

# Why are 21<sup>st</sup> Century Skills Important?

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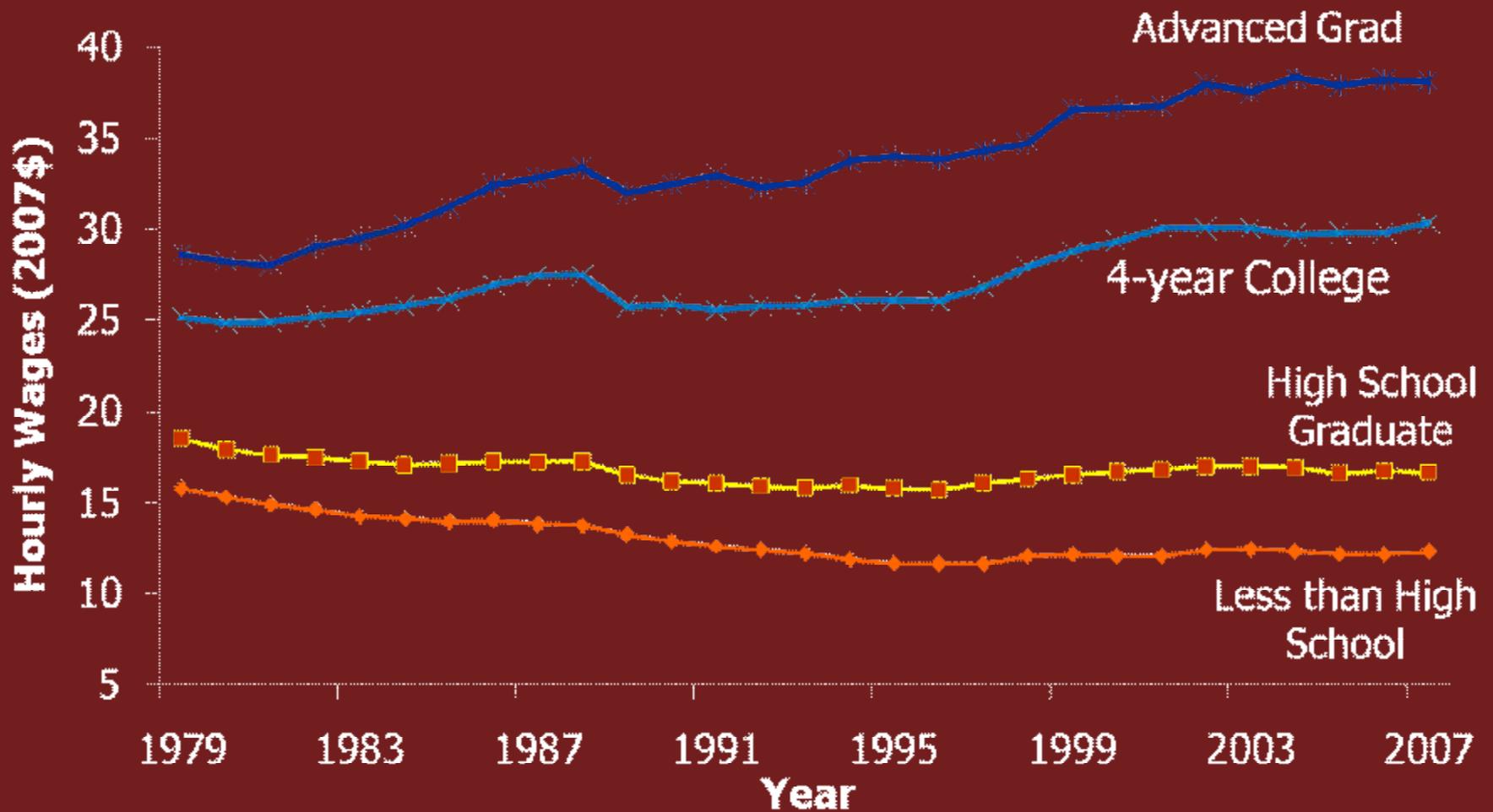
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## Goals for this Talk

1. Clarify how changes in the U.S. economy have affected the skills graduates of our schools need to earn a decent living and contribute to civic life in a pluralistic democracy.
2. Present some evidence on the nature of "21<sup>st</sup> century skills" other than literacy and numeracy, and how they affect labor market outcomes.
3. Describe recent evidence that school quality affects student outcomes through mechanisms other than improving math and reading skills.

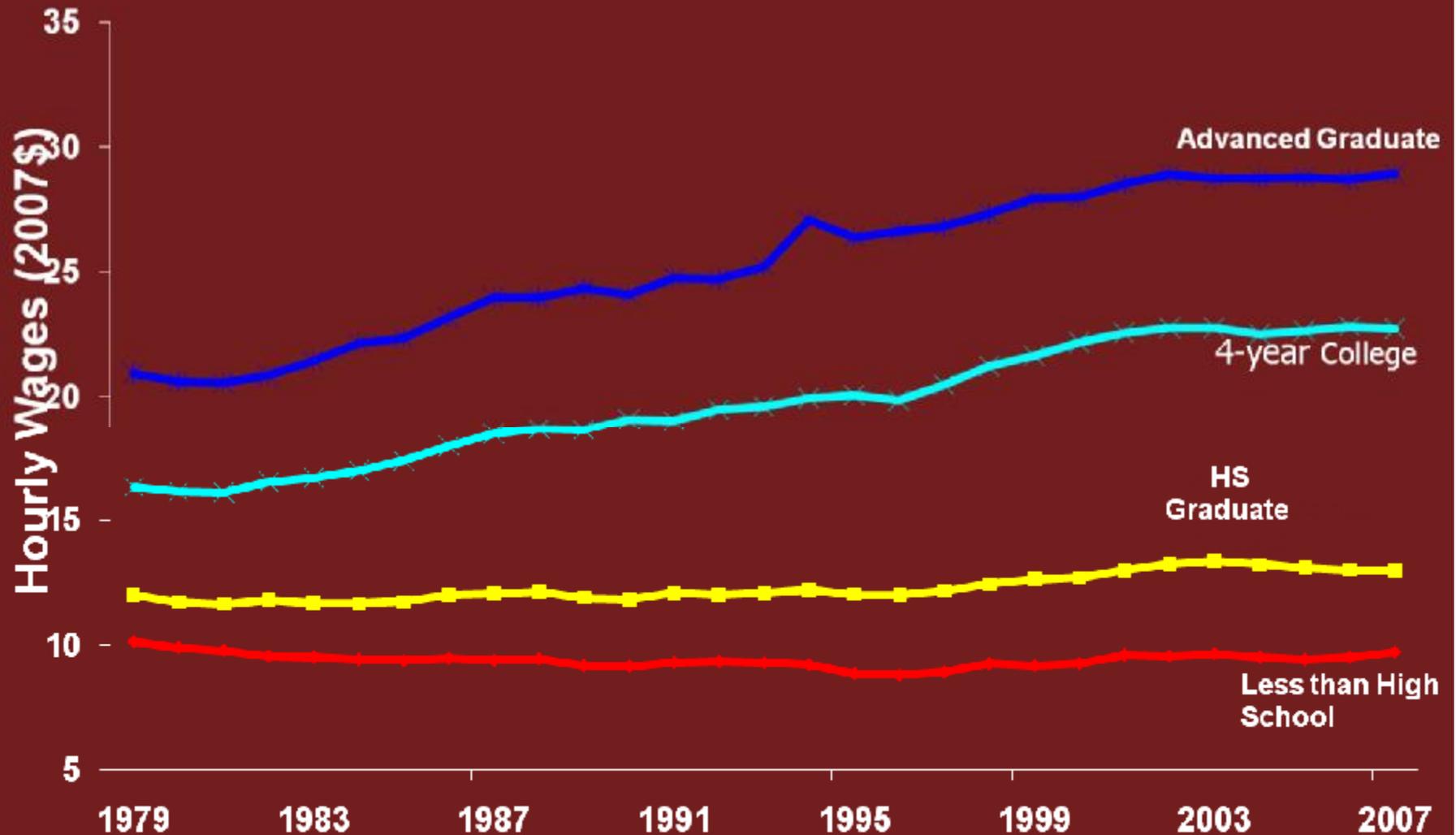
My thanks to David Autor for data, slides, and ideas.

# Men's real hourly wage by education, 1979-2007 (2007\$)



Source: The State of Working America 2008-10, table 3.16. Based on authors' analysis of CPS wage data described in Appendix B.

# Women's real hourly wage by education, 1979-2007 (2007\$)



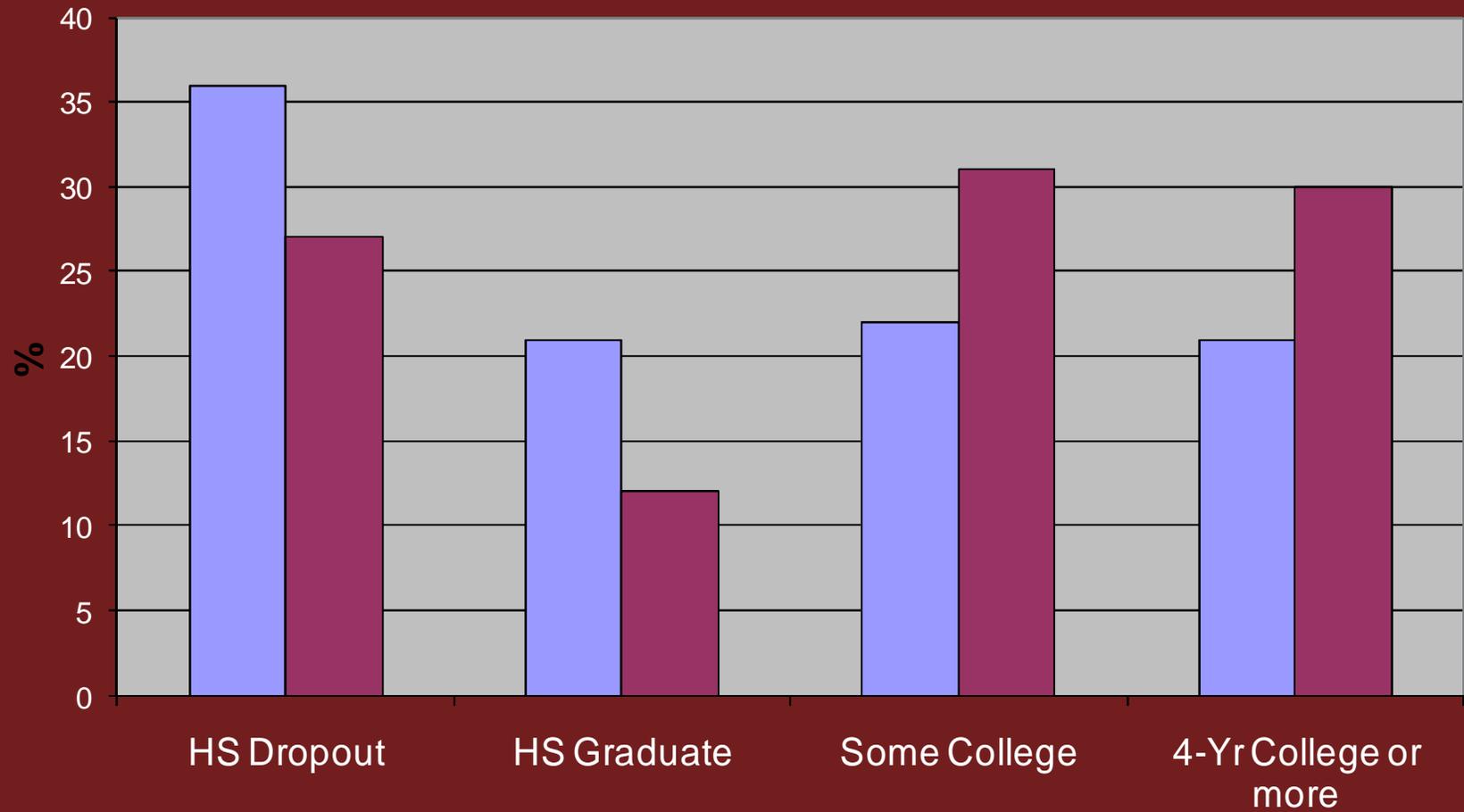
Source: The State of Working America 2008-10, table 3.17. Based on authors' analysis of CPS wage data described in Appendix B.

## One Possible Explanation for the Growth in the College-High School Wage Differential

- n The Supply of college-educated workers fell relative to the supply of high-school educated workers

# Educational Attainments of U.S. Labor Force,

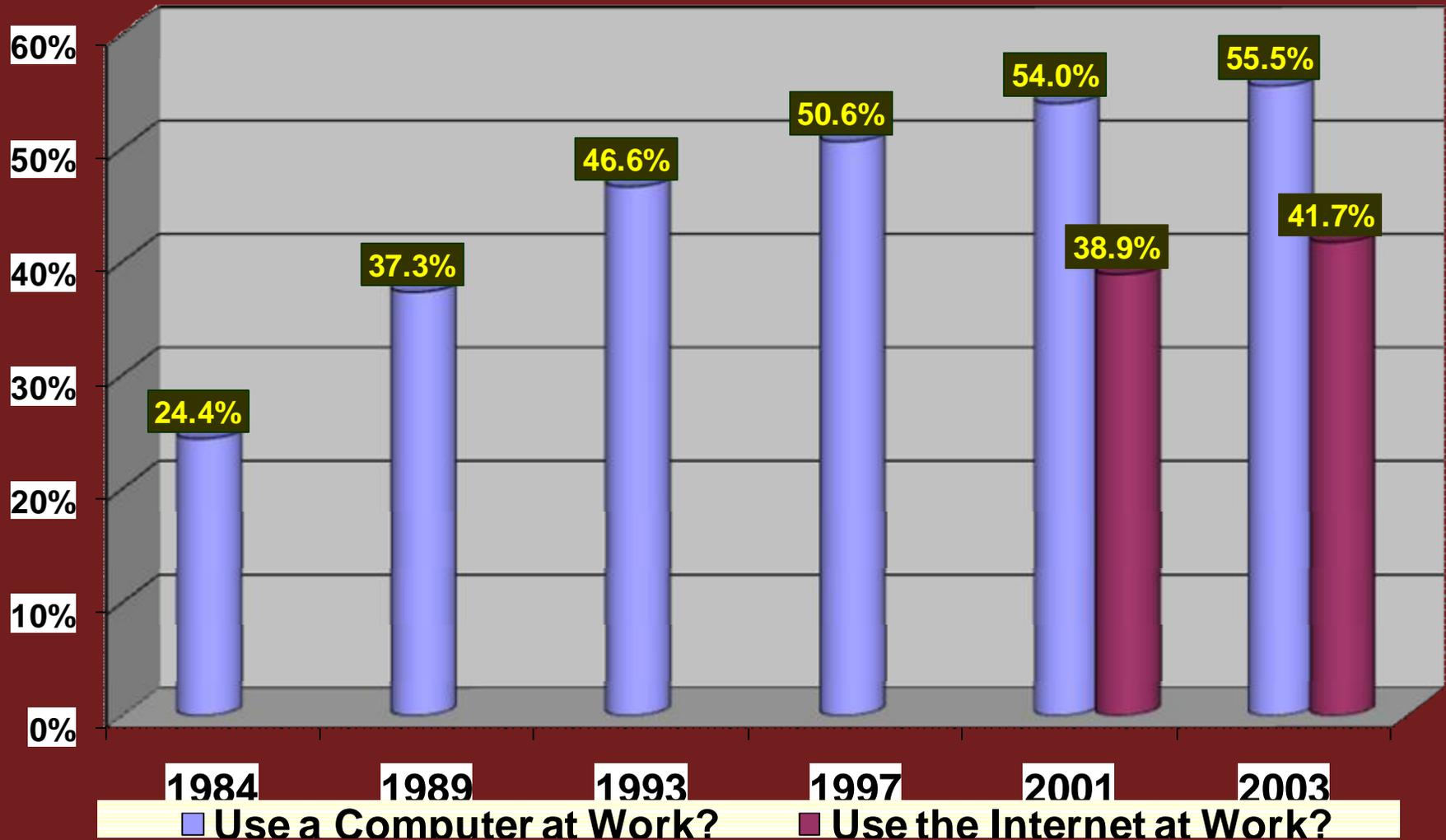
1980 2000



## Explanation lies in changes in demand for workers with different educational attainments

- n What changes increased the value of college educated workers to employers relative to the value of high school educated workers?
- n One candidate: more and faster computers changing the way much work is accomplished, and facilitated outsourcing of some kinds of work to lower-wage countries.
- n An important caveat: the evidence I present does not explain the extraordinary growth in the earnings of the top one percent of earners. (cf. Hacker and Pierson, 2010).

## Share of US Workers Using a Computer and Using the Internet on the Job, 1984 - 2003



# The Need for Careful Theory

- n Initial Response: Computers must Substitute for less educated workers and Complement more educated workers.
- n BUT
  - What about chess?
  - What about caring for the elderly?

# A theory about the Impact of Computer-Driven Technological Change

- n All Human Work involves processing information
- n Computers are strongest at performing processing that can be described in rules (*Rules Based Logic*)
- n Examples: Mathematical Algorithms, Diagnostic Procedures, Securities Trading, Order Processing

# Computerizing the Routine Tasks: Self-Service Check-In



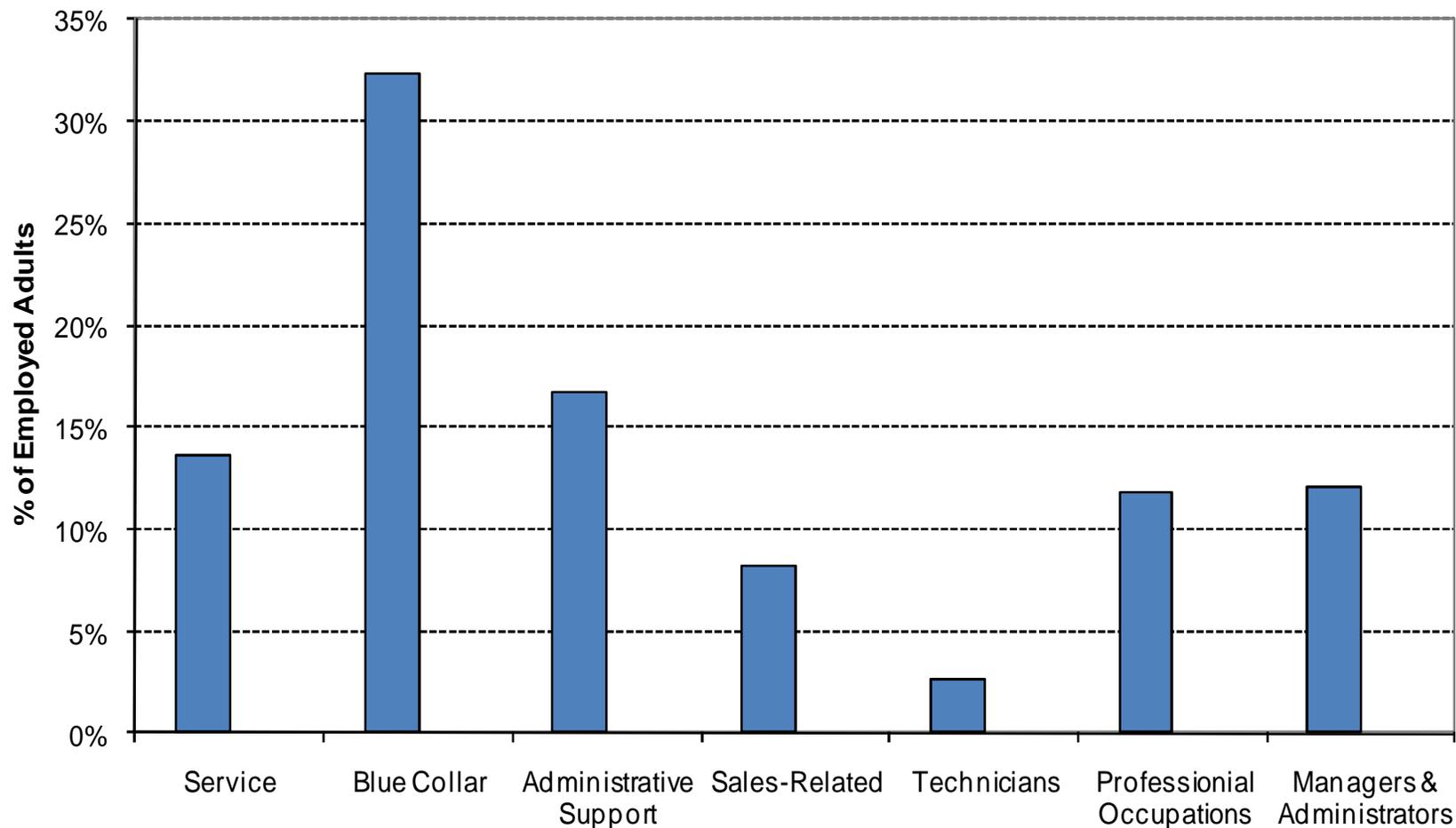
## Types of Tasks Computers Do Not Well

Tasks that cannot be described well as a series of if-then-do steps because:

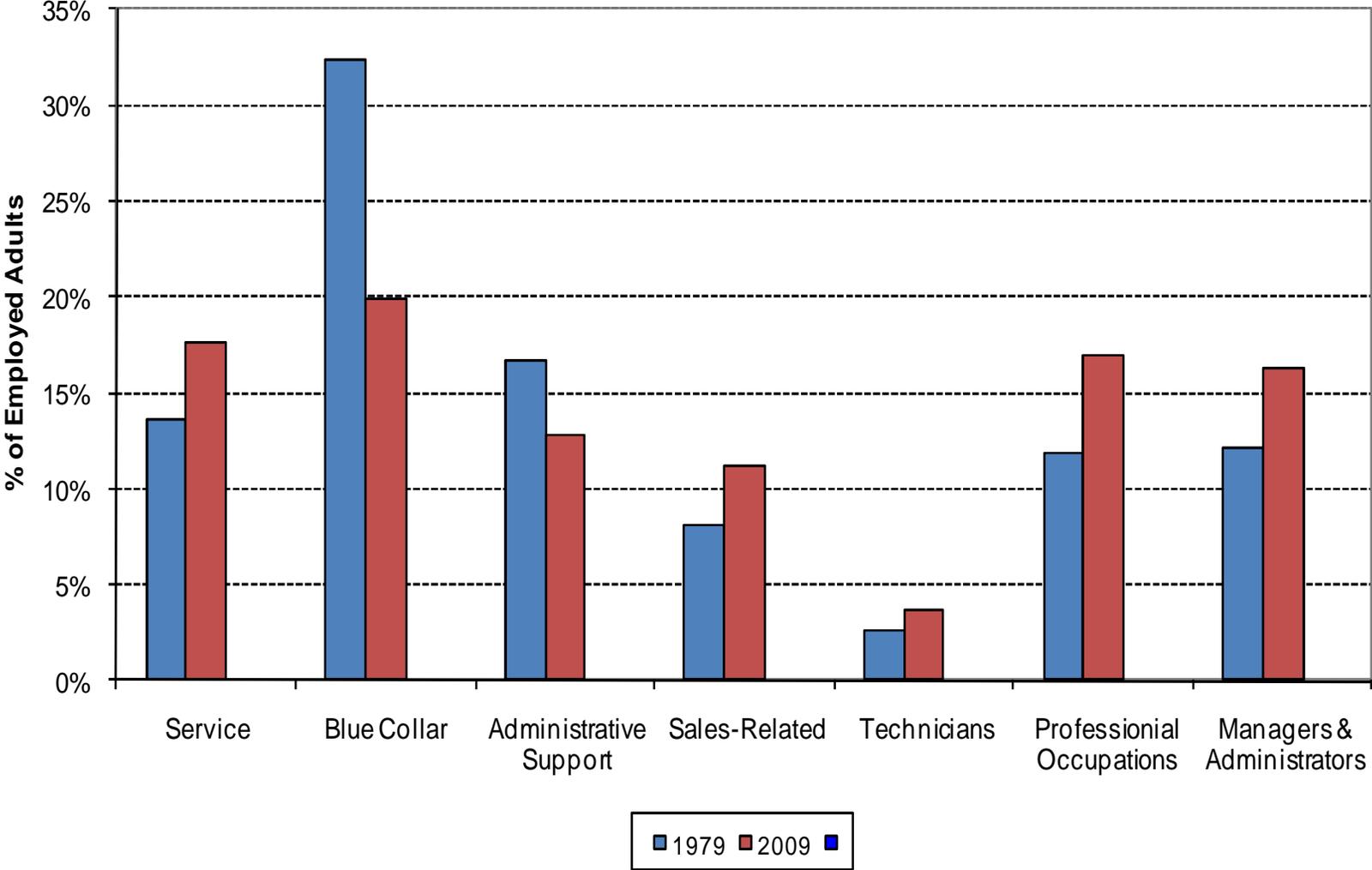
- “We know more than we can tell.” (Polyani).
- Not all contingencies can be predicted ahead of time.
- We learn to define the task and accomplish it through social interactions.

# The 1979 Adult Occupational Distribution

Groups arrayed from lowest average earnings on left to highest average earnings on right



# The Adult Occupational Distribution: 1979 & 2009



# New Questions

- n The occupational distribution has changed markedly over the last 35 years in ways that reduce demand for workers whose jobs consist of carrying out rules-based tasks.
- n But the occupational groups we have examined contain many disparate occupations.
- n Required skill mix varies widely among the hundreds of occupations in the U.S. economy.

# Composition of Employment in Service Occupations 2000

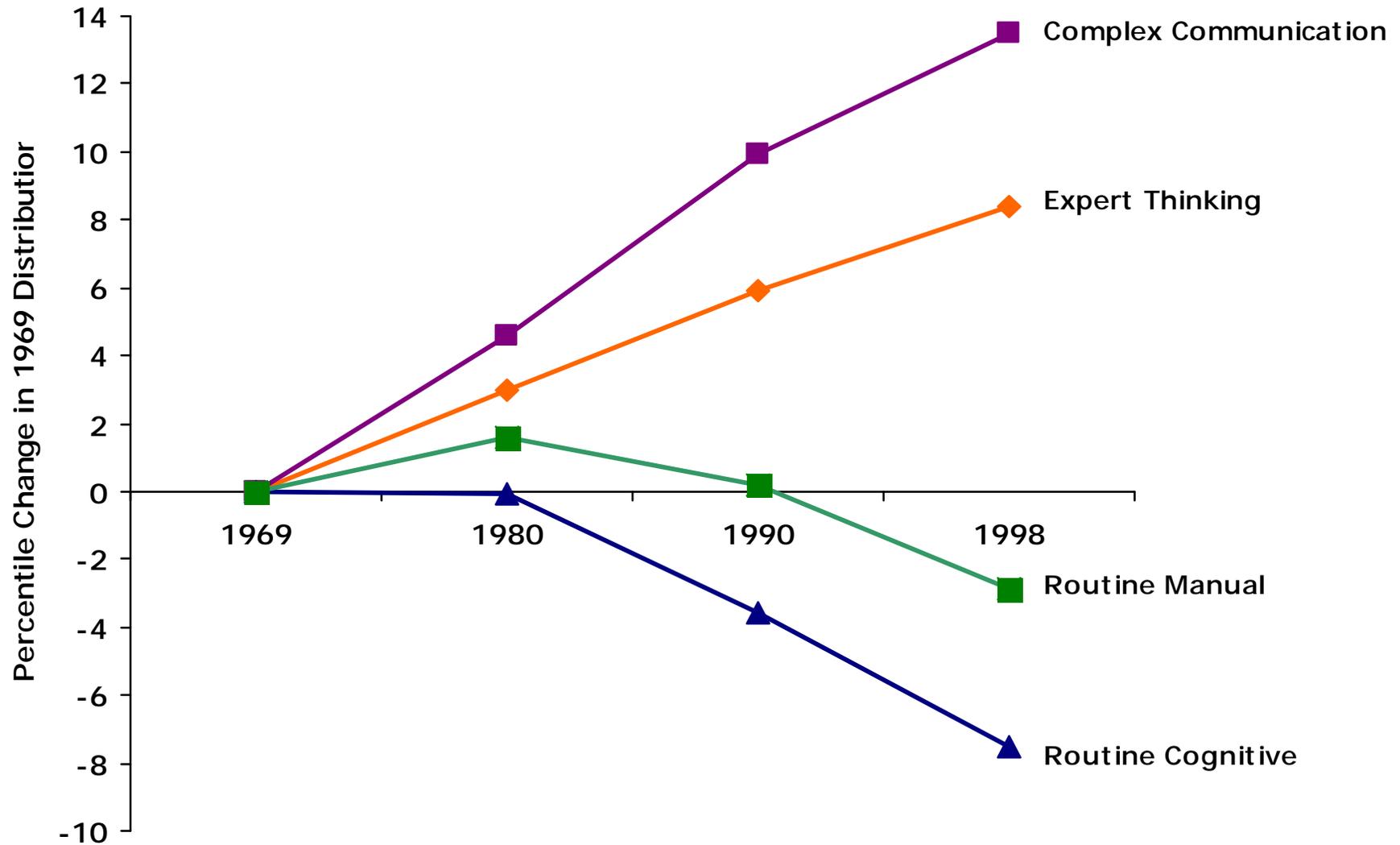


## Four Kinds of Workplace Tasks

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- n Routine Cognitive (filing, bookkeeping)
- n Routine Manual (assembly line work)
- n Expert Thinking (identifying and solving new problems)
- n Complex Communication (eliciting critical information and conveying a convincing interpretation of it to others)

# Economy-Wide Measures of Routine and Non-Routine Task Input: 1969-1998 (1969=0)



# Key Elements of Expert Thinking:

- n A great deal of well organized knowledge about the problem (not memorized facts, but well understood relationships).
- n Skill at pattern recognition
- n Initiative (a disposition)
- n Metacognition

# Key elements of Complex Communication

- n Observing and listening.
- n Eliciting critical information.
- n Interpreting the information.
- n Conveying the interpretation to others.

# Measuring “non-cognitive” skills

n Swedish study by Lindqvist and Vestman (2011)

“non-cognitive skills” of 18-year old males measured in 25 minute interview by psychologist

Critical “non-cognitive skills measured:

- n willingness to assume responsibility
- n independence
- n outgoing character
- n persistence
- n emotional stability
- n initiative
- n social skills

# Impact of “non-cognitive skills on labor market performance of men in their 30s.

- n Very large impact on probability of being employed and on earnings
  - especially important impact on labor market outcomes for males with cognitive skills below the median.

## School Quality affects Student Outcomes through mechanisms other than test scores

- n MDRC evaluation of the impact of an offer to attend a Career Academy
- n Deming evaluation of the impacts of winning a lottery to attend a better middle school or high school.

# Skills needed for a contributing life in a pluralistic democracy

- n Problems the country faces are complex
  - Immigration policy
  - Global warming
  - Proliferation of nuclear weapons
- n The skills needed to understand these problems and participate in discussions about their solutions include:
  - Expert thinking
  - Complex communication.

# Summing Up

- n Changes in technology are altering skill demands quite rapidly.
- n The important skills increasingly are the ability to do tasks computers and computer-driven machinery do not do well.
- n Well-paying jobs increasingly are those that require expert thinking and complex communication and the “non-cognitive skills” measured in the Swedish study.

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