

# The Polarization of Employment: Explanations and Implications

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# Introduction

Technology has been improving dramatically over the past half century—the signs of it are all around us

At the same time, the labor market has changed in profound ways

- ▶ in terms of differences in pay—inequality has increased substantially
- ▶ in terms of the jobs people do—middle wage jobs are in decline, a process known as **job polarization**

Economists have documented these changes extensively, and have attempted to explain them

I will give a (mostly chronological) overview of this work, with a focus on job polarization

# Outline

Technological change and the rising demand for skills

The task approach and the polarization of the labor market

Extending the task approach: firms' technology choice

Implications for education and training

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# The price of computing

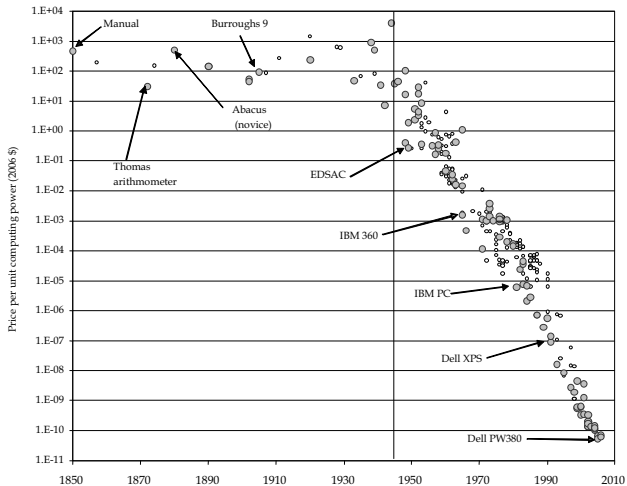
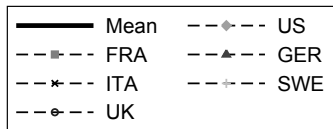
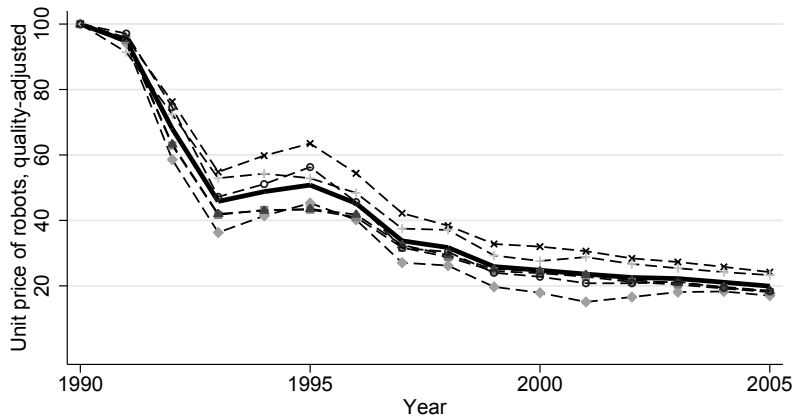
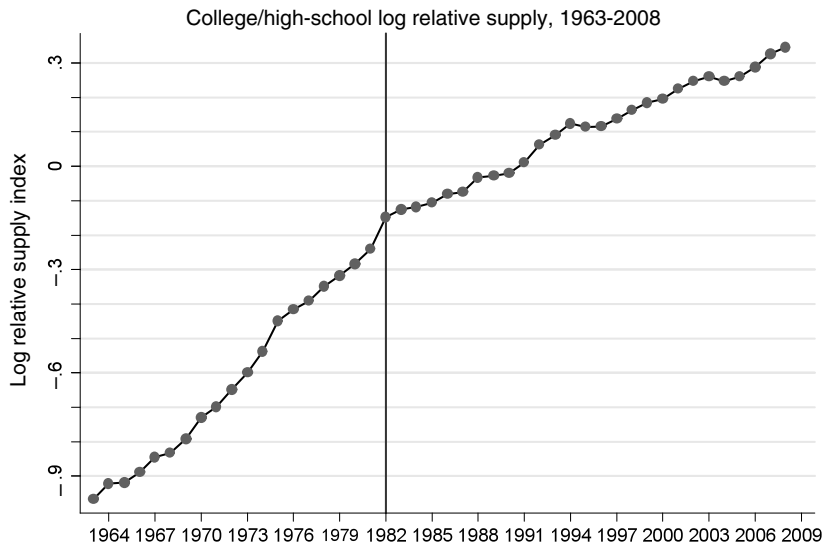


FIGURE 3  
THE PROGRESS OF COMPUTING MEASURED IN COST PER COMPUTATION PER  
SECOND DEFLATED BY THE PRICE INDEX FOR GDP IN 2006 PRICES

# The price of robot labor

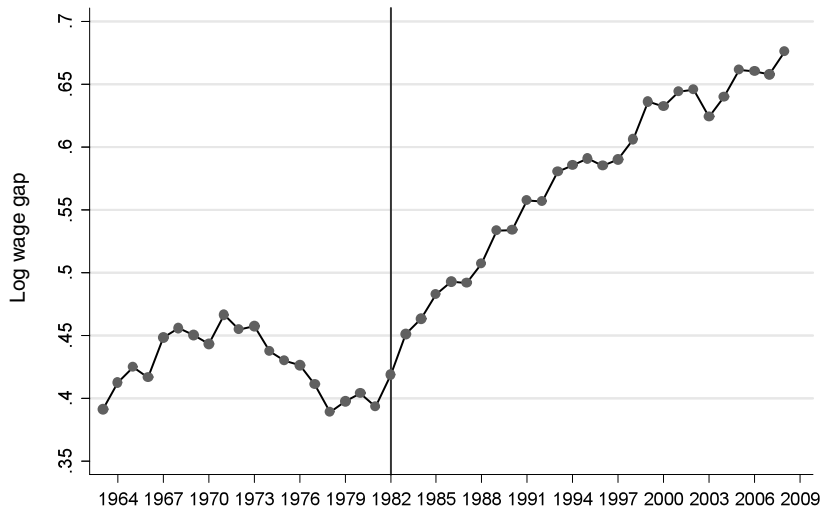


# The ratio of college to high school workers



# The college premium

Composition adjusted college/high-school log weekly wage ratio, 1963-2008





## A puzzle and an explanation

The 'supply' of college labor relative to high school labor has gone up

- ▶ everything else equal, the relative price (the college premium) should have declined

But the college premium instead went up!

If labor markets are competitive, then a rising demand for skills is the only way to reconcile these facts

Modern technology seems to augment the productivity of skilled workers disproportionately—this is the theory of **Skill-Biased Technological Change** (SBTC)

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# Moving beyond SBTC

By what mechanism might technology augment skilled labor?

- ▶ which tasks are taken over by computers/machines?
- ▶ which tasks do skilled workers perform?
- ▶ which tasks are inputs to what skilled workers do?

Example: analytical thinking as performed by consultants or investment bankers requires numerical calculations, which used to be done by humans, now done by computers

Autor et al. (2003) call the tasks vulnerable to automation “routine tasks”, document a decline in the number of human workers performing them—**Task-Biased Tech. Change** (TBTC)

## From TBTC to job polarization

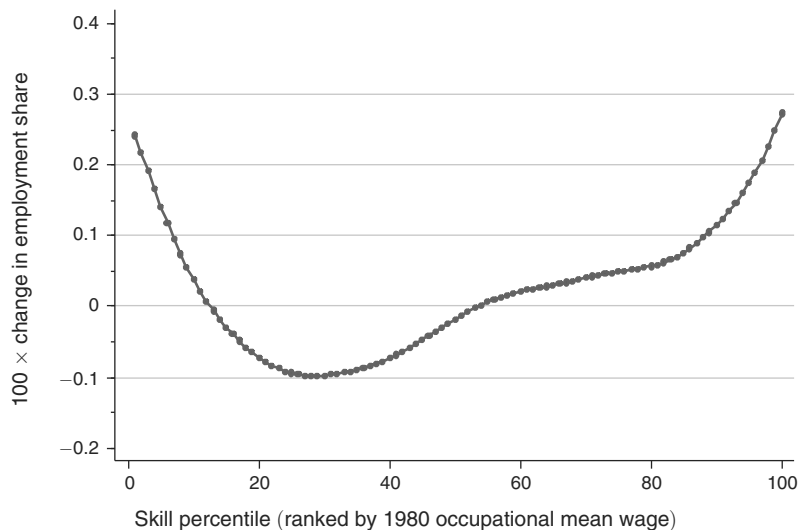
“Routine tasks” such as computing, record keeping, repetitive assembly are more common in middle wage occupations than in high and low wage ones

- ▶ with this observation, TBTC predicts that employment shifts towards both high and low wage occupations
- ▶ hollowing out of the labor market or **job polarization**

Indeed, this has happened!

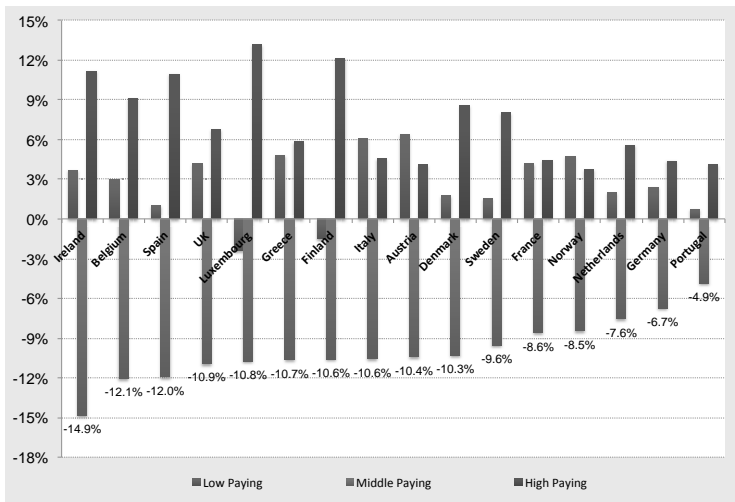
# Job polarization in the US

Panel A. Smoothed changes in employment by skill percentile, 1980–2005

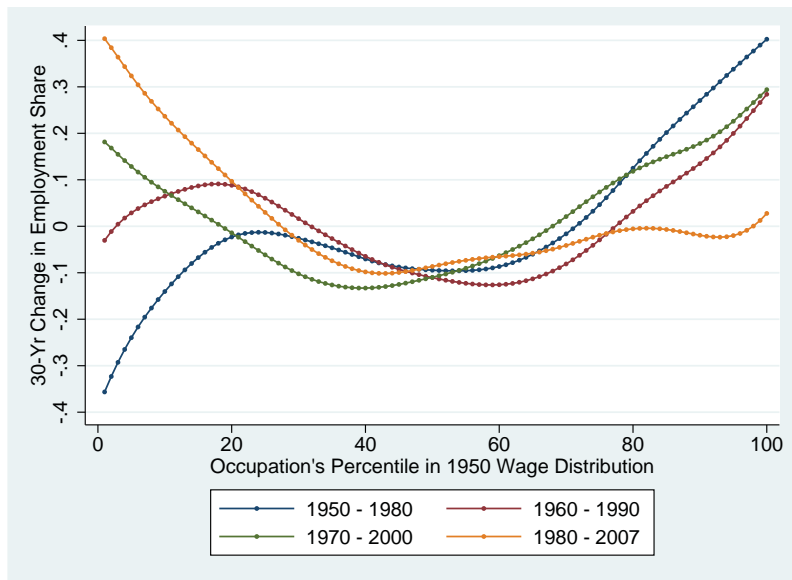


# Job polarization in Europe

Change in Occupational Employment Shares in Low, Middle and High Wage Occupations in 16 EU Countries, 1993 - 2010



# Job polarization before ICT



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# Feasible is not enough

Some low-skill work could in principle be automated but is not (yet) at all, or not (yet) on large scale

- ▶ cooking fast food
- ▶ cleaning
- ▶ simple forms of hairdressing

It seems plausible that automating these tasks just doesn't make sense economically—but then we need to think more carefully about the determinants of firms' choices in technology adoption!

# An alternative framework for tasks

Two things should matter for the automation decision: a task's **engineering complexity** and whether human workers require **training** to perform it—these two are not perfectly correlated

	COMPLEXITY		
	low	medium	high
<i>ALM framework</i>	<i>routine</i>		<i>non-routine</i>
<i>FO framework</i>		<i>automatable</i>	<i>subject to bottlenecks</i>
INNATE ABILITY	crushing rocks fast food preparation	customer reception driving a car	child care event planning
TRAINING-INTENSIVE	bookkeeping weaving	pre-trial research trading stocks	arguing a legal case designing fashion

# Why job polarization is not unique to ICT

Suppose some general purpose technology—the electric motor, ICT—makes it easier to automate tasks in general. Which tasks will firms **choose** to automate?

- ▶ tasks that are less complex (though as technology improves, automate more-complex tasks)
- ▶ tasks where labor is expensive—e.g. because of training

Low-skill workers are shielded from automation—they are cheap, and often perform complex tasks, as are high skill workers—the tasks they perform are too complex to be profitably automated

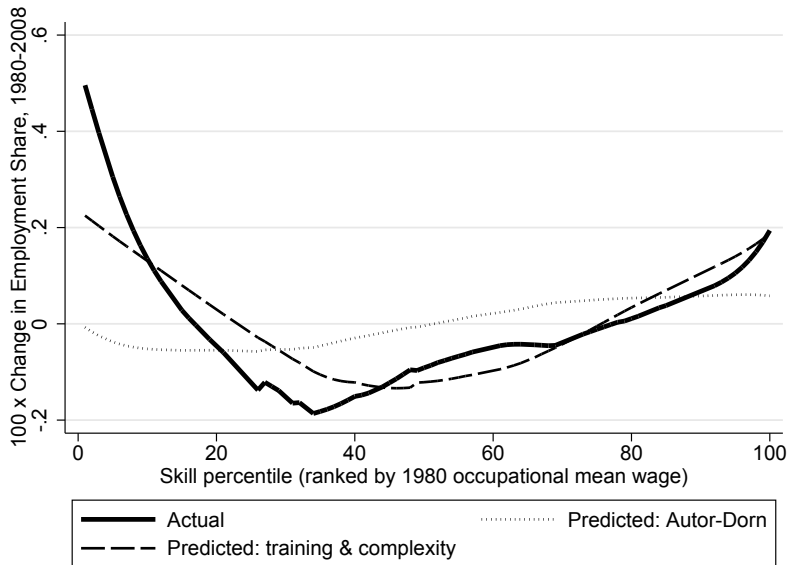
**Middle skill workers are most likely to be replaced**

# Accounting for job polarization in the US

For each of 260 occupations, measure their training requirements and engineering complexity in 1980

- ▶ statistical model that relates occupational employment growth to initial training requirements and complexity
- ▶ use model to predict the 2008 distribution of employment across occupations that is due to training and complexity
- ▶ compare to actual distribution

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## Focus on tasks is key

How much education, and what kind, should you obtain?

From the point of view of SBTC

- ▶ more education is a good thing as technology complements skilled labor, but no guidance on what kind

From the point of view of TBTC

- ▶ choose occupations that are likely to stay and which are likely to be complemented by technology
- ▶ be wary of jobs that require non-negligible amounts of training but are not very complex—these are likely to disappear
- ▶ keep in mind, declines in occupational employment and in training requirements are driven by the same forces, as the theory predicts

# Conclusion

As technology advances, the labor market gets transformed in profound ways

Economists have documented these changes thoroughly, and have attempted to come up with explanations

There has been a productive interplay between theory and evidence—theory has often led researchers to uncover unexpected facts, and new evidence has led to better theories

Policy implications are not straightforward



# Literature

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Thank you!