

Preliminary – Comments Welcome

# A Retrospective Look at the U.S. Productivity Growth Resurgence

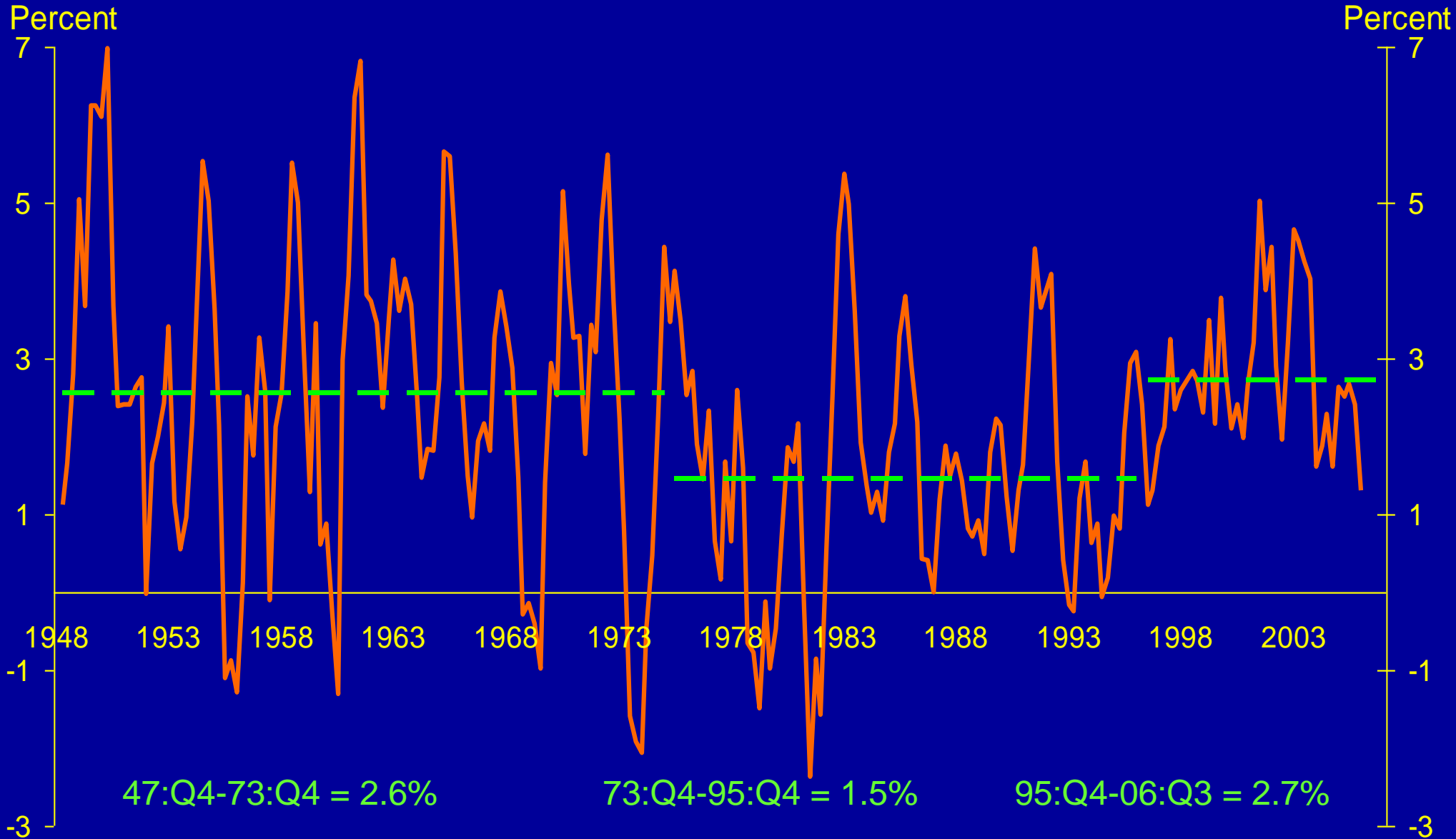
Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh\*  
January 2007

\*The views expressed here represent those of the author only and not necessarily those of the Federal Reserve Bank of New York or the Federal Reserve System.

# Outline

- Evolving View of U.S. Productivity Growth
- Sources of Productivity Growth
- Productivity Projections

# Three Productivity Eras



4-quarter growth in nonfarm business labor productivity.

Dotted line represents averages for 1948:Q4-1973:Q4, 1973:Q4-1995:Q4 and 1995:Q4-2006:Q3. BLS (11/23/06).

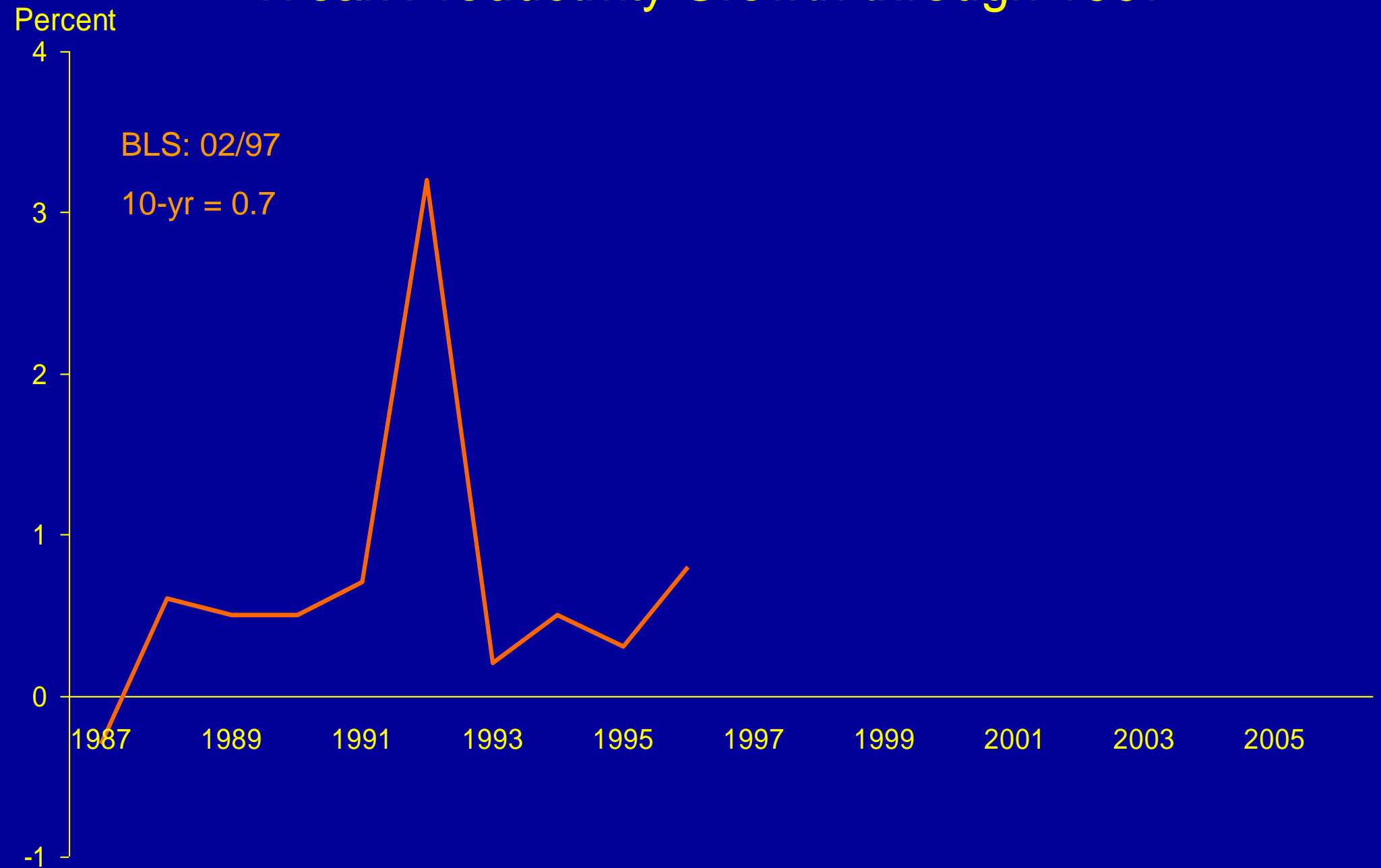
# Evolving View of U.S. Productivity Growth

- Pessimism through the early-1990s
  - Computer Productivity Paradox (Solow, '87)
  - Age of Diminished Expectations (Krugman, '93)
- Neoclassical view in mid-1990s
  - Computers are still small (Oliner-Sichel, '94, Jorgenson-Stiroh, '95)
- Some optimists in mid-1990s
  - New economy adherents (*Business Week*)
  - Chairman Greenspan

“...rapid acceleration of computer and telecommunication technologies can reasonably be expected to appreciably raise our productivity and standards of living in the twenty first century certainly, and quite possibly in some of the remaining years of this century.”

Federal Reserve Chairman Alan Greenspan  
National Governors' Association  
February 1996

# Weak Productivity Growth through 1997

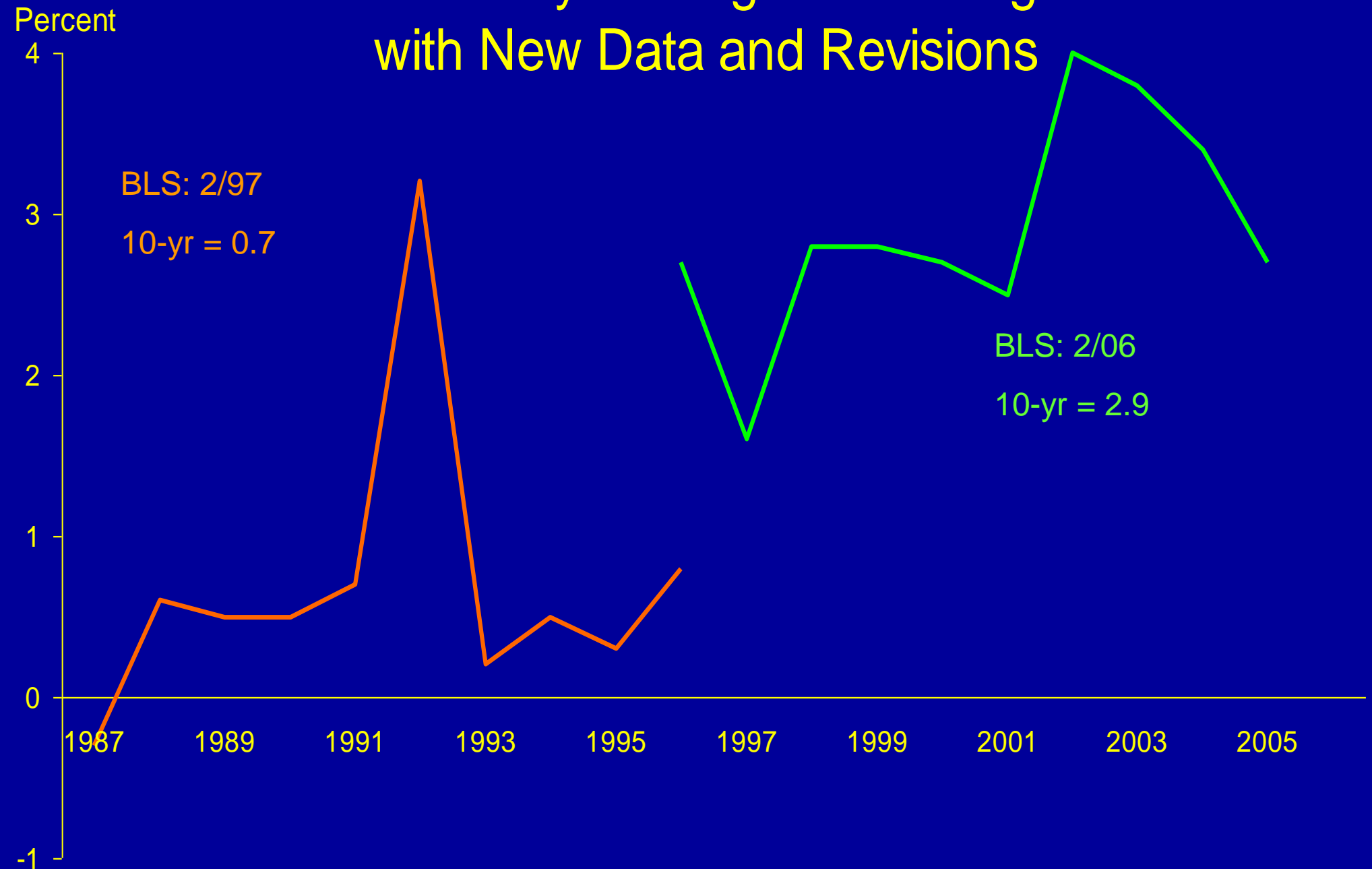


Note: Annual productivity growth for U.S. nonfarm business sector from BLS (2/11/1997) and BLS (2/2006).

# Evolving View of U.S. Productivity Growth

- Release of new data and revision of old data proved the optimists correct

# Productivity Resurgence Emerged with New Data and Revisions



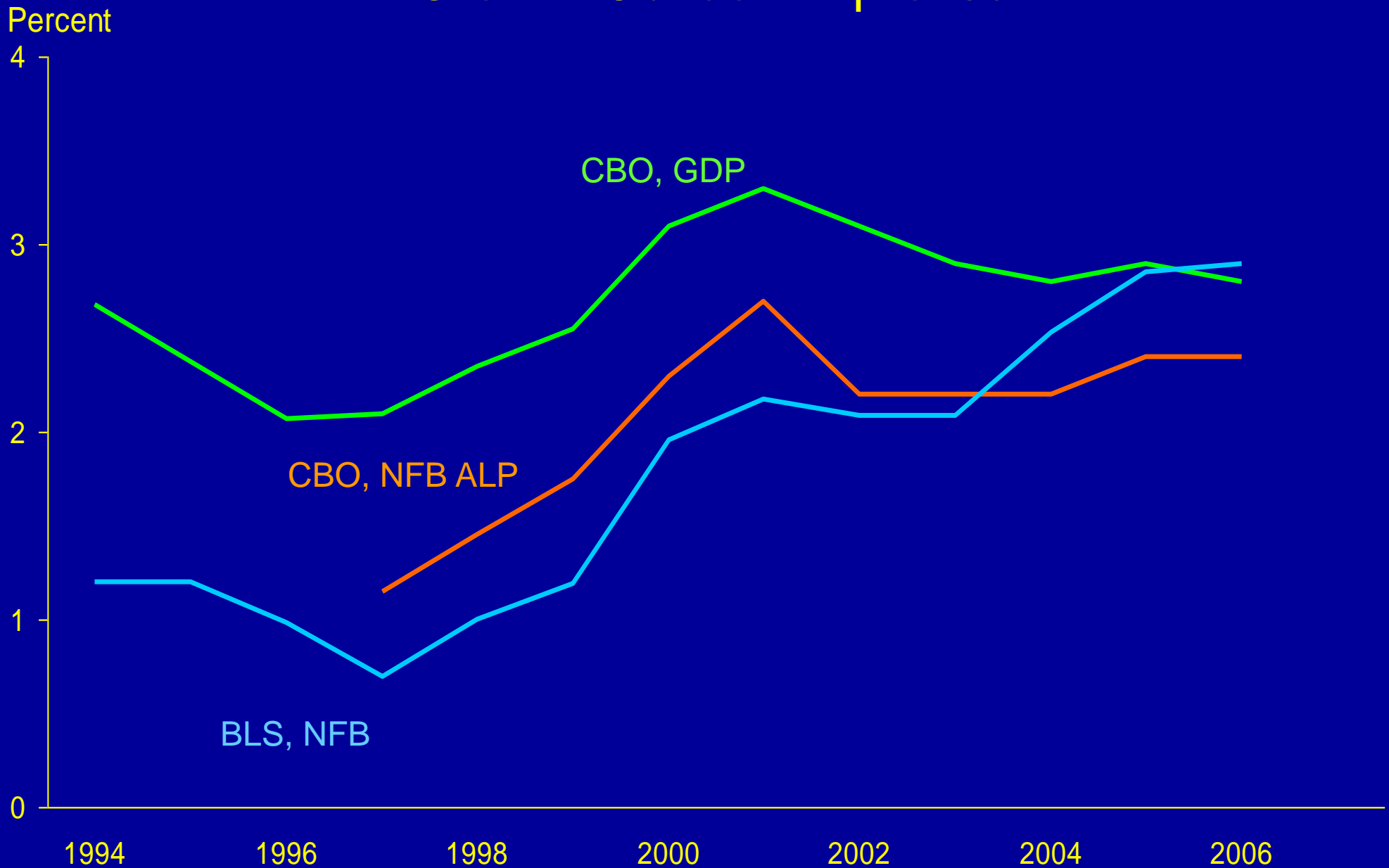
Note: Annual productivity growth for U.S. nonfarm business sector from BLS (2/11/1997) and BLS (2/2006).



# Evolving View of U.S. Productivity Growth

- Release of new data and revision of old data proved the optimists correct
- Two effects
  - Stimulated research on the role of IT
    - Macro, industry, firm, and case-study evidence that IT was important
  - Growth and productivity outlook improved dramatically
    - Implications for fiscal and monetary policy

# Growth Outlook Improved



Note: CBO data are 10-year projections from January Budget and Economic Outlook of each year. BLS data are average growths for trailing 10 years for nonfarm business sector.

# Sources of Productivity Growth

- Standard decomposition

$$\begin{aligned}\Delta \ln y = & \bar{v}_{K_n} \Delta \ln k_n + \bar{v}_{K_{IT}} \Delta \ln k_{IT} + \\ & \bar{v}_L \Delta \ln L_Q + \\ & \bar{w}_n \Delta \ln A_n + \bar{w}_{IT} \Delta \ln A_{IT}\end{aligned}$$

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## Sources of U.S. Output and Productivity Growth

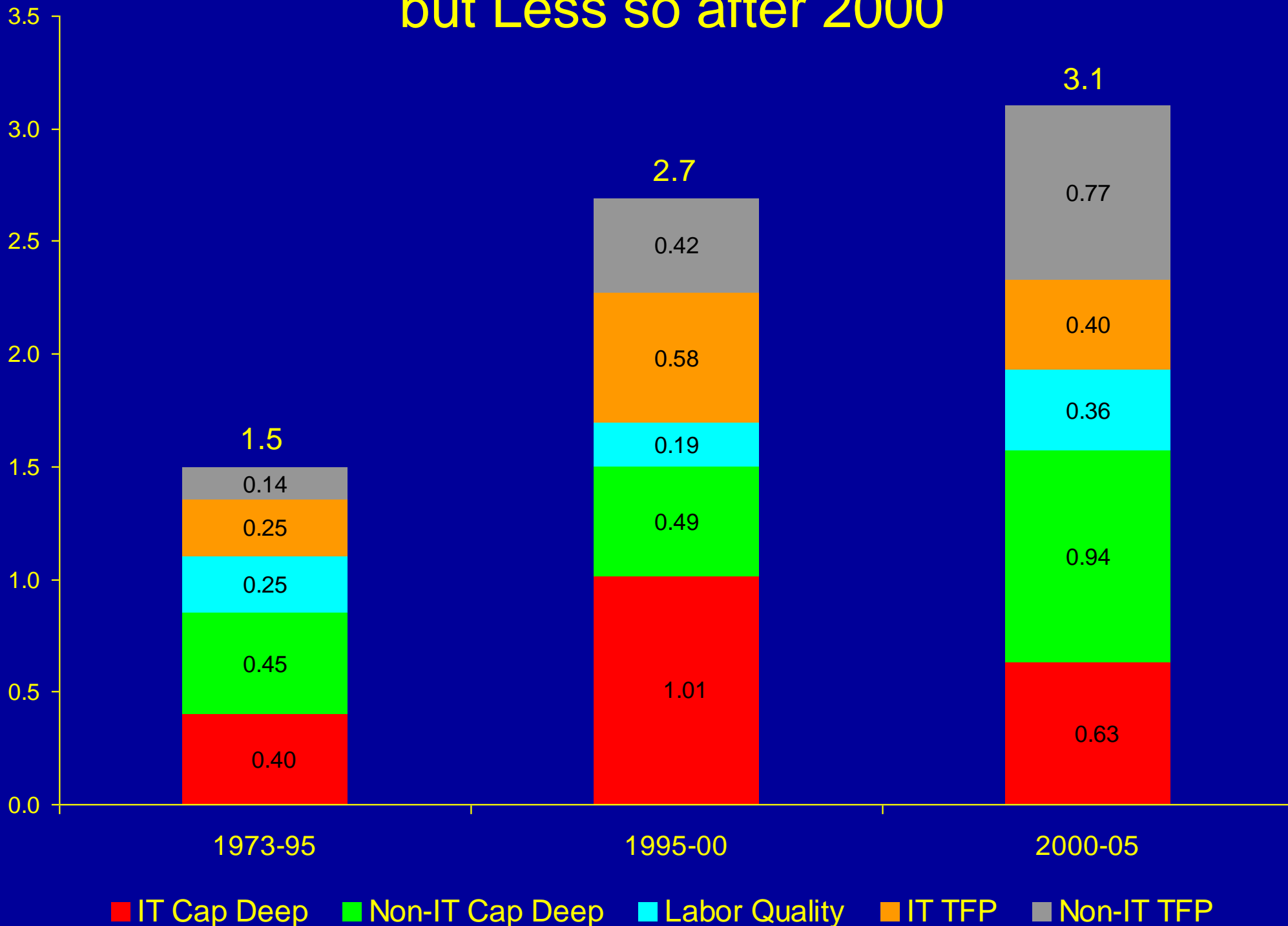
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	1973-1995	1995-2000	2000-2005
Average Labor Productivity	1.49	2.70	3.09
IT Cap Deepening	0.40	1.01	0.63
Non-IT Cap Deepening	0.45	0.49	0.94
Labor Quality	0.25	0.19	0.36
IT TFP	0.25	0.58	0.40
Non-IT TFP	0.14	0.42	0.77
Share Attributed to IT	0.43	0.59	0.33

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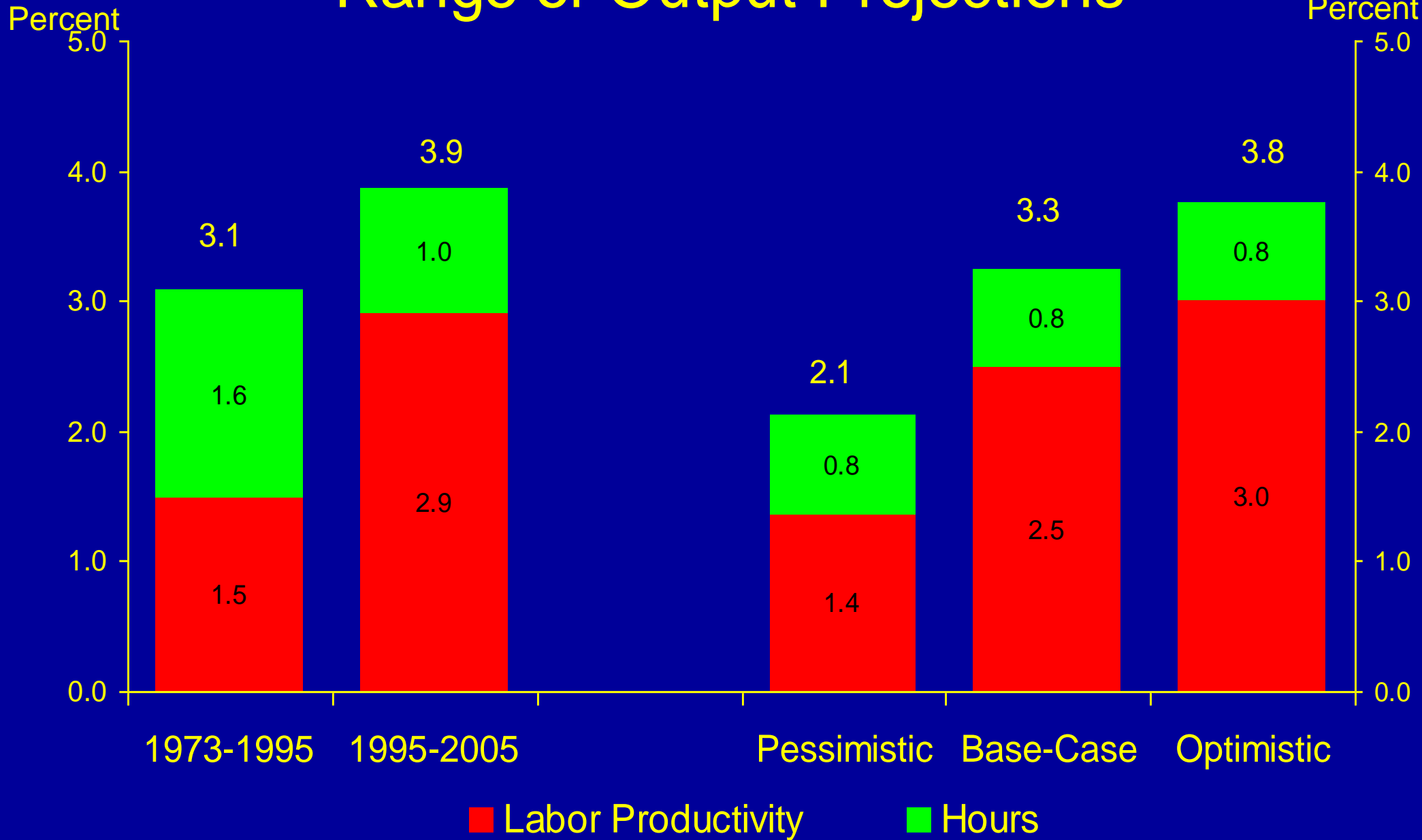
# IT is Important for Productivity Growth, but Less so after 2000



# Productivity Outlook

- Project productivity growth for next decade
  - Steady-state growth calibrations
    - Output and reproducible capital grow at same rate
    - Hours and labor supply grow at same rate
- Uncertainty about technological progress
  - Pessimistic, base-case, optimistic
  - Based on
    - Historical record
    - *International Technology Roadmap for Semiconductors*

# Range of Output Projections



Average annual growth rate for U.S. private sector. Numbers do not sum due to rounding.

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## Alternative Growth Projections

	Date	Horizon	Productivity	+ Hours	= Output
<b>Nonfarm Business</b>					
Gordon	Sep '06	25-year	2.1		
Global Insight	Sep '06	30-year	2.3	0.8	3.1
CBO	Aug '06	10-year	2.4	0.8	3.2
Jorgenson, Ho, Stiroh	Oct '06	10-year	2.5	0.8	3.3
Macroadvisors	Nov '06	3-year	2.5	0.9	3.4
<b>GDP</b>					
Aaronson et al.	Sep '06	10-year		0.4	
Gordon	Oct '06	25-year	1.8	0.7	2.5
SSA	Mar '06	10-year	1.9	0.7	2.6
CBO	Aug '06	10-year	2.1	0.7	2.8
Global Insight	Sep '06	30-year	2.1	0.7	2.8
Macroadvisors	Nov '06	3-year			3.1

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# Conclusions

- Productivity outlook evolved rapidly
  - Release of new data and revisions of old
- IT remains important, but less in 2000s than in 1990s
- Outlook remains solid, but edging down
  - Part of post-2000 gains appear transitory
  - JHS from 2.6% to 2.5%
    - Impact of BLS employment revisions about 2.4%
  - Little evidence that “productivity slowdown” will return

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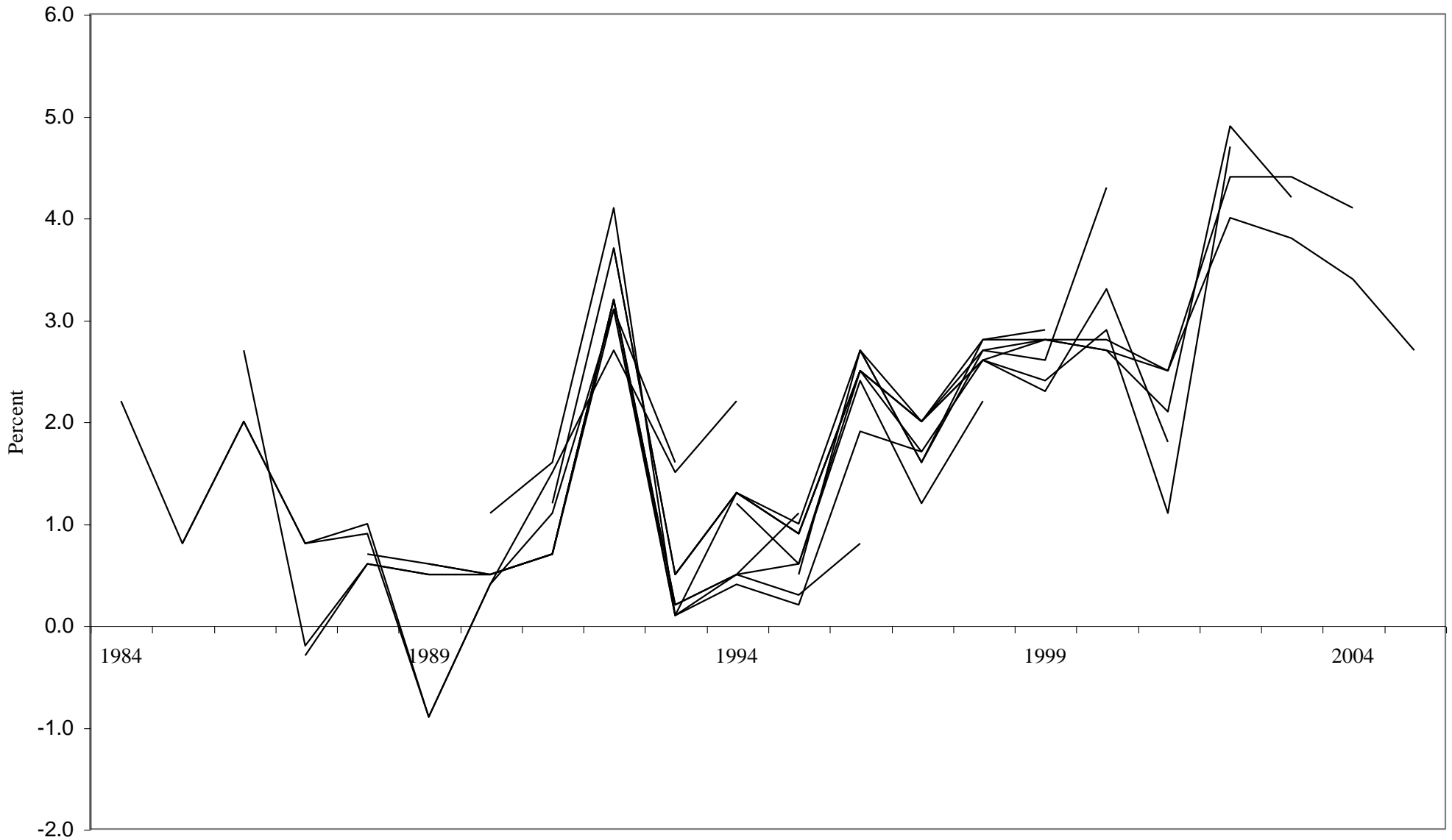
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# Reference Charts

# Figure 2: Evolution of U.S. Productivity Data

## Nonfarm Business Productivity



Note: Data are the annual growth rates of nonfarm business productivity for the trailing 10 years from February of each year, as reported in various BLS productivity releases.







