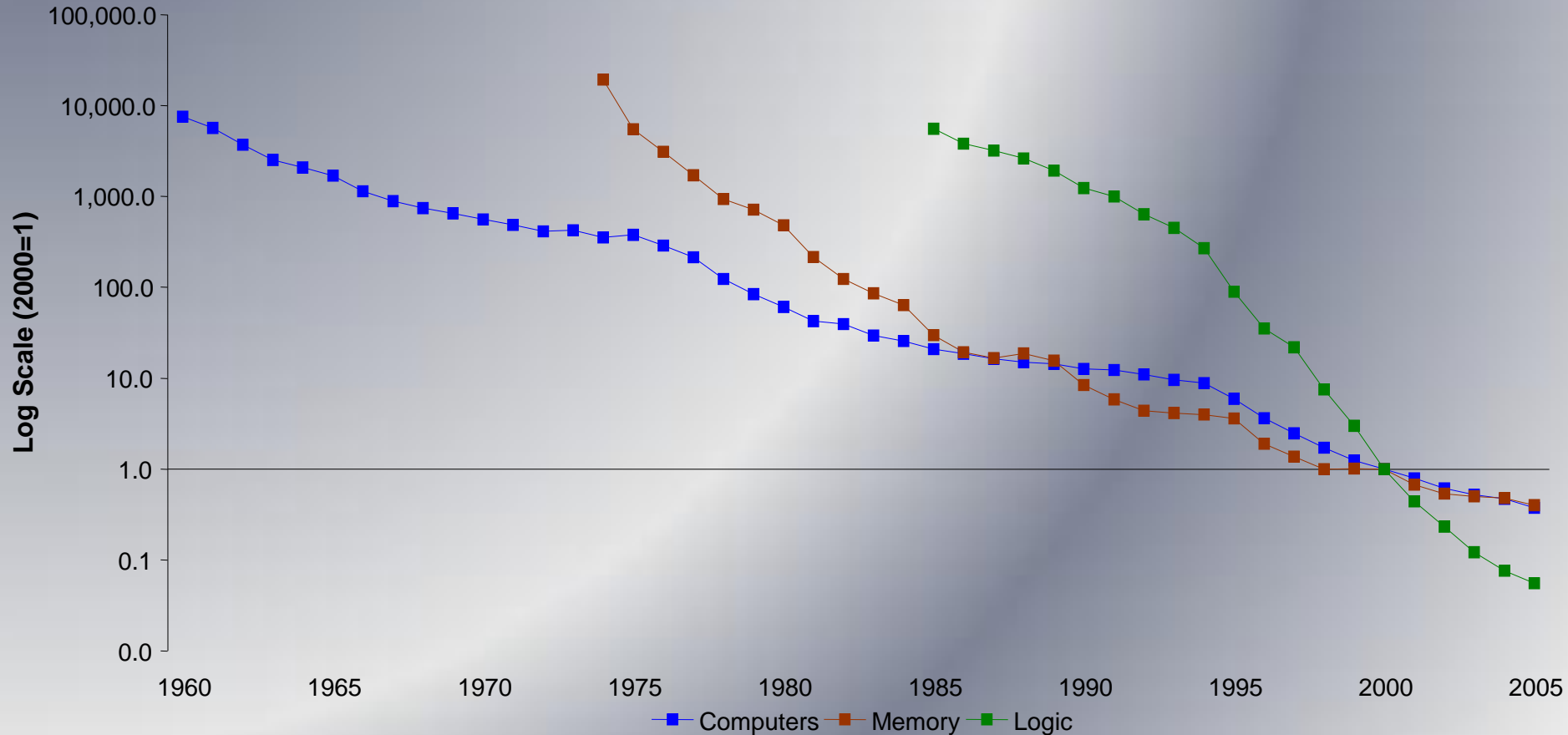
Communications Equipment:

Terminal, Switching, and Transmission.

Software:

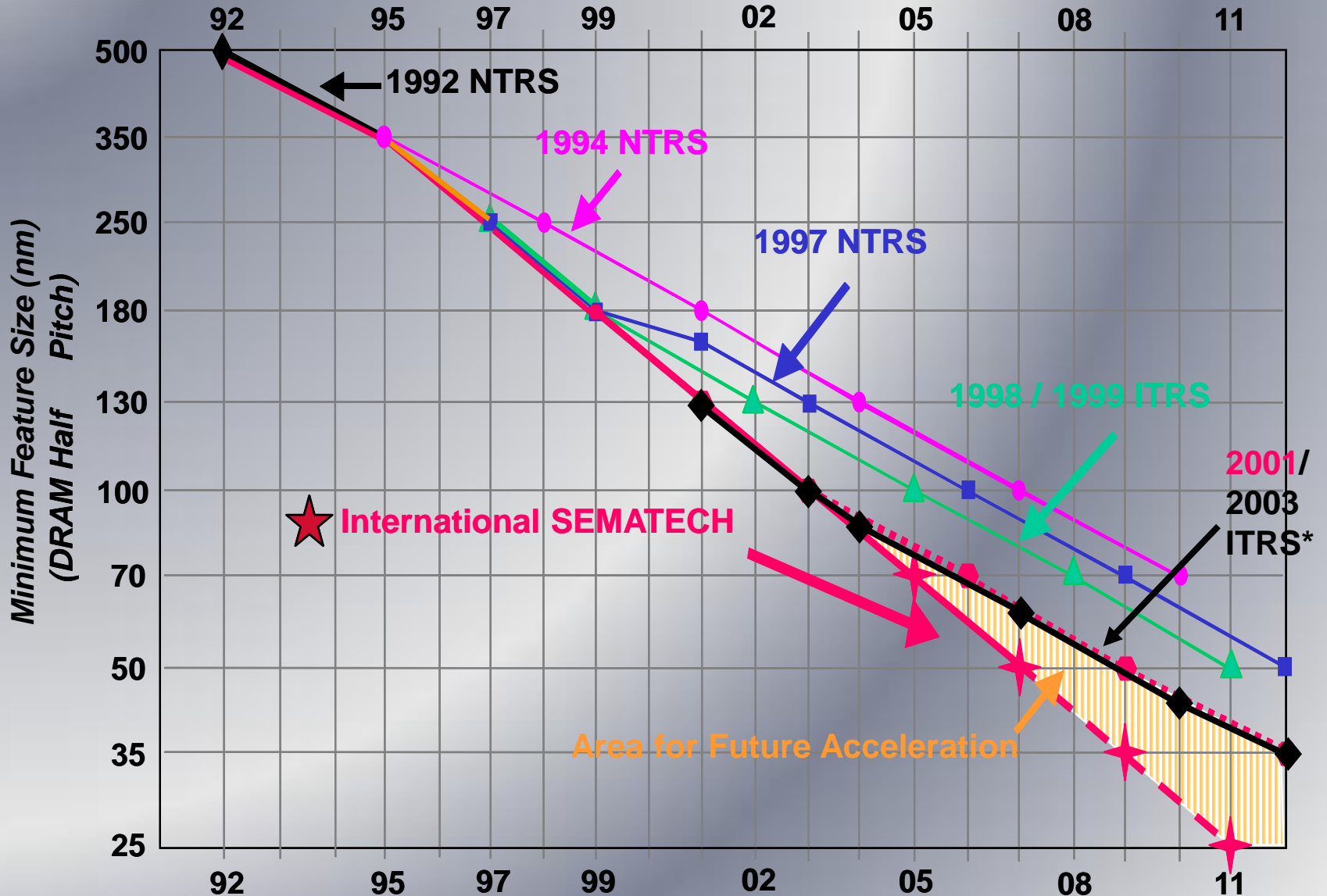
Prepackaged, Custom, and Own-Account.

Relative Prices of Computers and Semiconductors, 1960-2005



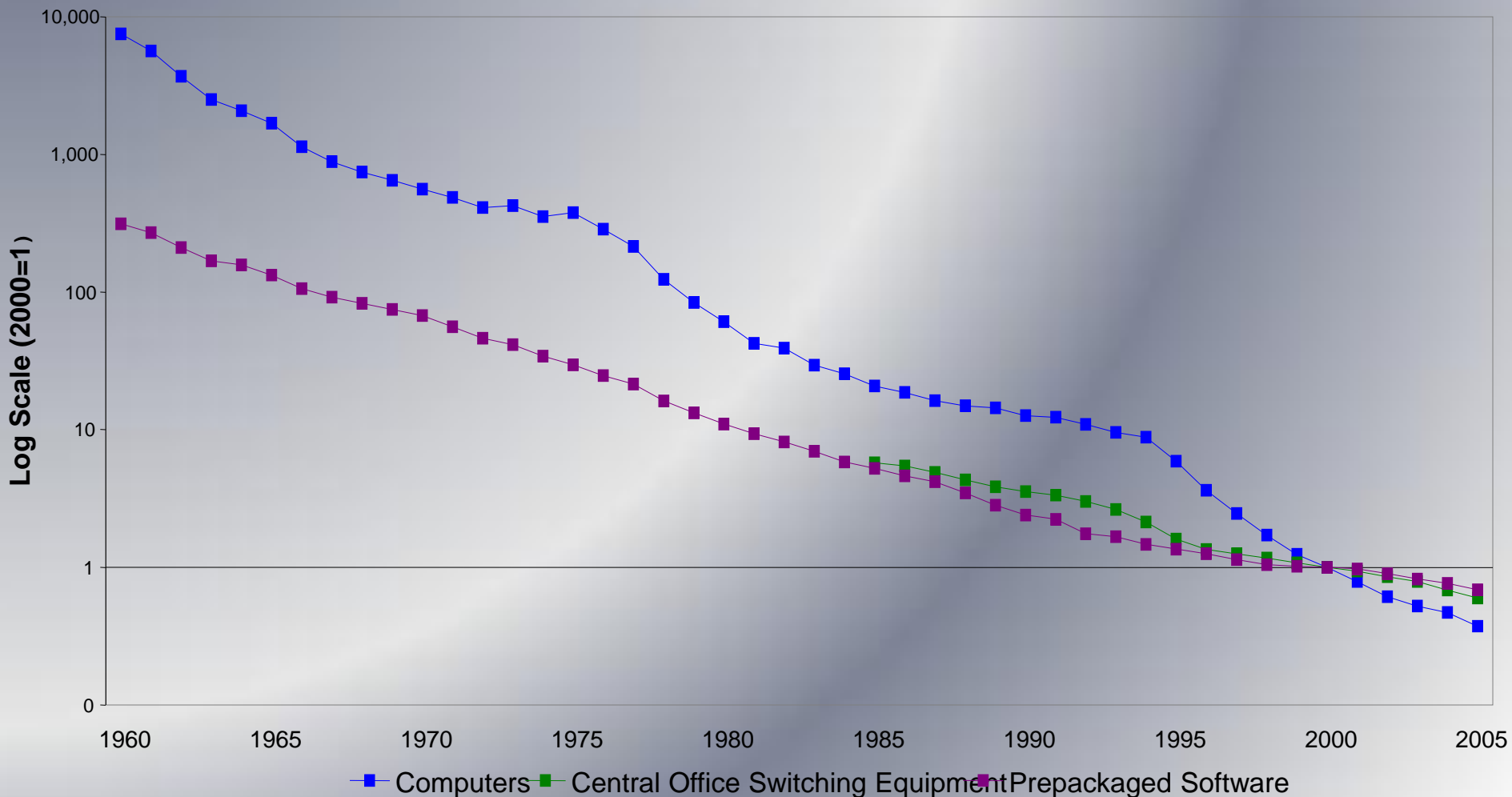
Note: All price indexes are divided by the output price index.

Semiconductor Roadmap Acceleration



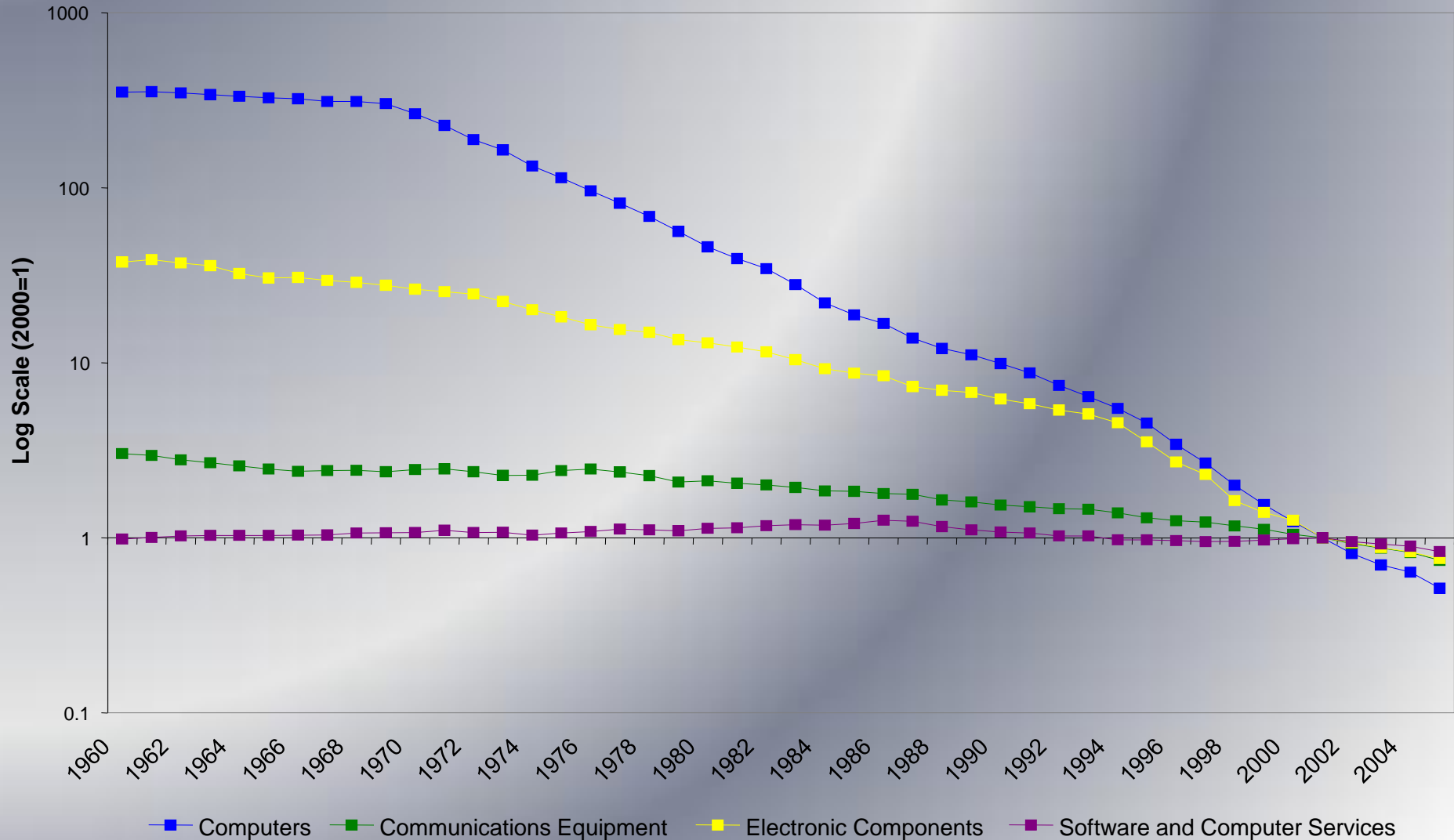
*Note the 2003 ITRS timing is unchanged from the 2001 ITRS

Relative Prices of Computers, Central Office Switching Equipment, and Prepackaged Software, 1960-2005



Note: All price indexes are divided by the output price index.

Relative Prices of Computers, Communications, Electric Components, and Software and Computer Services, 1960-2005



Role of Information Technology: IT Prices, Investment, and Productivity

Capital Contribution to Economic Growth:

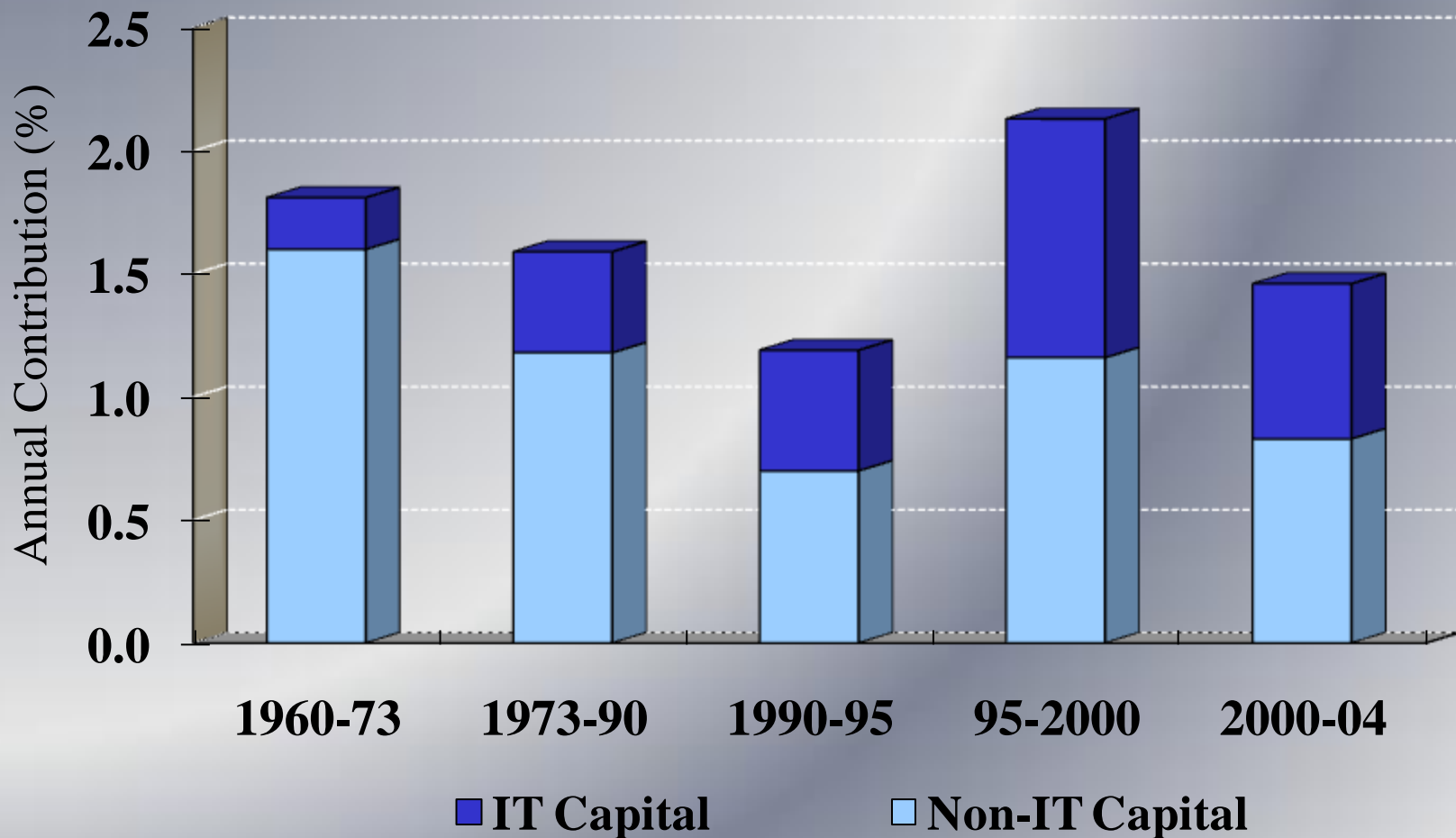
IT versus Non-IT Capital Services.

Capital Contribution by Type:

Computers, Communications Equipment, and Software.

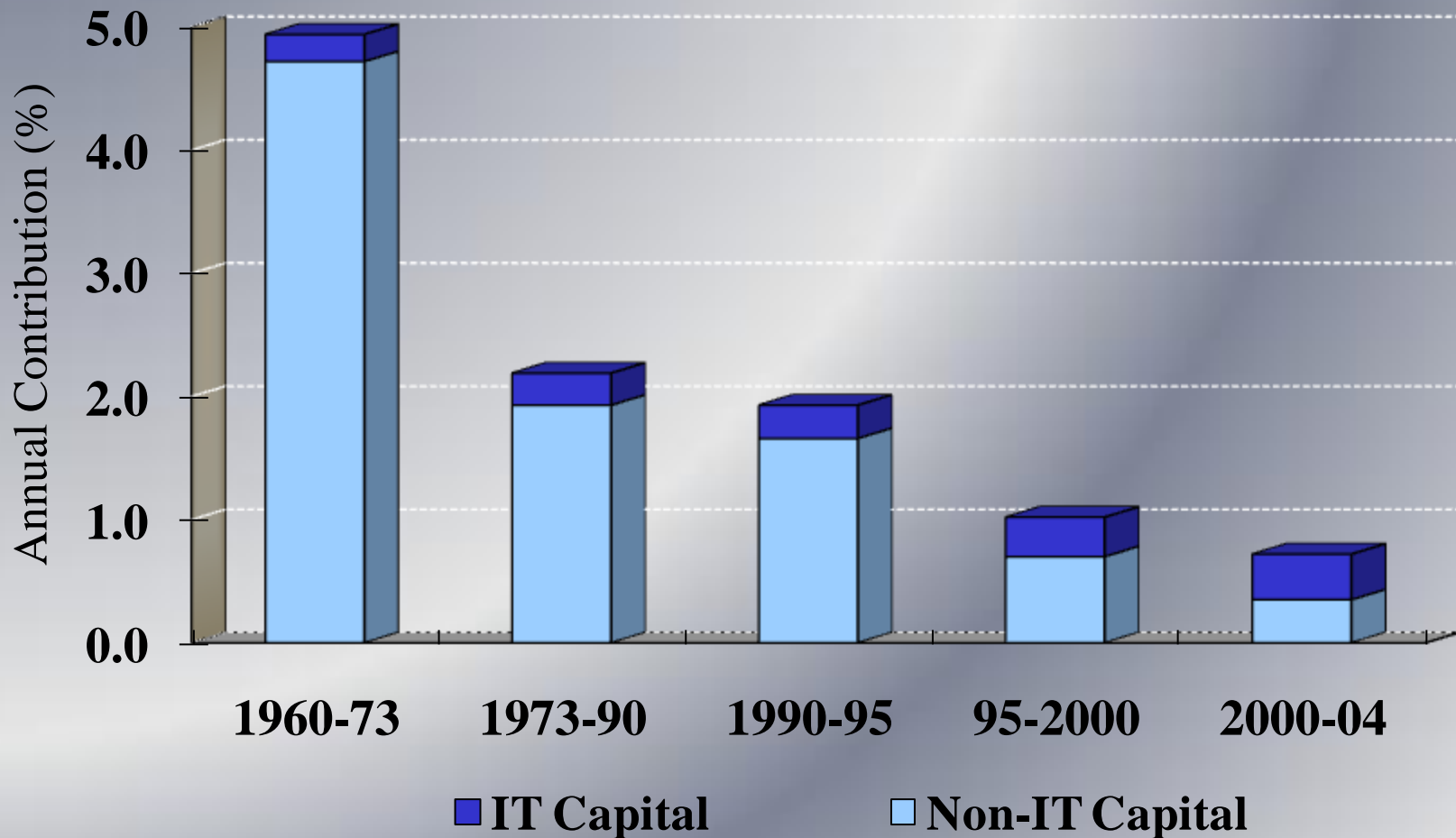
Capital Input Contribution of Information Technology in the U.S.

Average annual percentage growth rates, weighted by income shares.



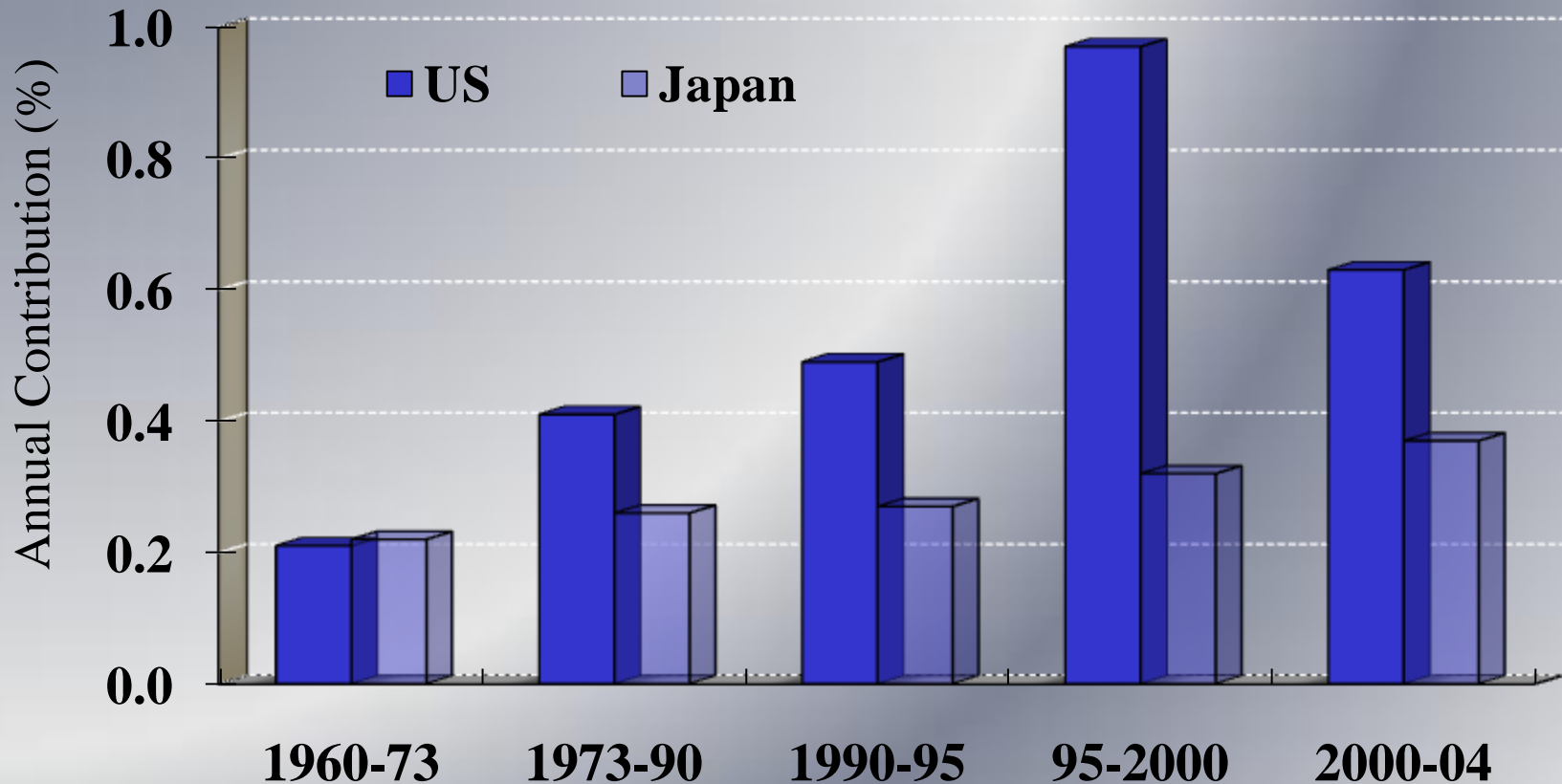
Capital Input Contribution of Information Technology in Japan

Average annual percentage growth rates, weighted by income shares.



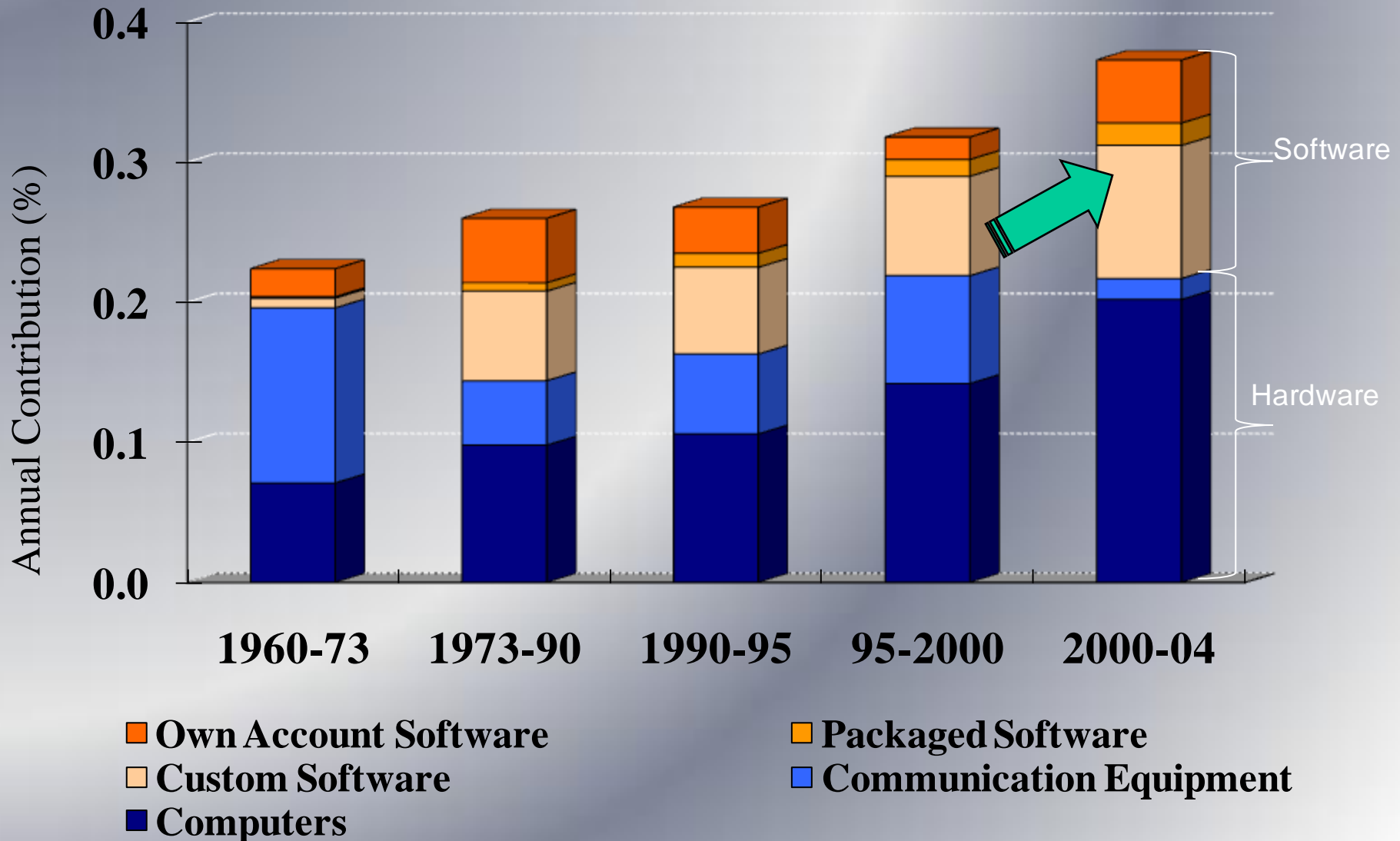
-Comparison between the U.S. and Japan- Capital Input Contribution of Information Technology

Average annual percentage growth rates, weighted by income shares.



Decomposition of IT Capital Input Contribution in Japan

Average annual percentage growth rates, weighted by income shares.



IT Investment and Productivity Growth in the U.S. and Japan

Total Factor Productivity:

IT-Production versus Non-IT Production.

Sources of Economic Growth:

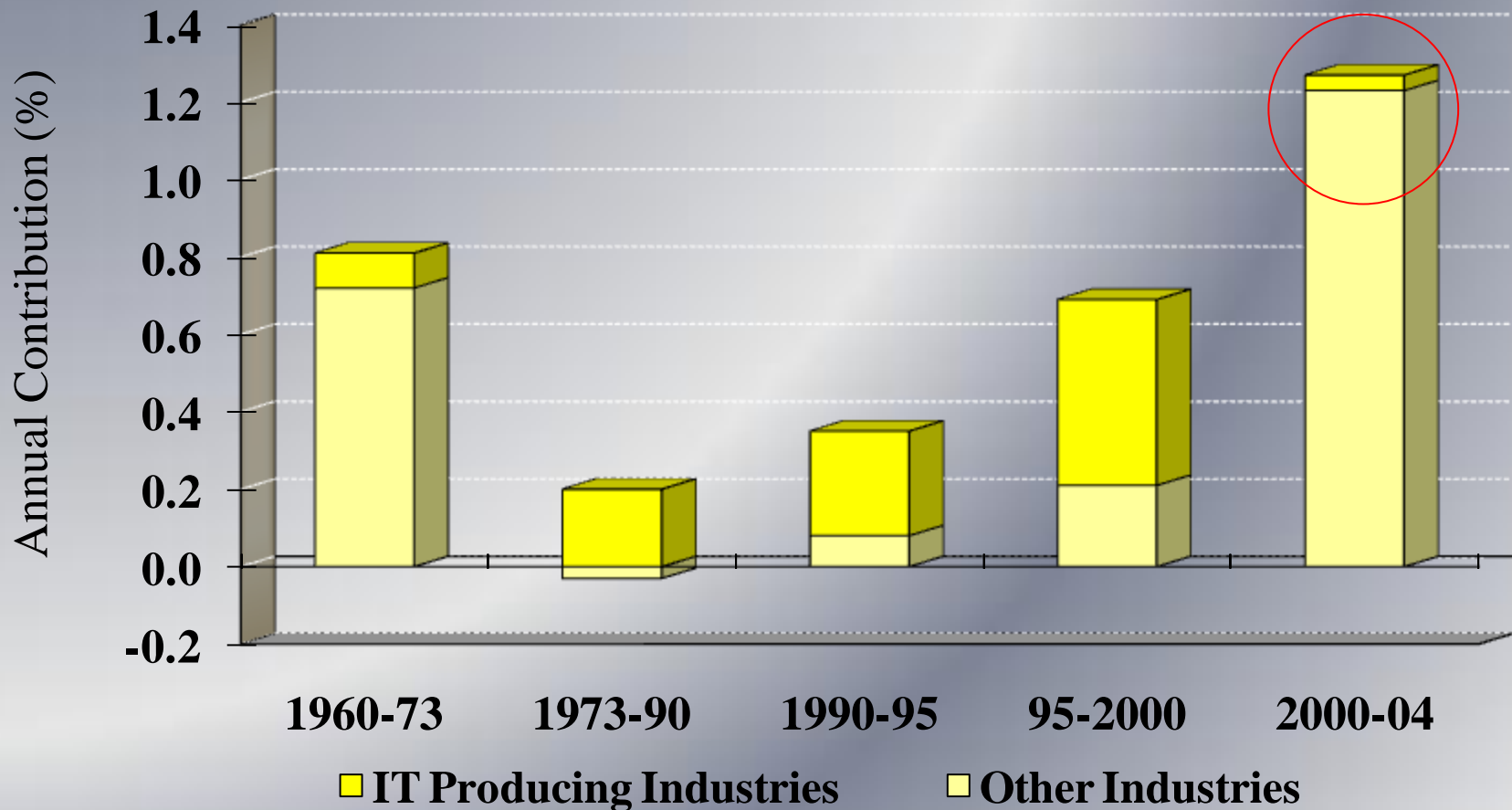
Capital Input, Labor Input, and TFP.

Average Labor Productivity Growth:

Capital Deepening, Labor Quality, TFP.

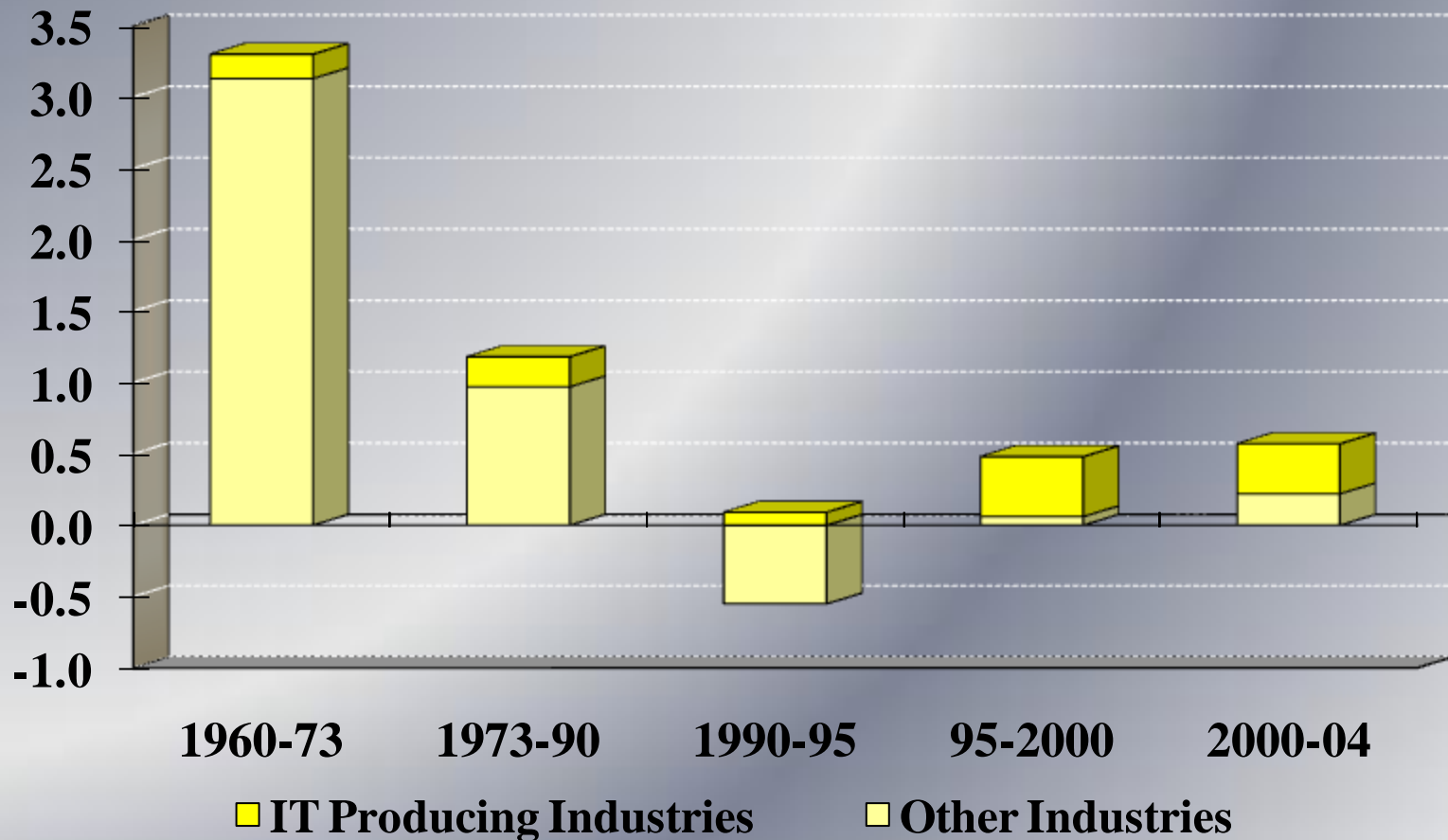
Productivity Contribution of IT Producing Industries in the U.S.

Average annual percentage growth rates, weighted by Domar weights.



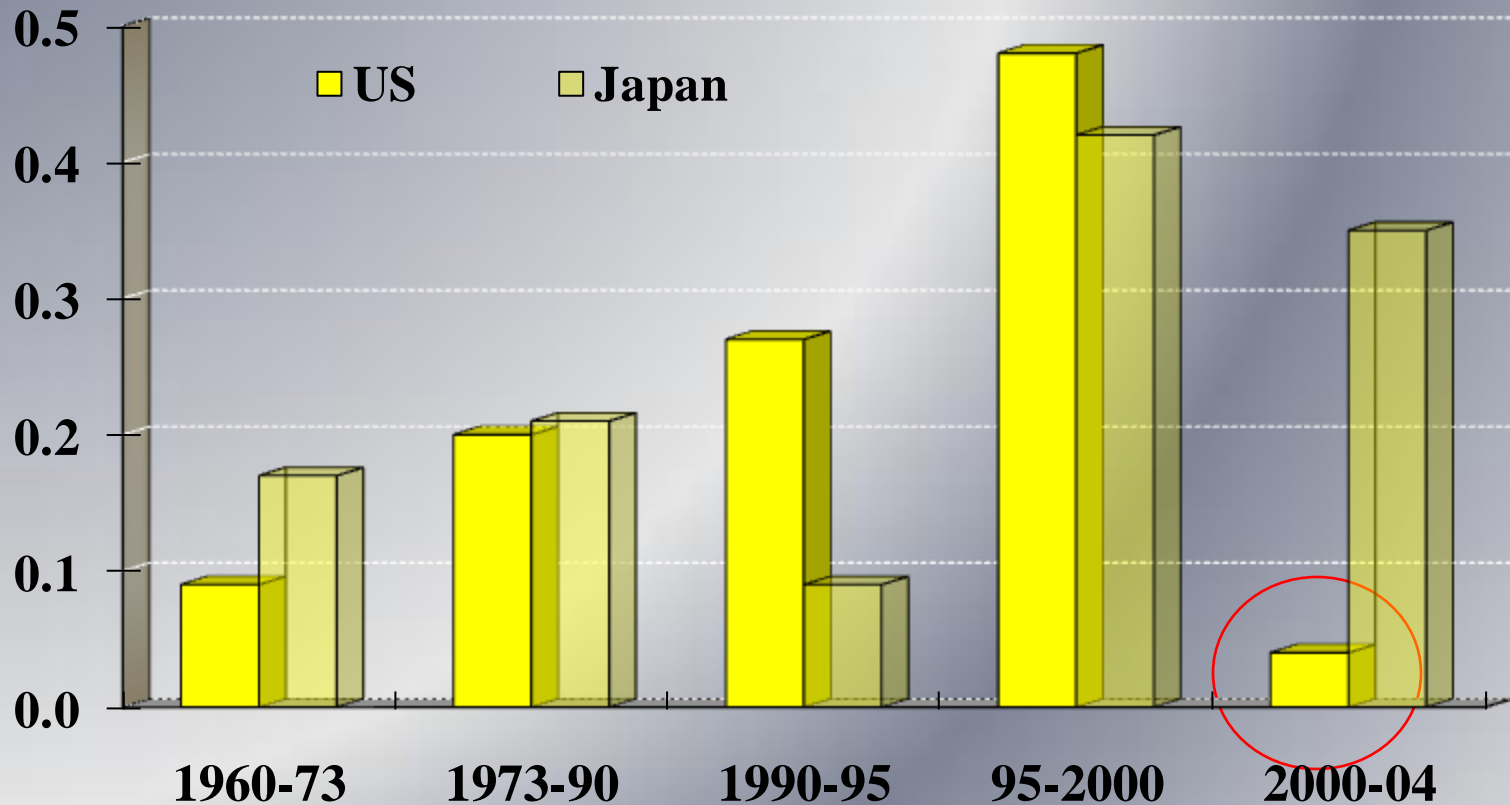
Productivity Contribution of IT Producing Industries in Japan

Average annual percentage growth rates, weighted by Domar weights.



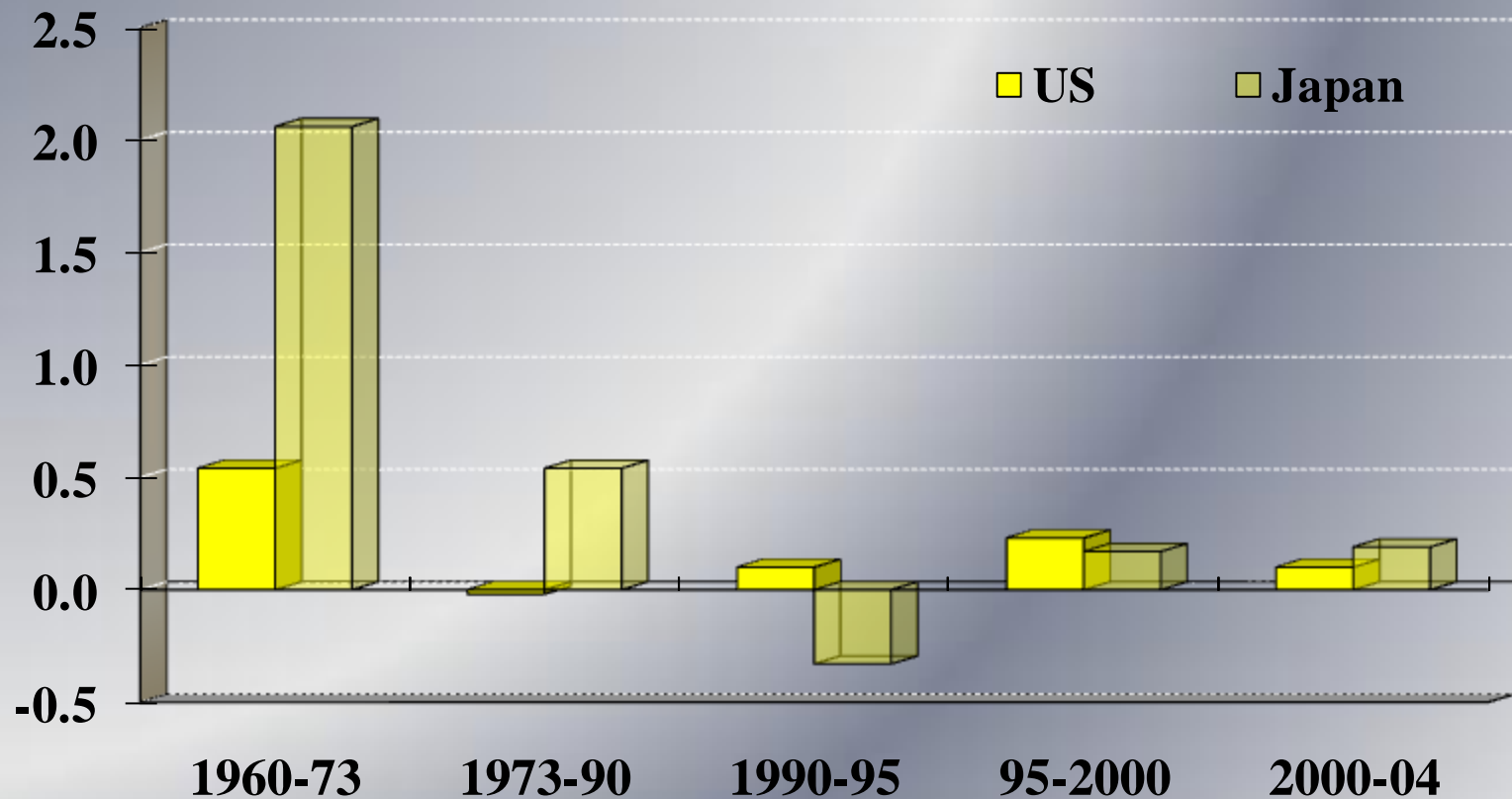
-Comparison between the U.S. and Japan- Productivity Contribution of IT Producing Industries in the U.S. and Japan

Average annual percentage growth rates, weighted by Domar weights.



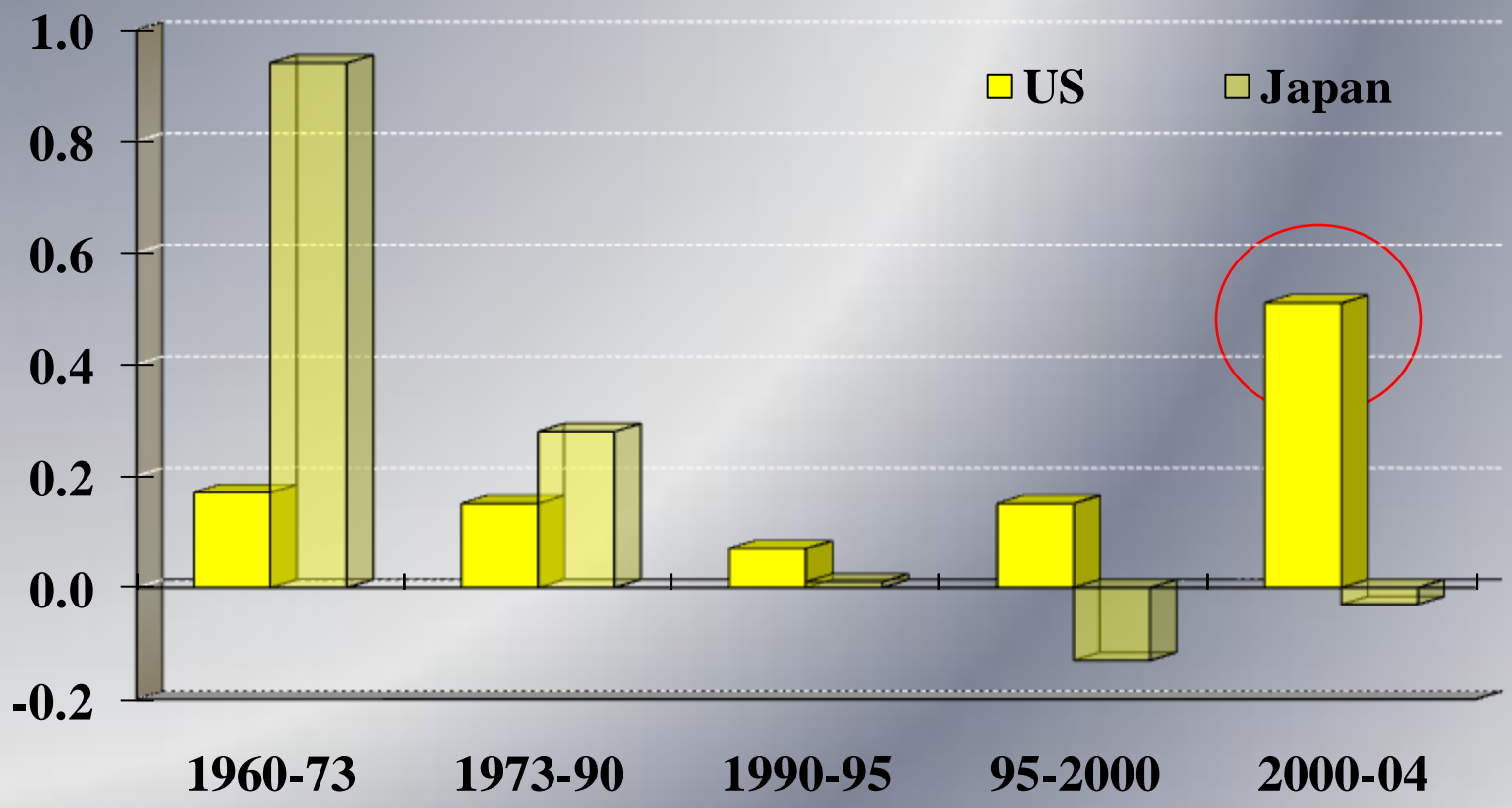
-Comparison between the U.S. and Japan- Productivity Contribution of Non-IT Manufacturing in the U.S. and Japan

Average annual percentage growth rates, weighted by Domar weights.



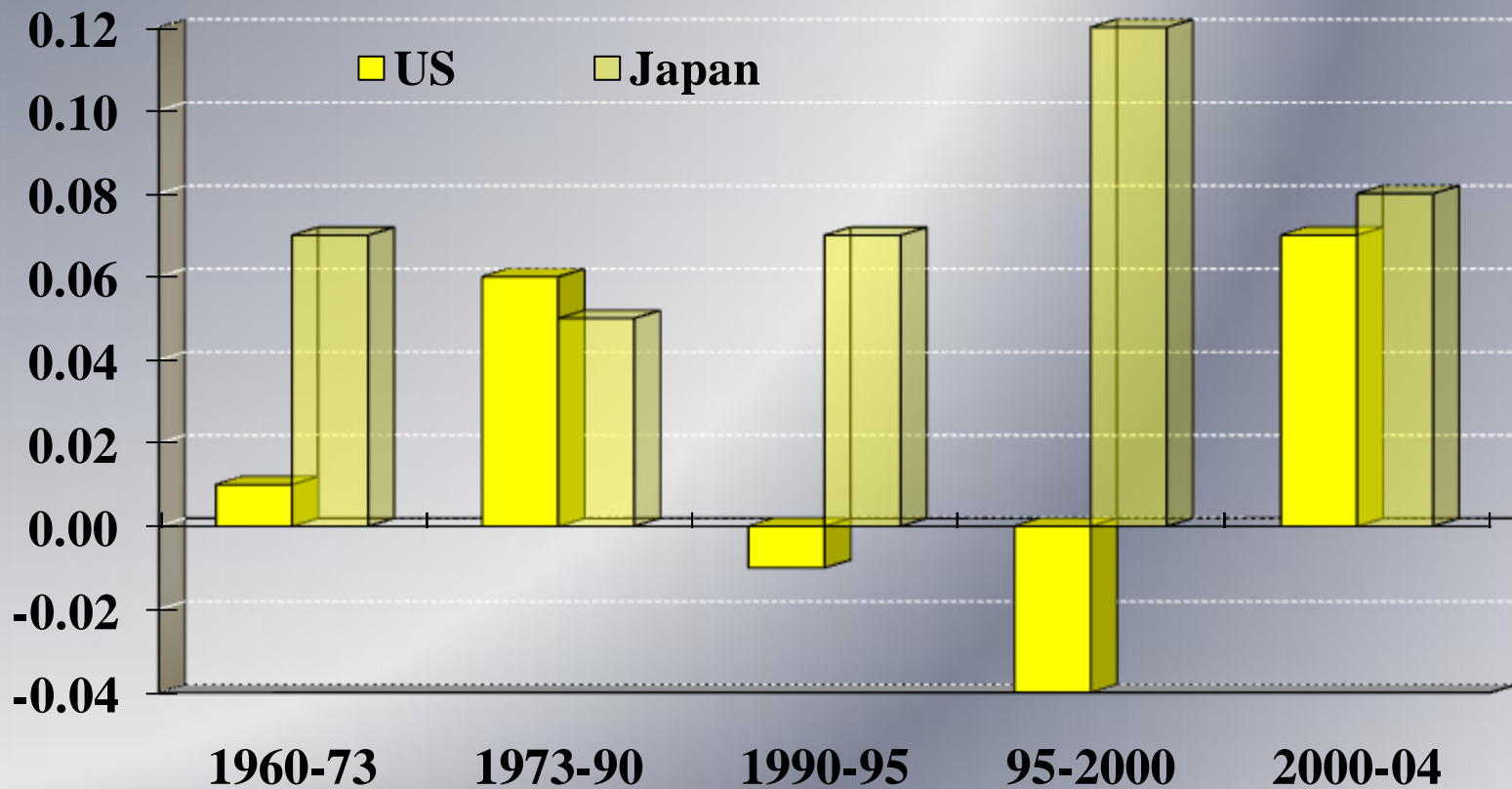
-Comparison between the U.S. and Japan- Productivity Contribution of Wholesale and Retail Trade in the U.S. and Japan

Average annual percentage growth rates, weighted by Domar weights.



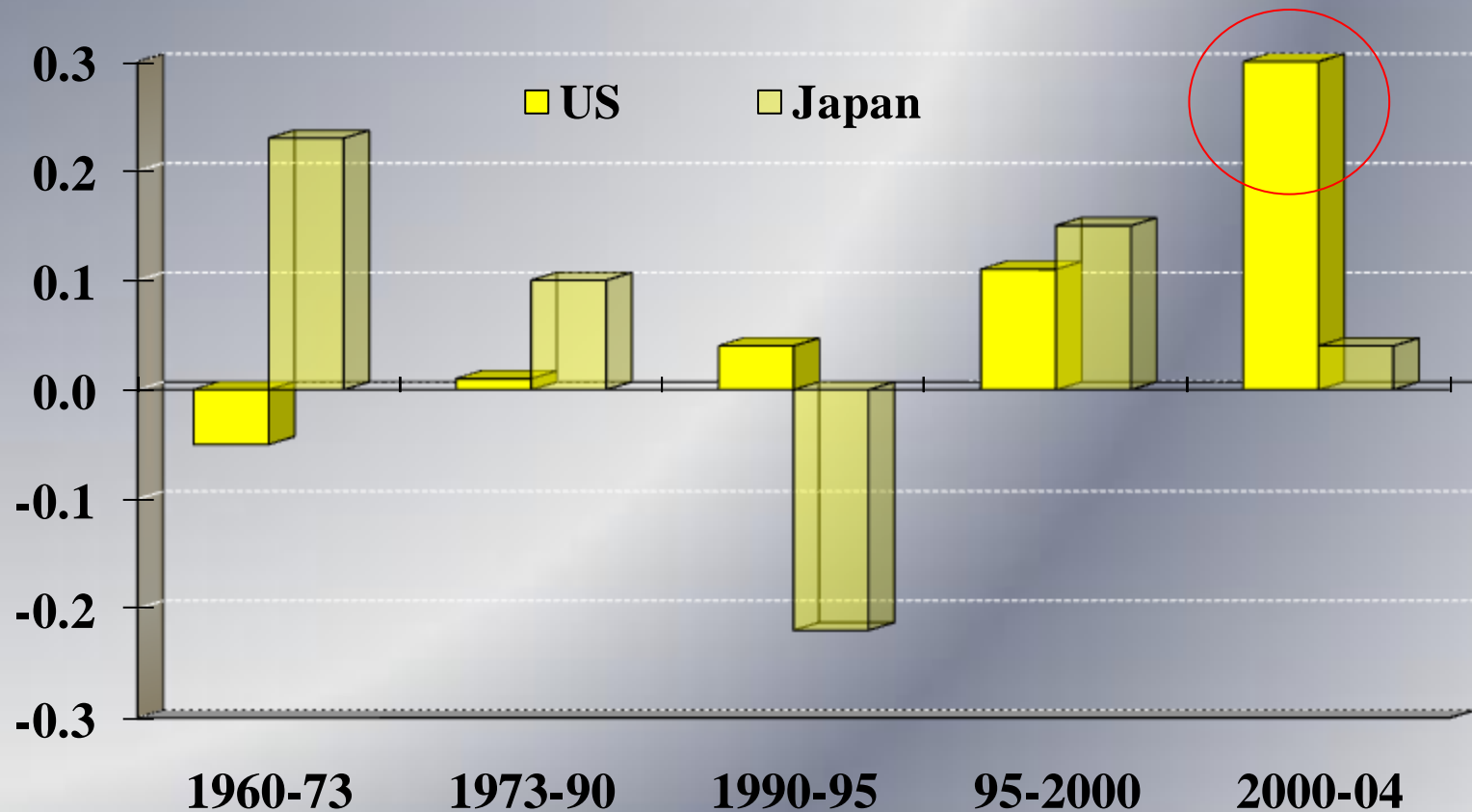
-Comparison between the U.S. and Japan- Productivity Contribution of Communications in the U.S. and Japan

Average annual percentage growth rates, weighted by Domar weights.

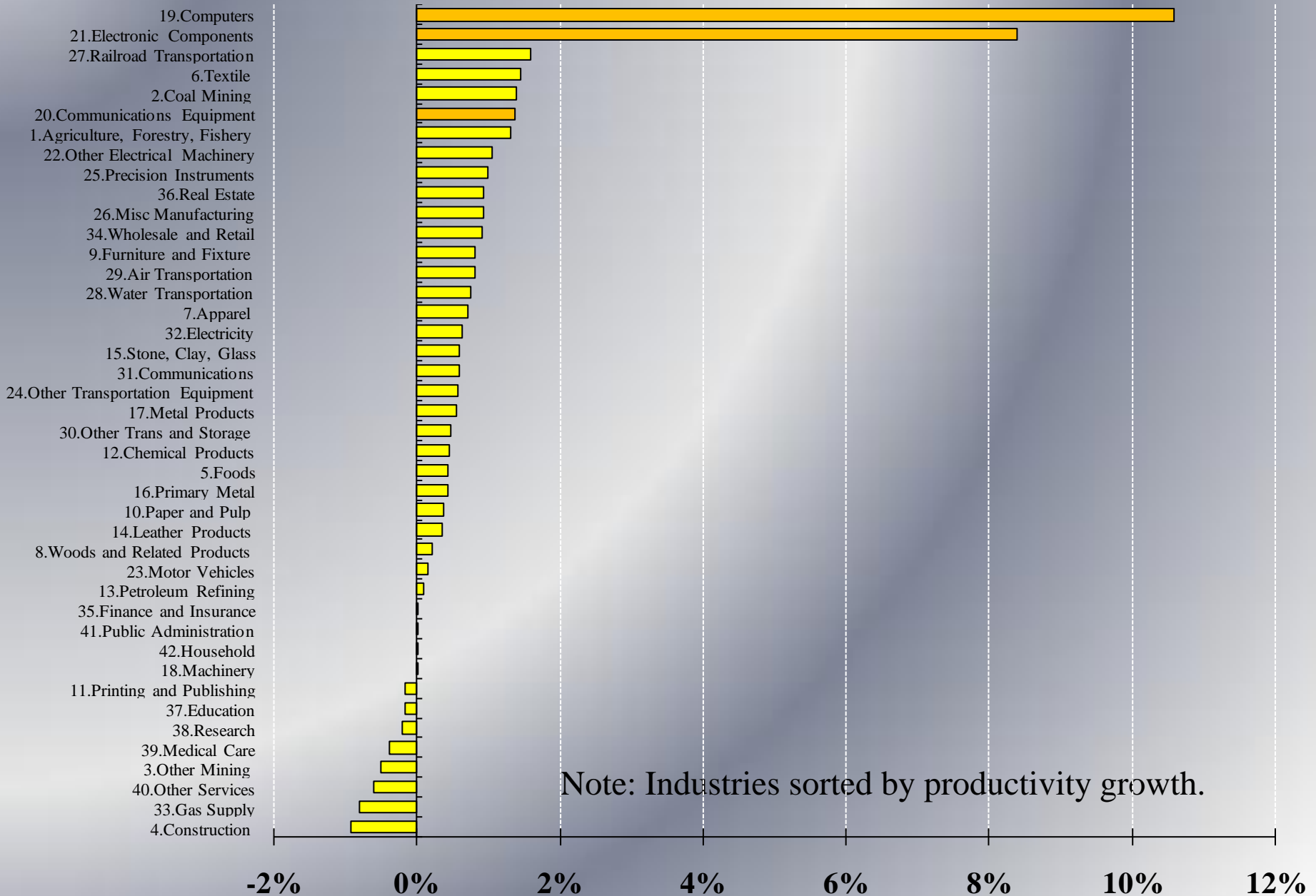


-Comparison between the U.S. and Japan- Productivity Contribution of Finance and Insurance in the U.S. and Japan

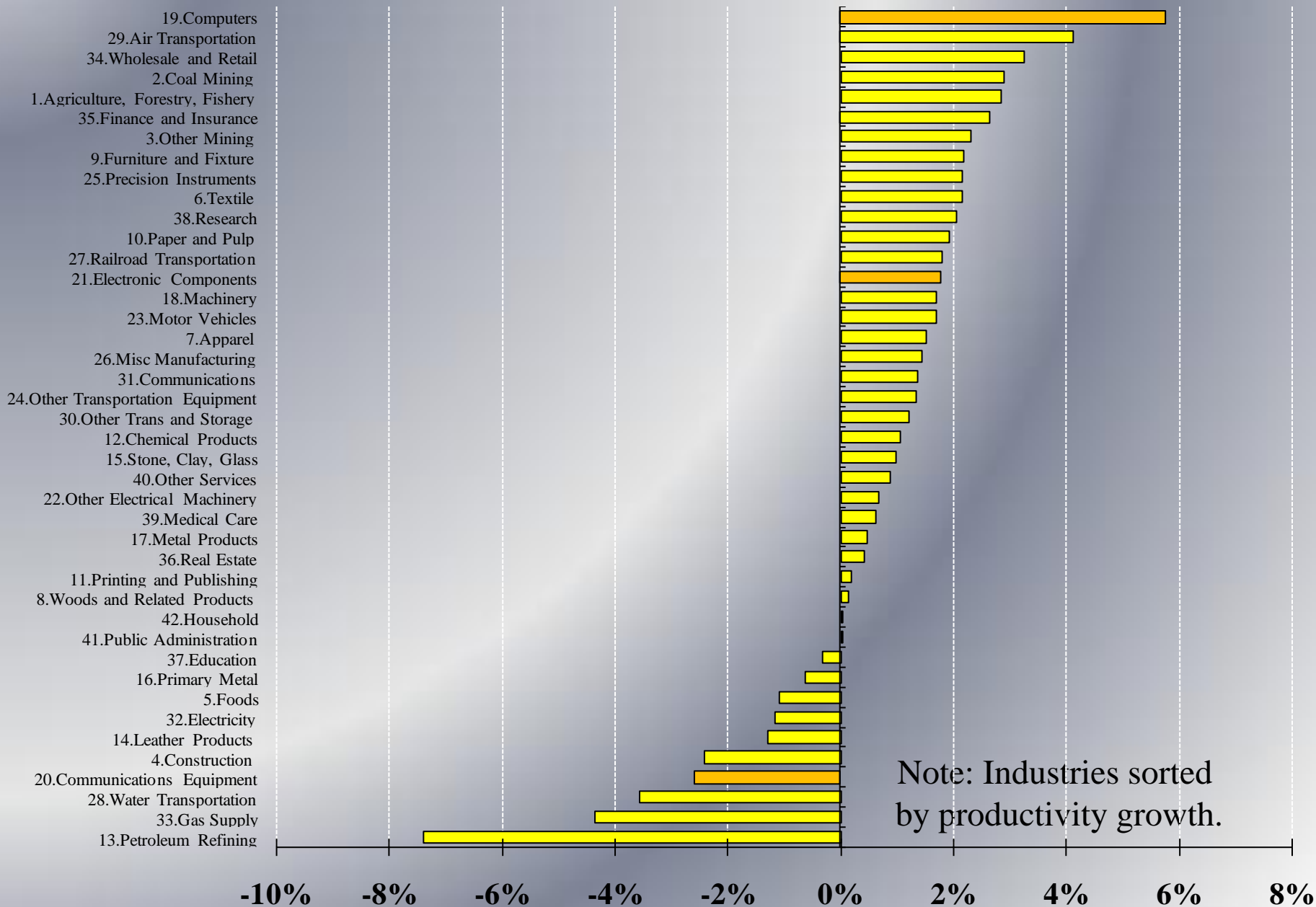
Average annual percentage growth rates, weighted by Domar weights.



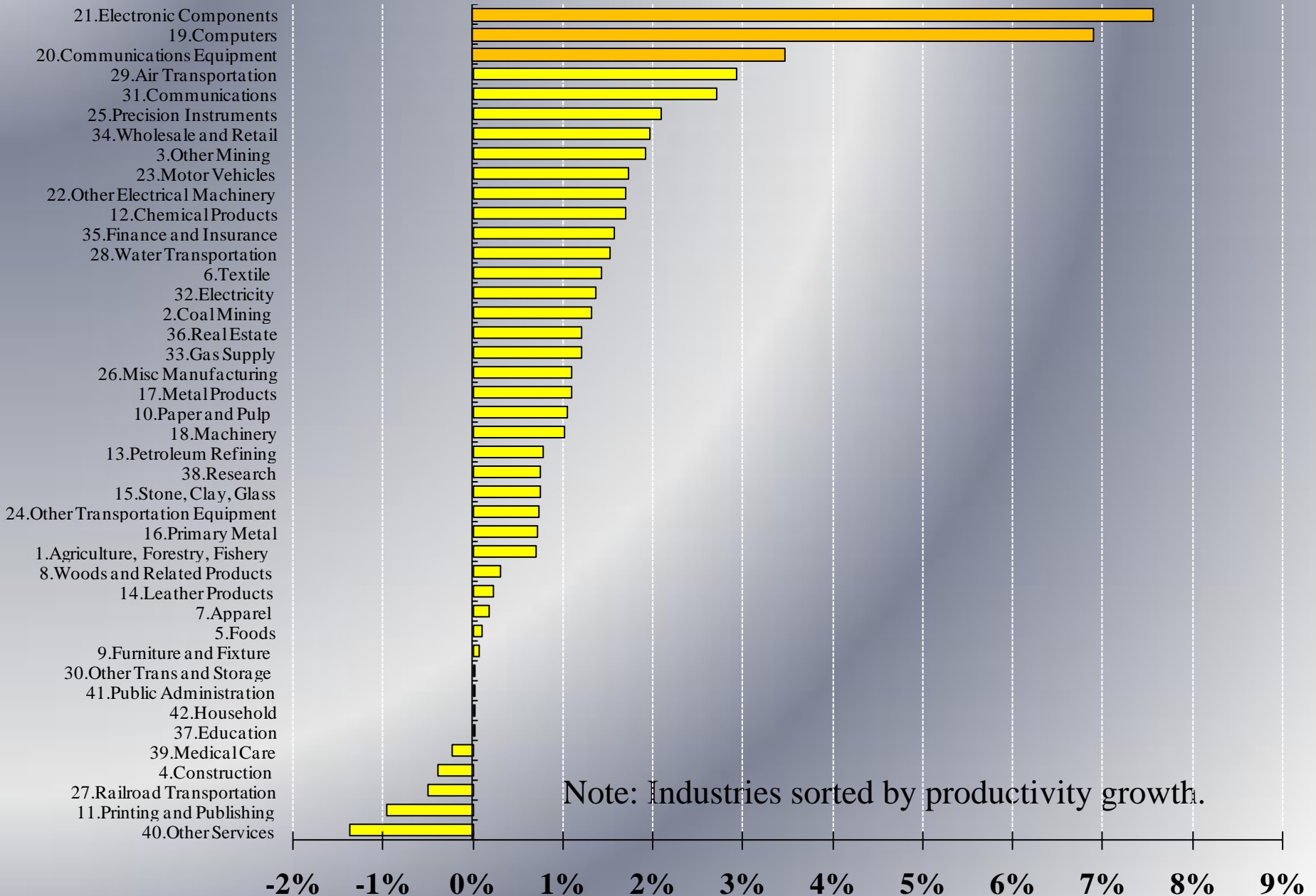
Industry Productivity Growth in the U.S., 1960-2000



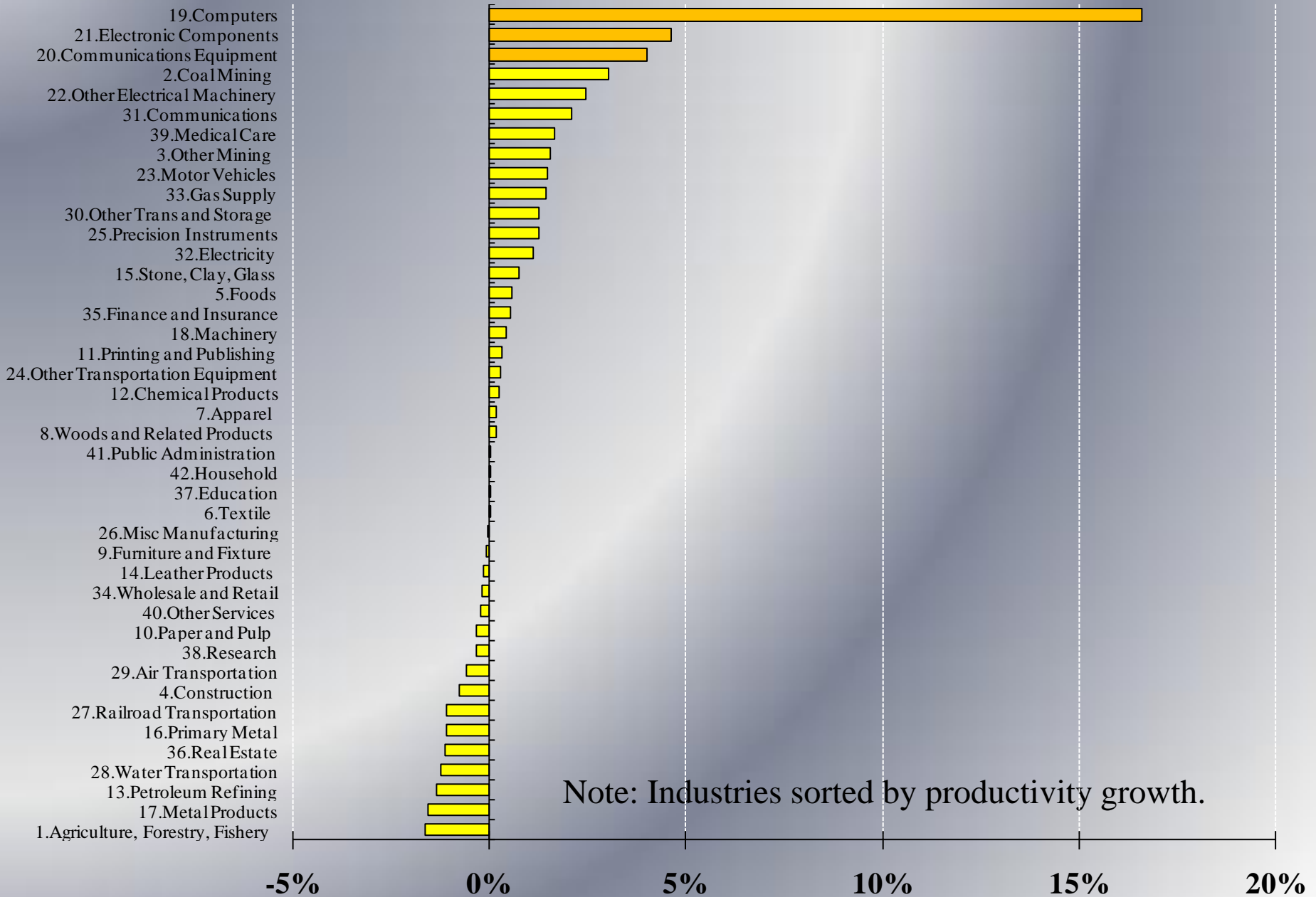
Industry Productivity Growth in the U.S., 2000-2004



Industry Productivity Growth in Japan, 1960-2000

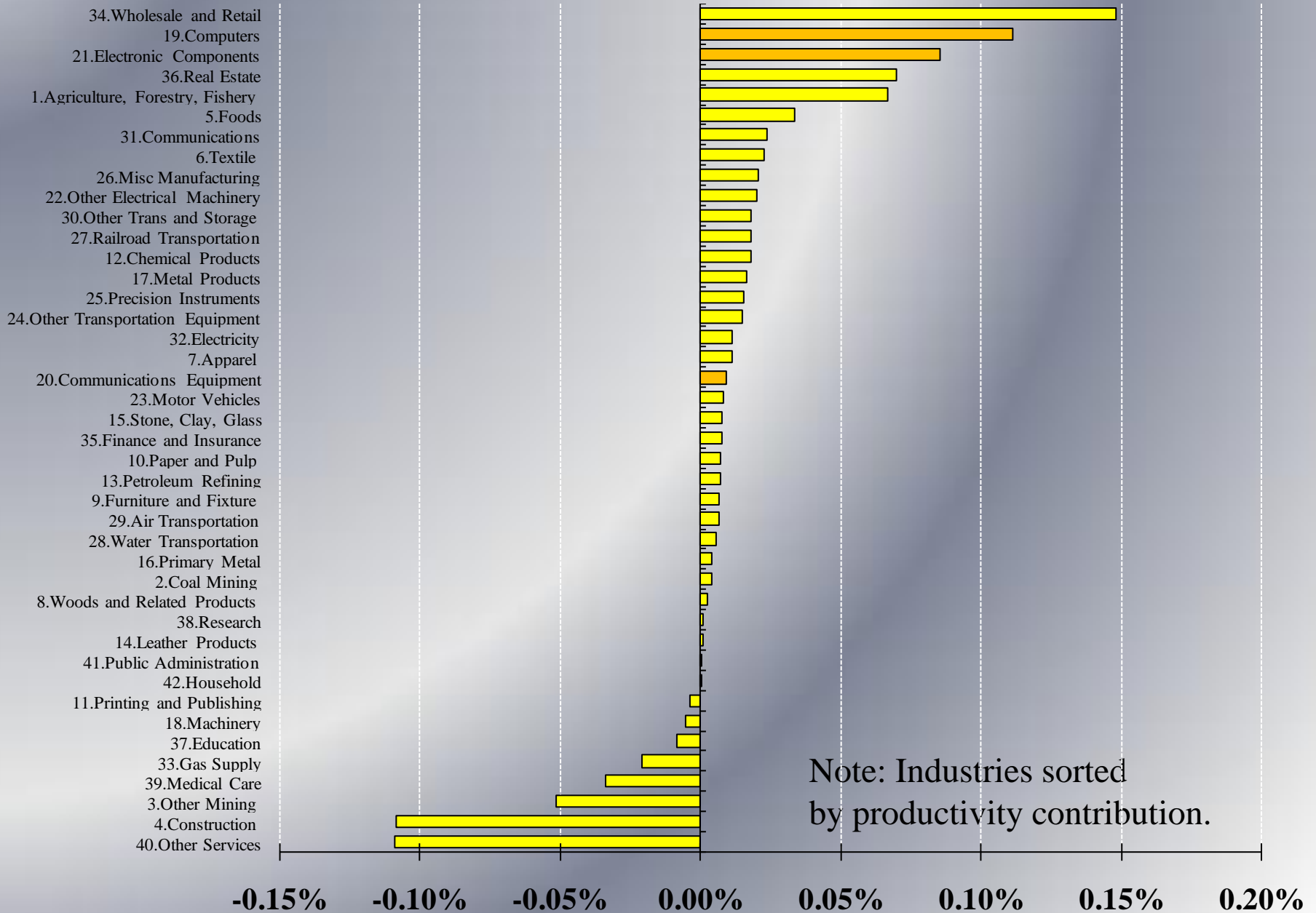


Industry Productivity Growth in Japan, 2000-2004

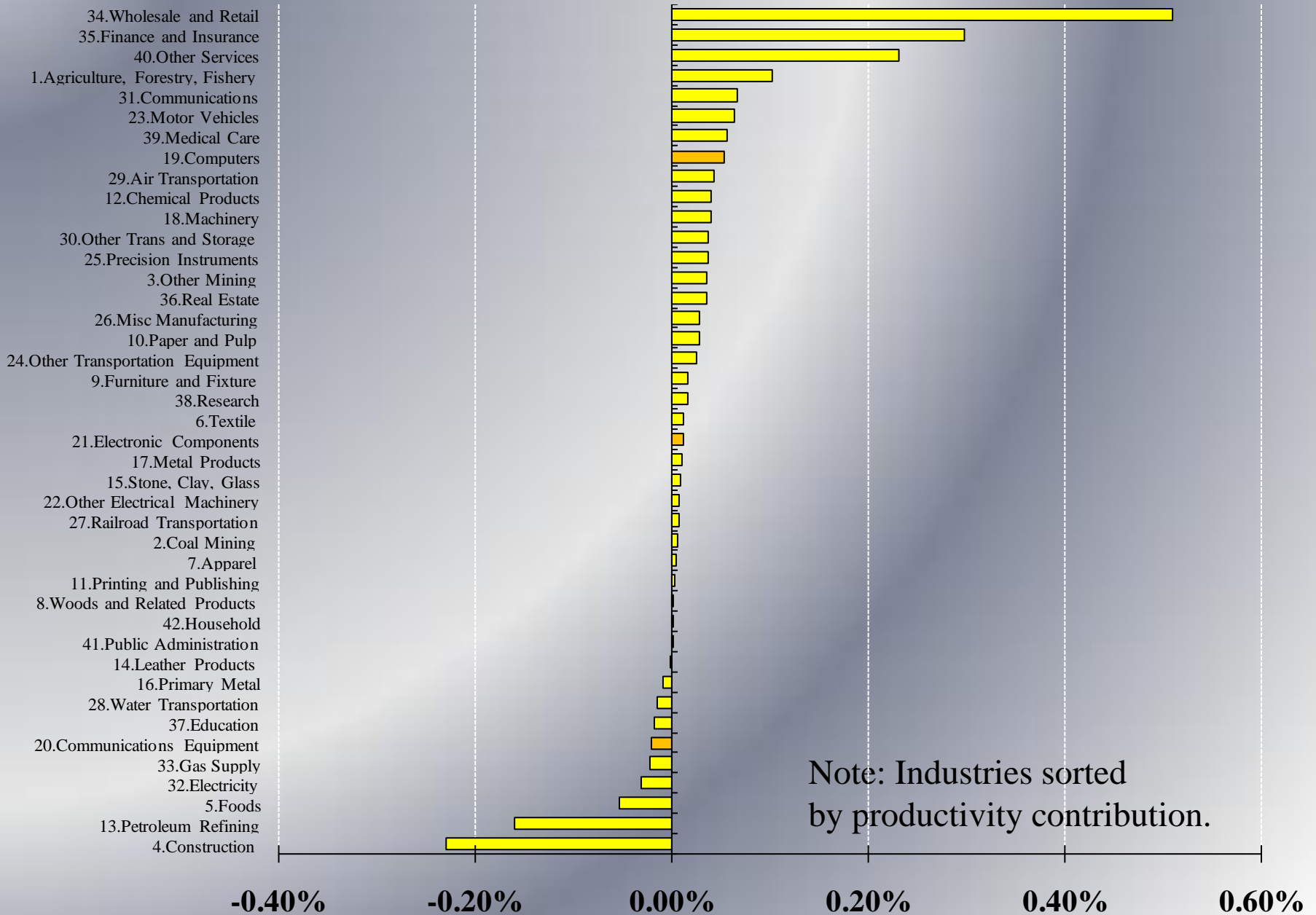


Note: Industries sorted by productivity growth.

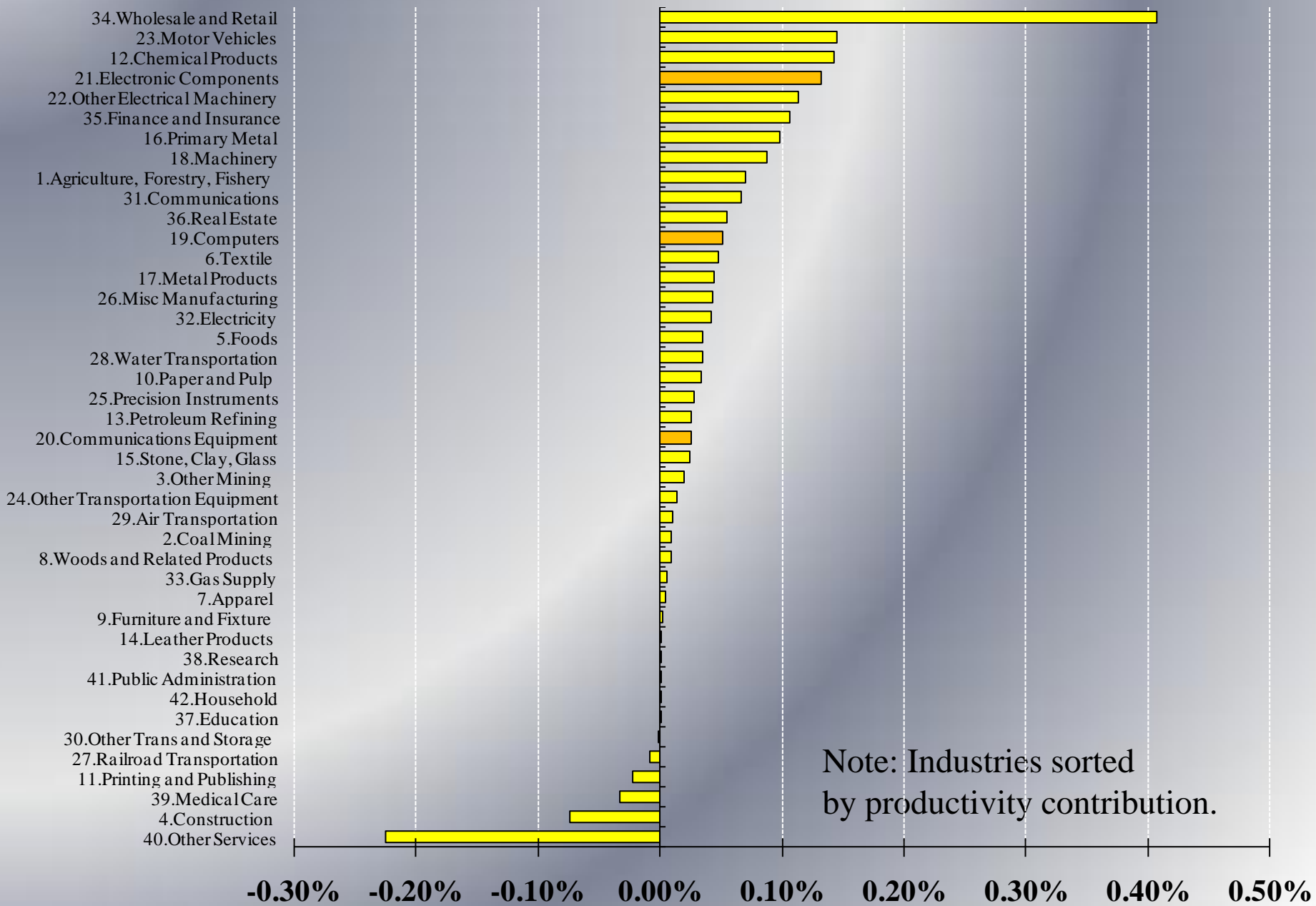
Industry Contributions to Productivity in the U.S., 1960-2000



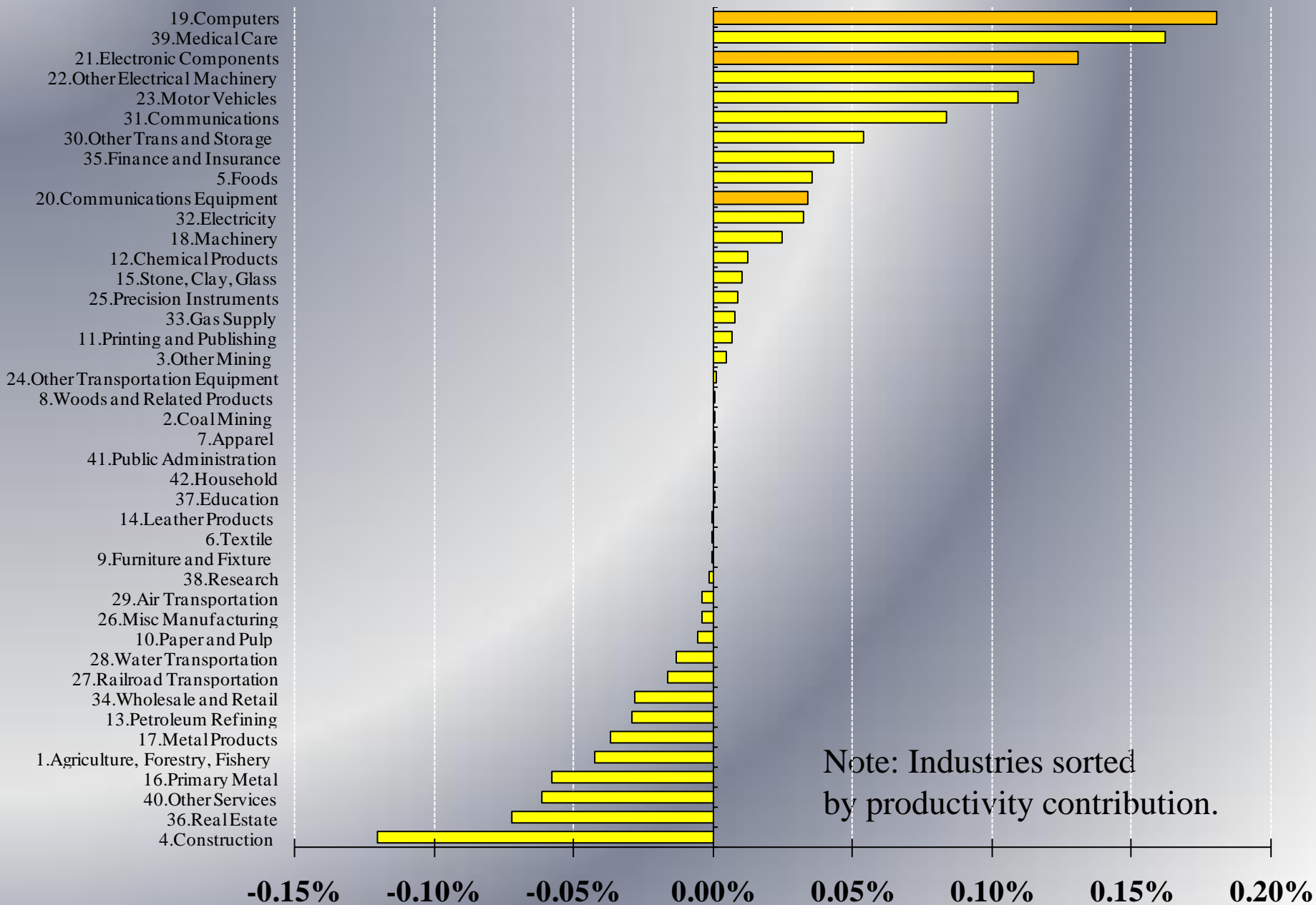
Industry Contributions to Productivity in the U.S., 2000-2004



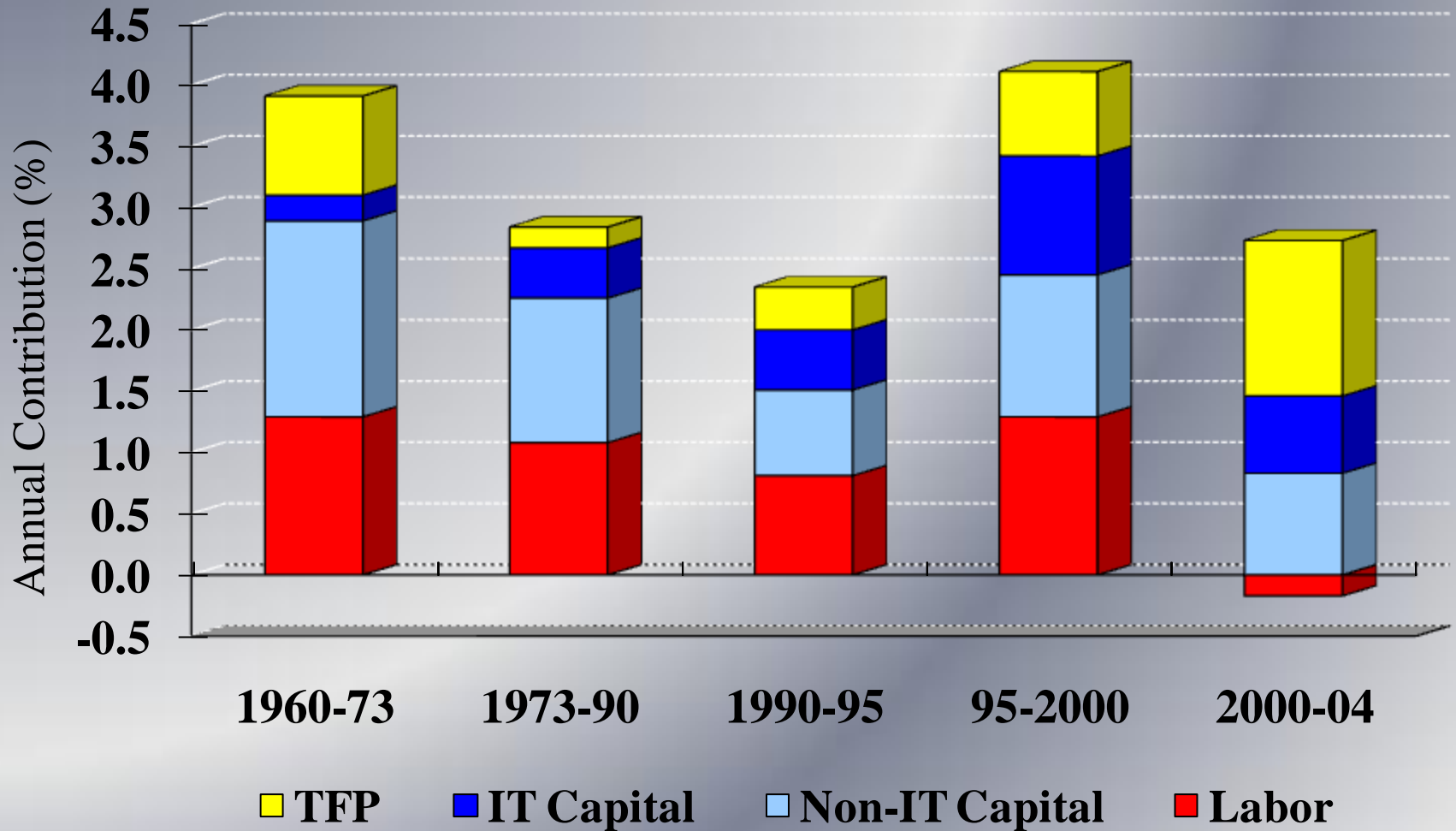
Industry Contributions to Productivity in Japan, 1960-2000



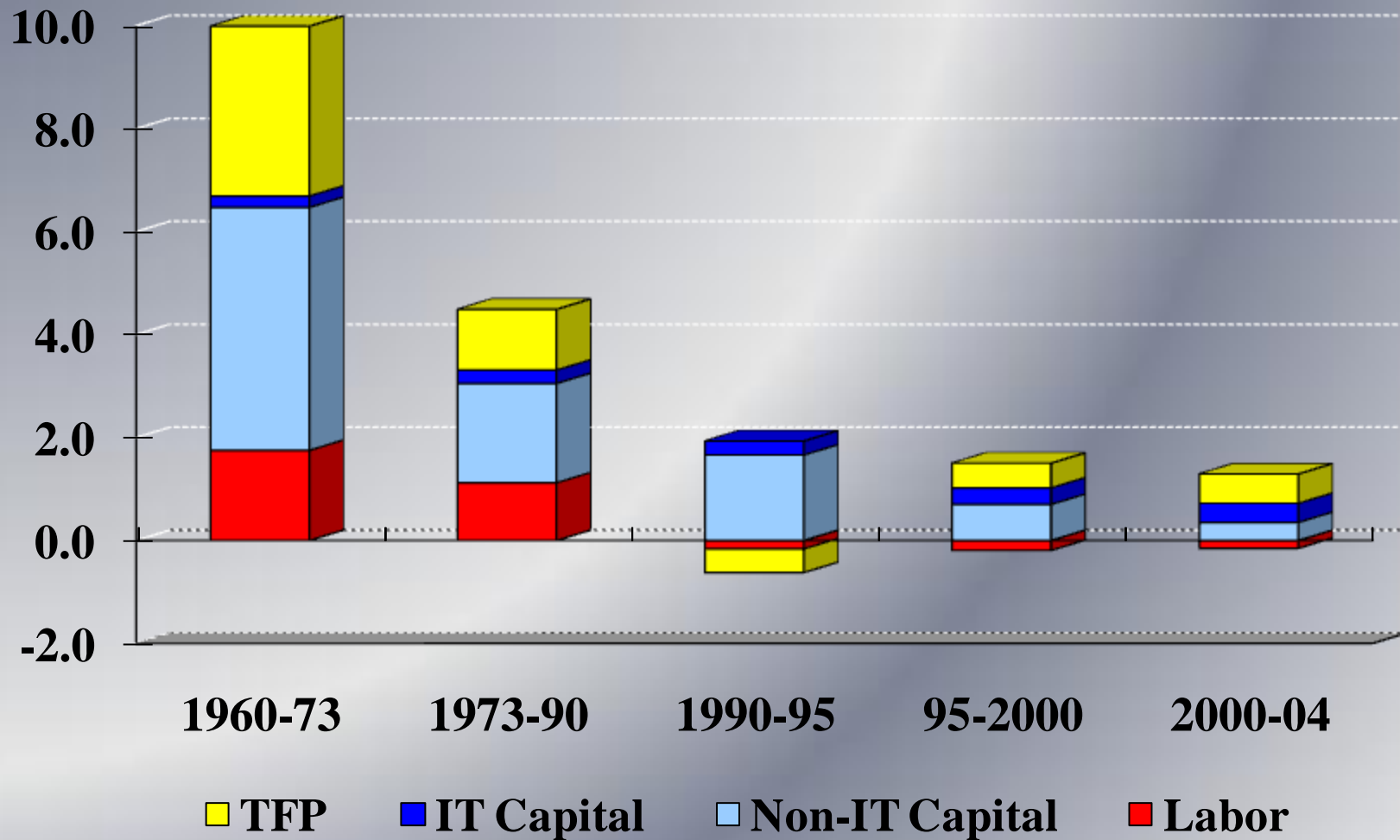
Industry Contributions to Productivity in Japan, 2000-2004



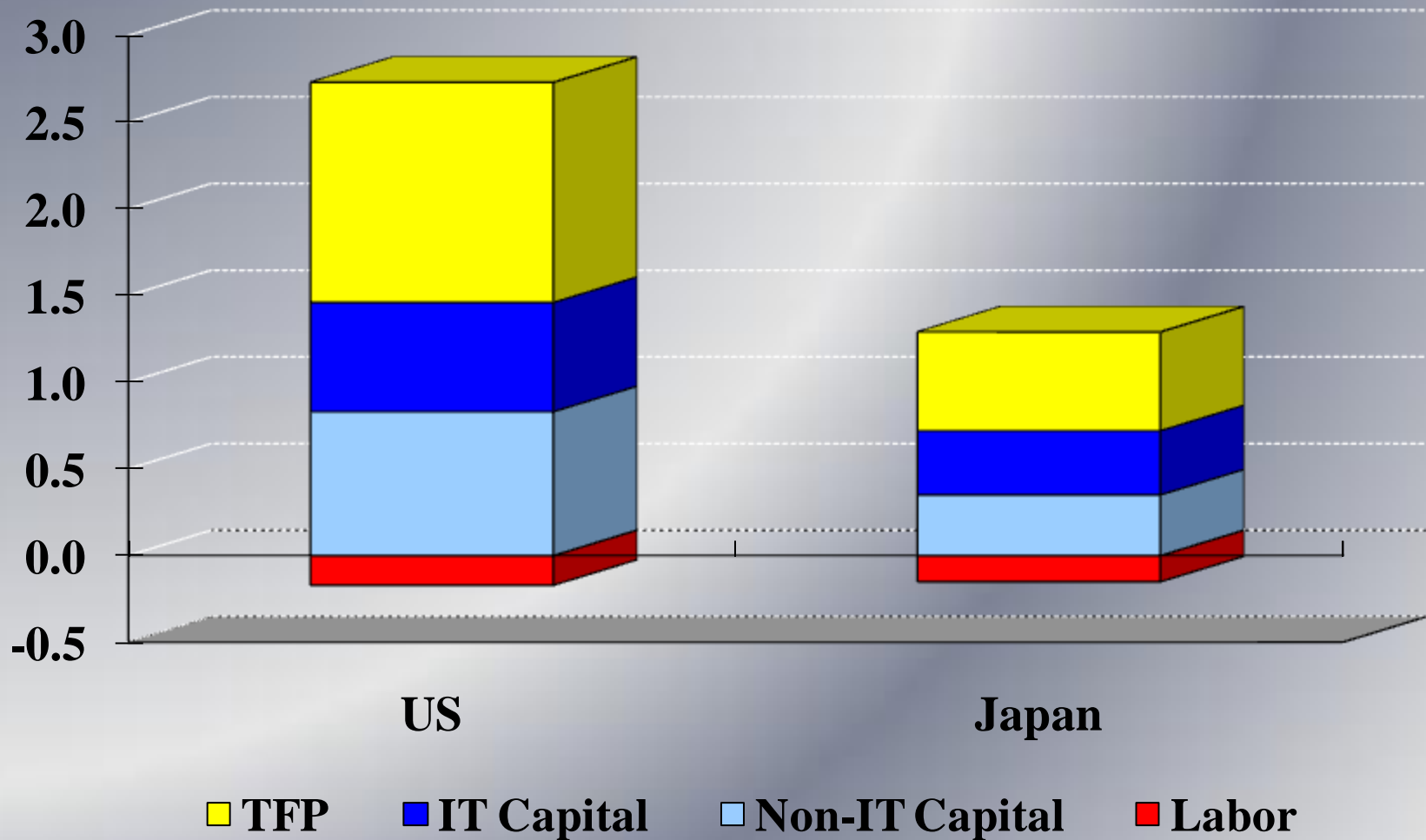
Sources of Economic Growth in the U.S., 1960-2004



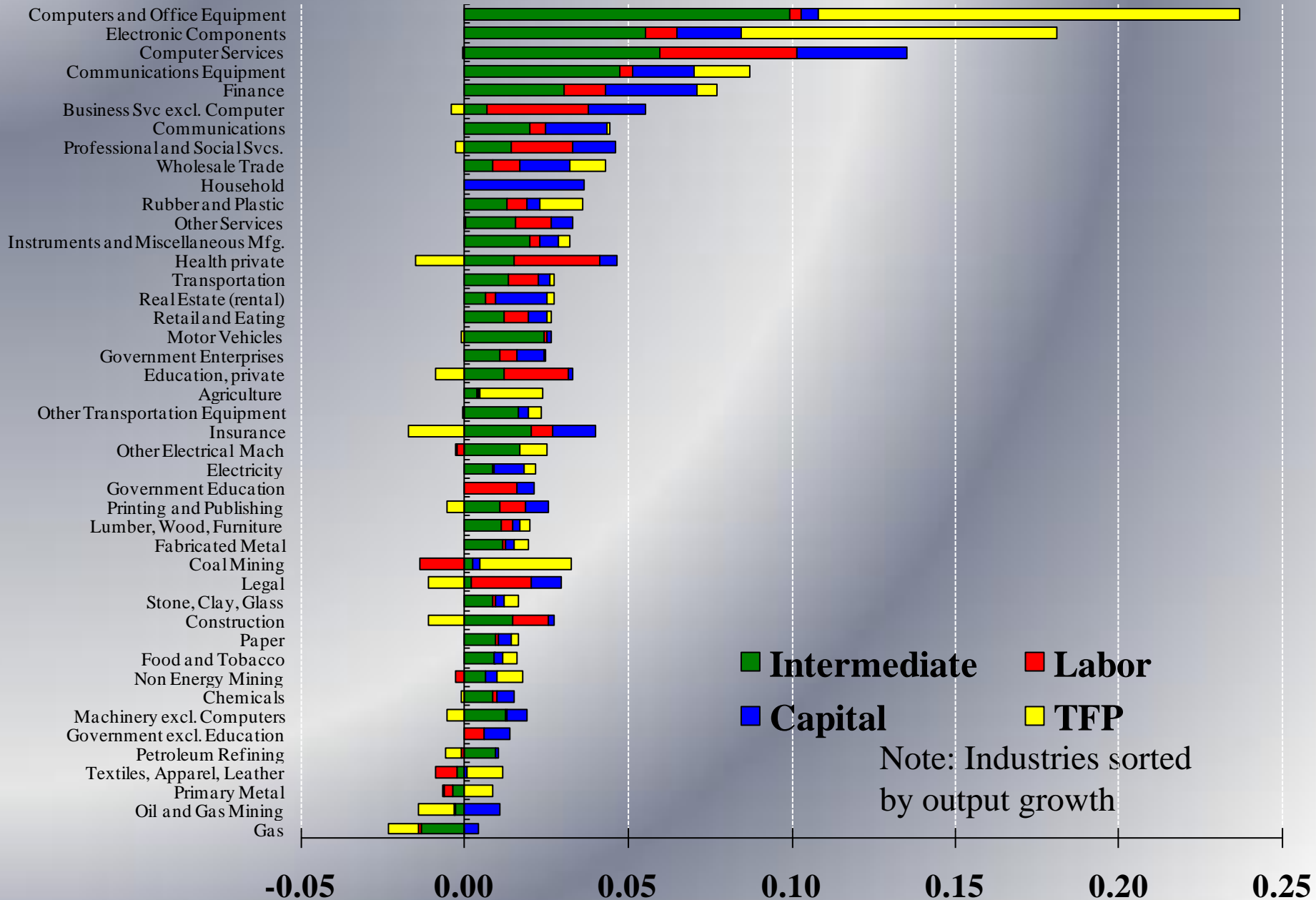
Sources of Economic Growth in Japan, 1960-2004



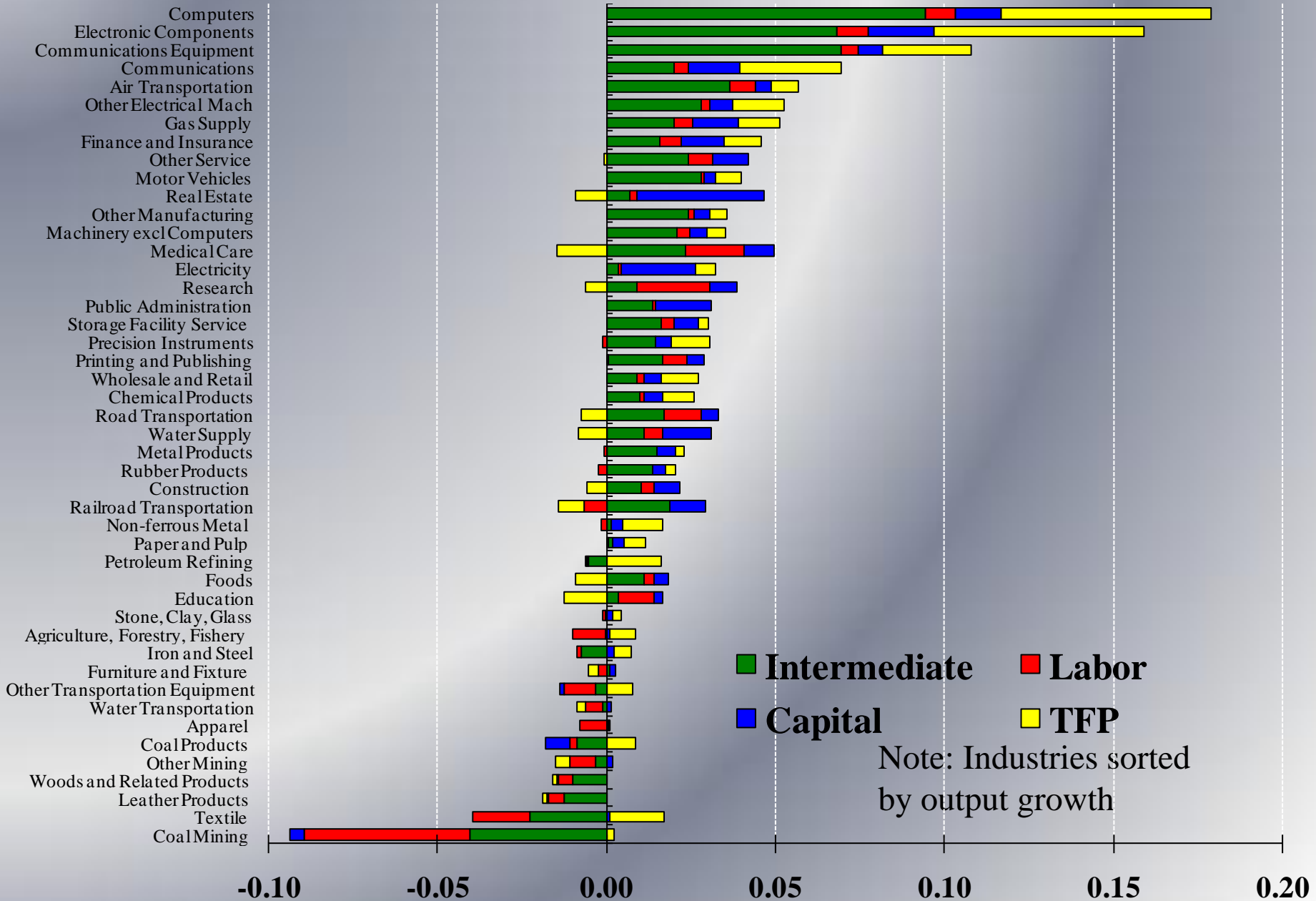
-Comparison between the U.S. and Japan- Sources of Economic Growth, 2000-2004



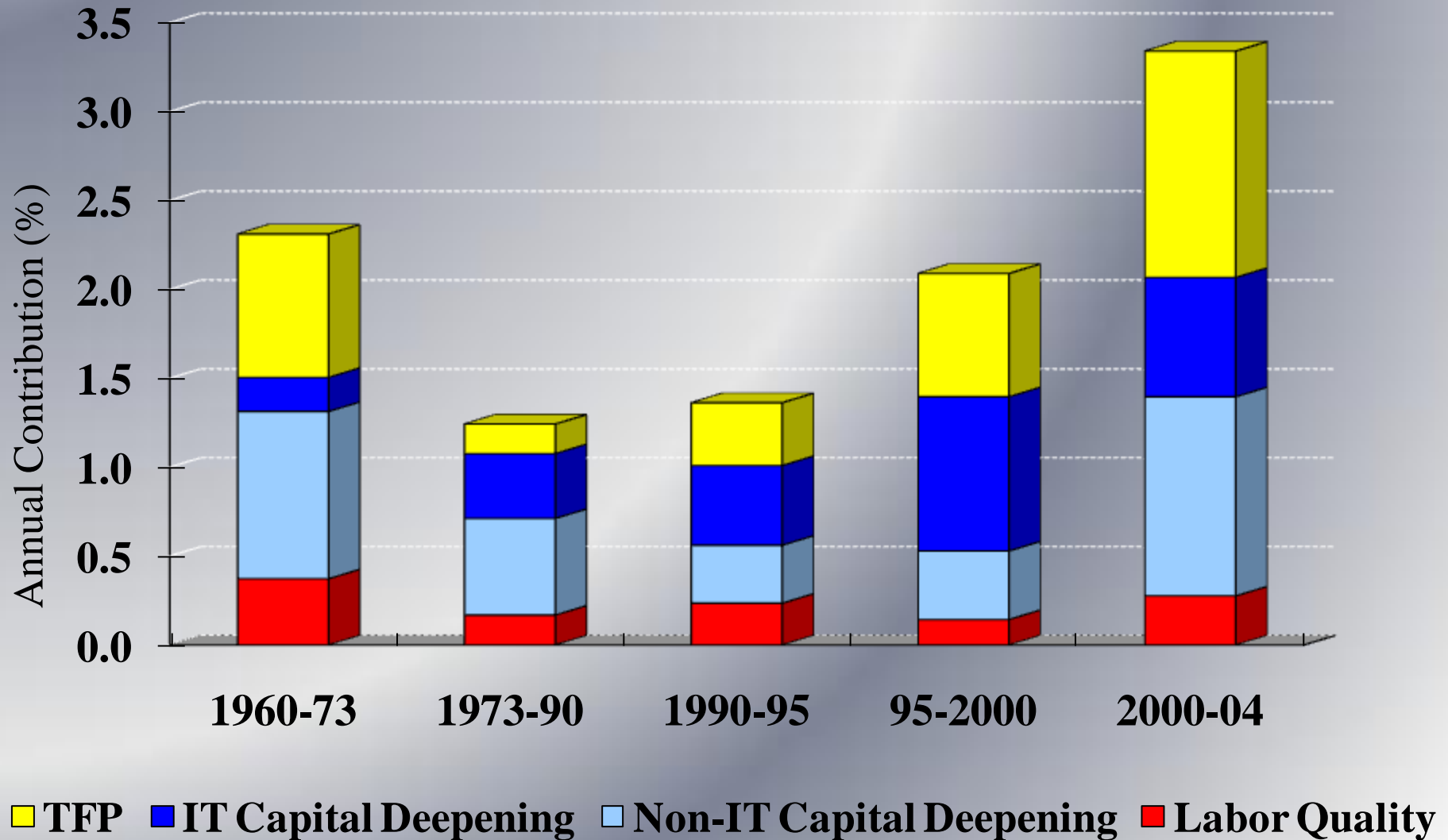
Sources of Growth in Industry Output in the U.S., 1977-2000



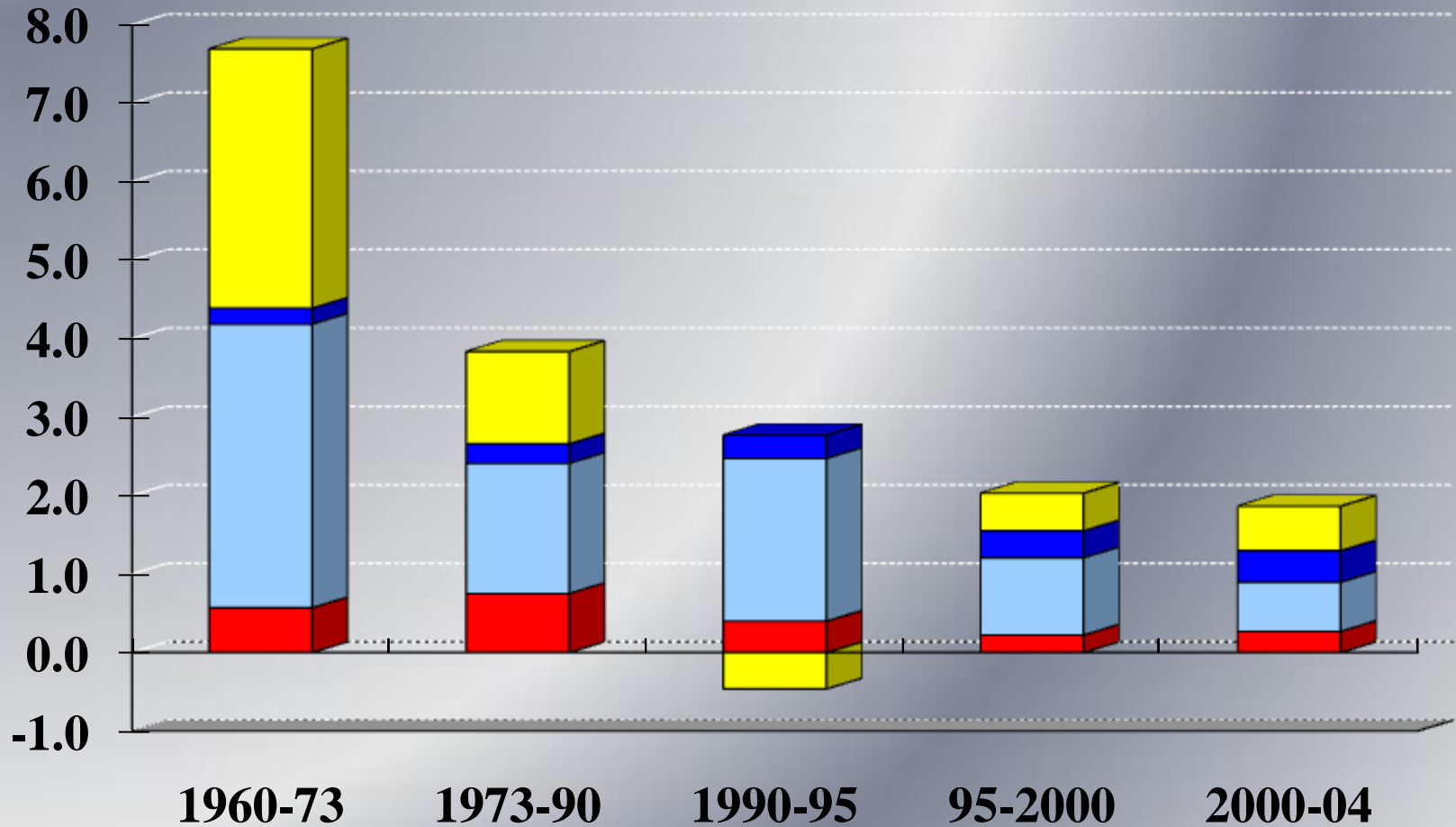
Sources of Growth in Industry Output in Japan, 1977-2000



Sources of Labor Productivity Growth in the U.S., 1960-2004

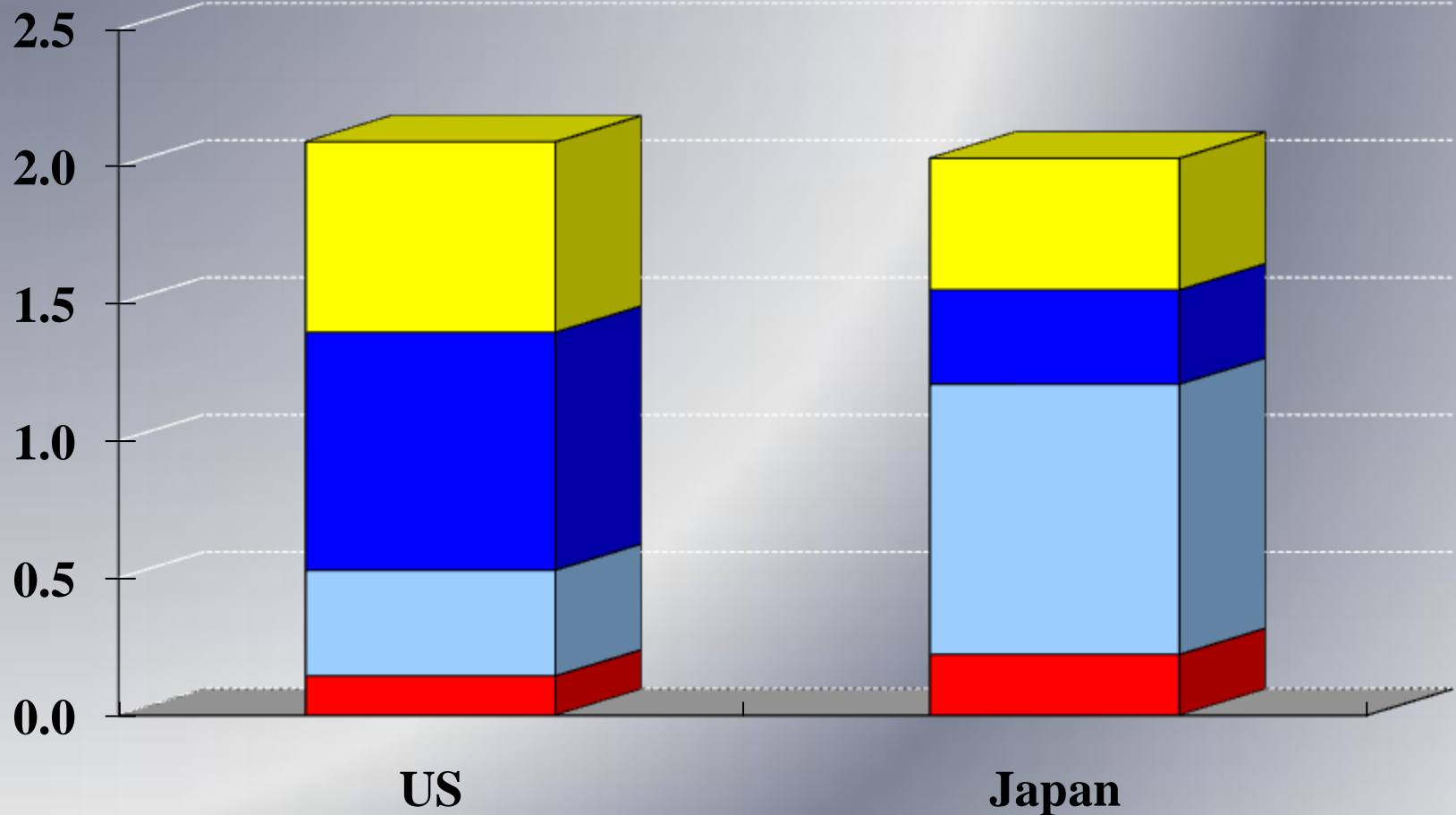


Sources of Labor Productivity Growth in Japan, 1960-2004



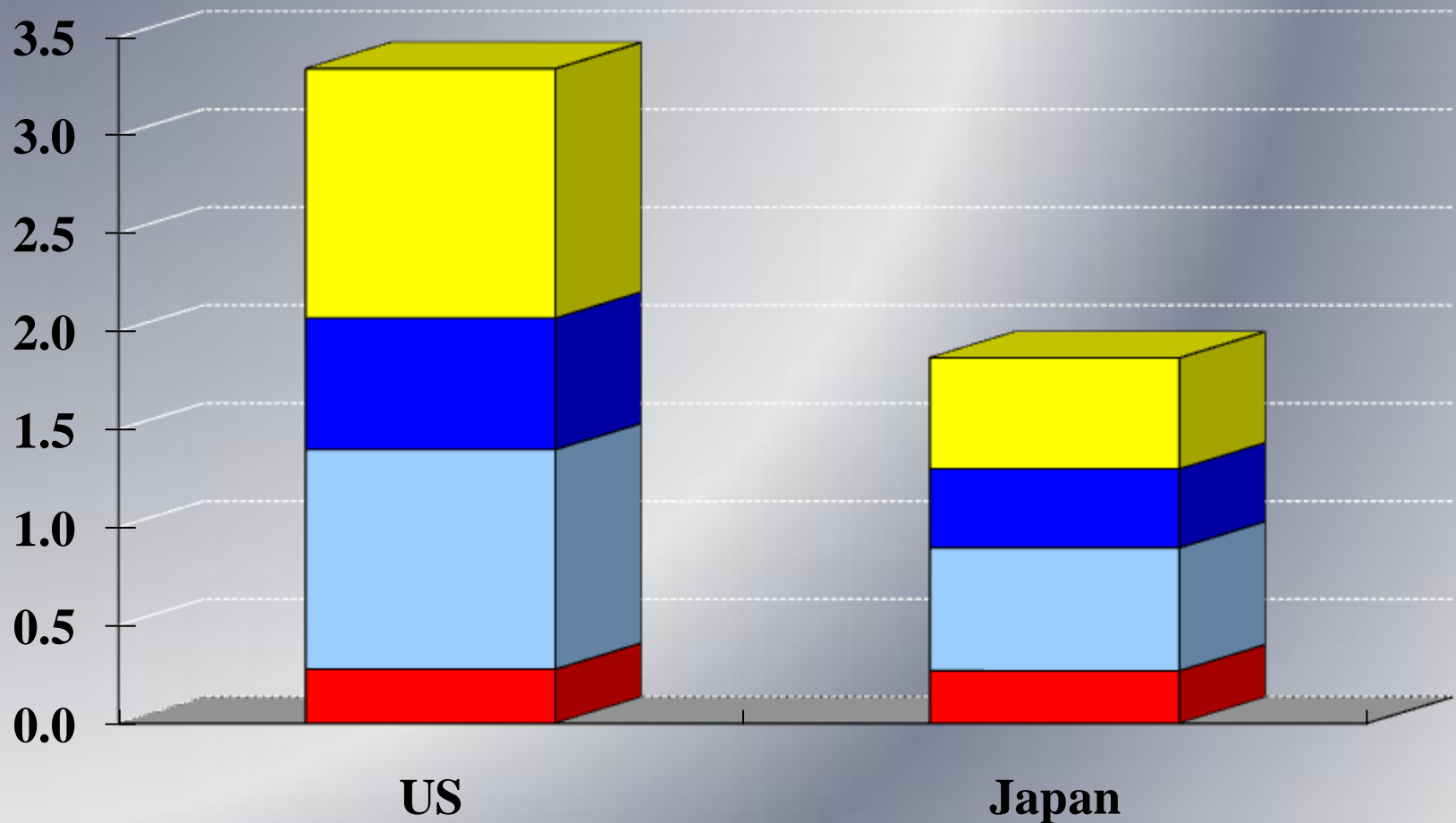
■ TFP ■ IT Capital Deepening ■ Non-IT Capital Deepening ■ Labor Quality

-Comparison between the U.S. and Japan- Sources of Labor Productivity Growth in Japan, 1995-2000



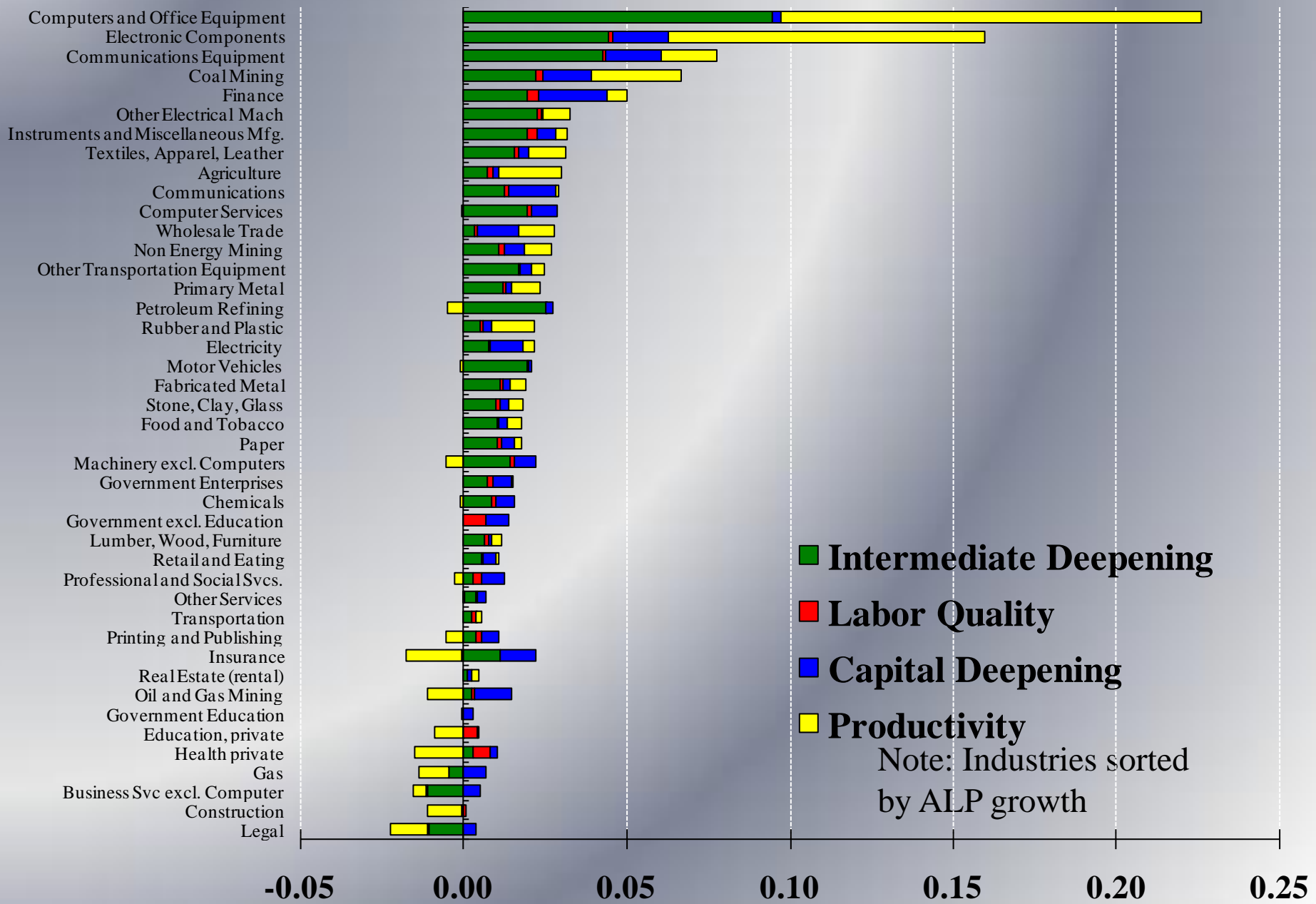
■ TFP ■ IT Capital Deepening ■ Non-IT Capital Deepening ■ Labor Quality

-Comparison between the U.S. and Japan- Sources of Labor Productivity Growth in Japan, 2000-2004

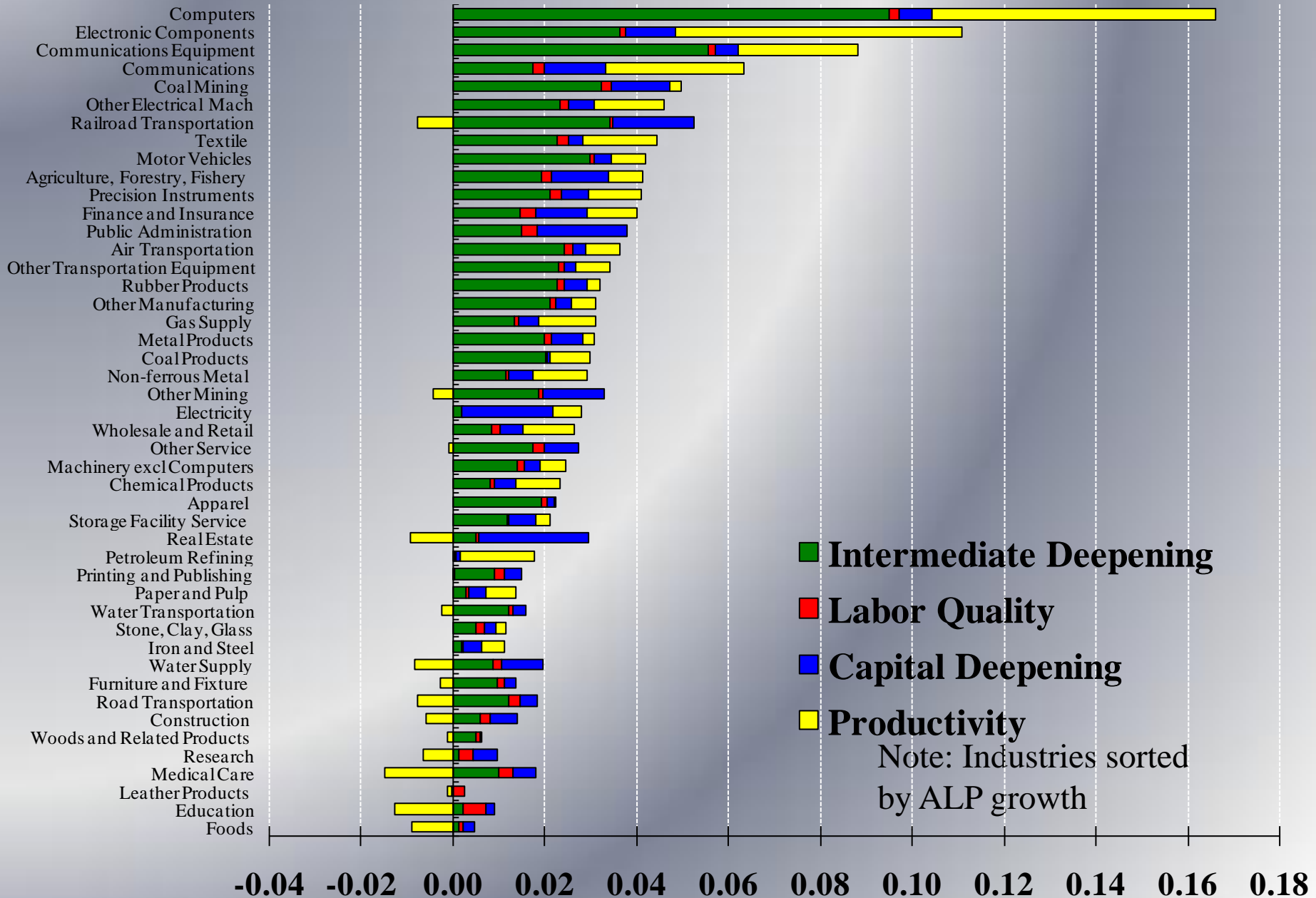


■ TFP ■ IT Capital Deepening ■ Non-IT Capital Deepening ■ Labor Quality

Sources of Industry Labor Productivity Growth in the U.S., 1977-2000



Sources of Industry Labor Productivity Growth in Japan, 1977-2000



Economics on Internet Time: The New Research Agenda

- The Solow Paradox -- we see computers everywhere but in the productivity statistics -- versus the Information Age.
- Equity Valuations and Growth Prospects: accumulation of intangible assets versus irrational exuberance.
- Widening Wage Inequality: capital-skill complementarity versus skill-biased technical change.
- Modeling IT and the semiconductor industry: permanent versus transitory contributions to economic growth.