Economic Growth in the Information Age

By

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INTRODUCTION:
Prices of Information Technology

THE INFORMATION AGE:
Faster, Better, Cheaper!

ROLE OF INFORMATION TECHNOLOGY:
IT Prices and the Cost of Capital

AMERICAN GROWTH RESURGENCE:
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).
Transistor Density on Micro Processors and Memory Chips
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, 1977-2000

All price indexes are divided by the output price index.

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Log Scale (1996=1)
ROLE OF INFORMATION TECHNOLOGY: IT Prices and the Growth of Output.

OUTPUT SHARES OF IT:
Computers, Communications Equipment, Semiconductors, Software, and IT Services.

OUTPUT CONTRIBUTION OF IT:
IT versus Non-IT Value Added.

OUTPUT CONTRIBUTION BY TYPE:
Computers, Communications Equipment, Semiconductors, Software, and IT Services.
Value Added Shares of Information Technology by Type, 1977-2000

Share of current dollar gross domestic product.
Industry Contributions to Value Added Growth

Domar-weighted contributions of industry value

Note: IT Services is the capital service flow from Household and Government
Industry Contribution to Value Added

Average annual percentage growth rates, weighted by the value share.

- 1977-1989
- 1989-1995
- 1995-2000

Annual Contribution (%)

- Non IT
- IT
ROLE OF INFORMATION TECHNOLOGY:
IT Prices, Investment, and Productivity.

INPUT SHARES OF IT:
Computers, Communications Equipment, and Software.

CAPITAL CONTRIBUTION:
IT versus Non-IT Capital Services.

CAPITAL CONTRIBUTION BY TYPE:
Computers, Communications Equipment, and Software.
IT Capital Input Shares by Type

Percent


Computers
Communications
Software
Total IT

- Computers
- Communications
- Software
- Total IT
Capital Input Contribution of Information Technology

Average annual percentage growth rates, weighted by income


Annual Contribution (%)

Non-IT Capital Services  IT Capital Services

Average annual percentage growth rates, weighted by income
Industry Contributions to Capital Input Growth, 1977-2000

Note: Industries sorted by IT capital contribution.
AMERICAN GROWTH RESURGENCE: IT Investment and Productivity Growth.

TOTAL FACTOR PRODUCTIVITY:
IT-Production versus Non-IT Production.

SOURCES OF U.S. ECONOMIC GROWTH:
Capital Input, Labor Input, and TFP.

AVERAGE LABOR PRODUCTIVITY GROWTH:
Capital Deepening, Labor Quality, TFP.
Sources of U.S. TFP Growth

1977-1989
- Reallocation of Non-college Educated Labor
- Reallocation of Non-IT Capital
- Wgt. Sectoral TFP (Other)

1989-1995
- Reallocation of College Educated Labor
- Reallocation of IT Capital
- Wgt. Sectoral TFP (IT Producers)

1995-2000
- Reallocation of Non-college Educated Labor
- Reallocation of Non-IT Capital
- Wgt. Sectoral TFP (Other)
- Reallocation of IT Capital
- Wgt. Sectoral TFP (IT Producers)
Industry Contributions to Productivity, 1977-2000

Note: Industries sorted by productivity contribution.
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.