

## Recall the Katz and Murphy Model

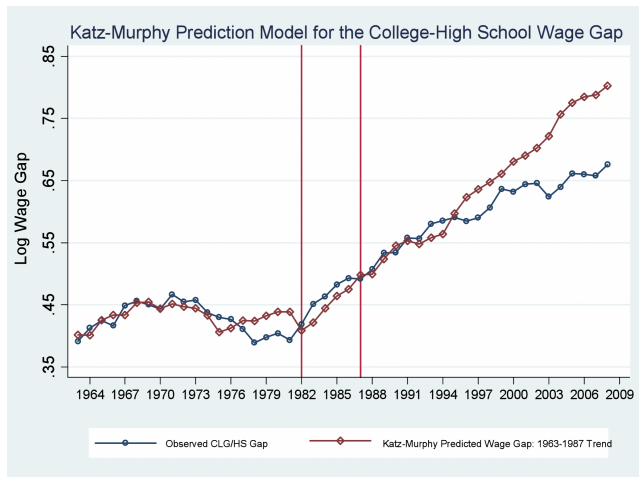


Figure 1: Acemoglu and Autor (2011)

# What's the Story?

## Economic Story

- Demand and Supply for high skill labor
- Demand goes faster than supply then price increases
- Supply goes faster than demand then price decreases
- Demand grows faster than supply in the past years

## Sources of demand and supply

- Demand: technology progress, integrated markets, investment in physical capital
- Supply: investment in human capital

## Change in Real Wage Recently

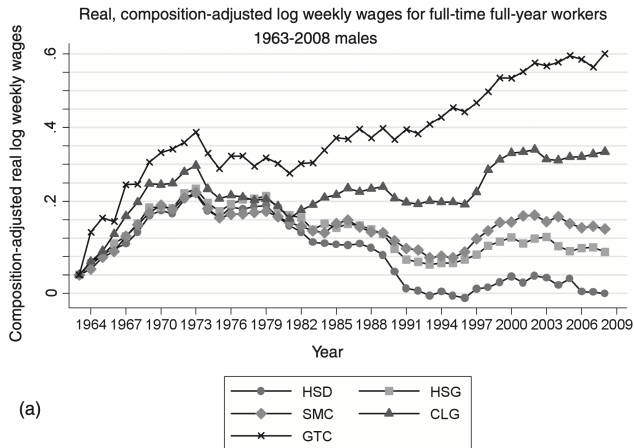


Figure 2: Source: Acemoglu and Autor (2011)

# Polarization

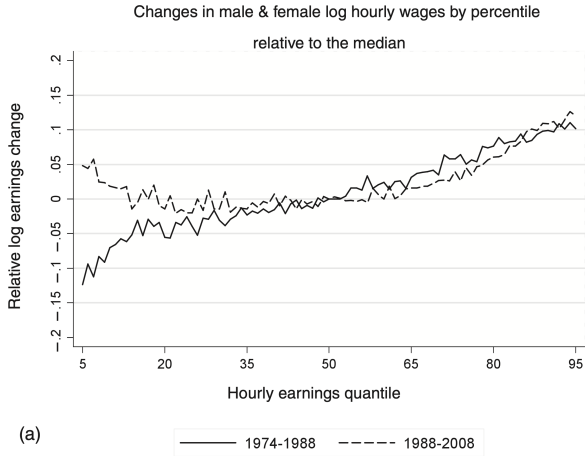


Figure 3: Source: Acemoglu and Autor (2011)

# Employment Change by Skill Group

Smoothed changes in employment by occupational skill percentile 1979-2007

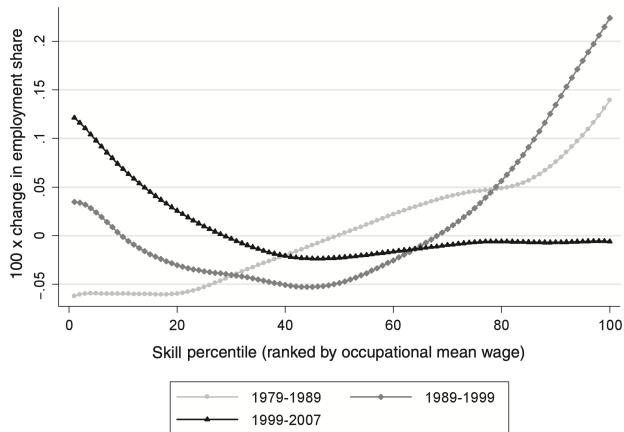


Figure 4: Source: Acemoglu and Autor (2011)

# Worldwide Employment Change by Skill Group

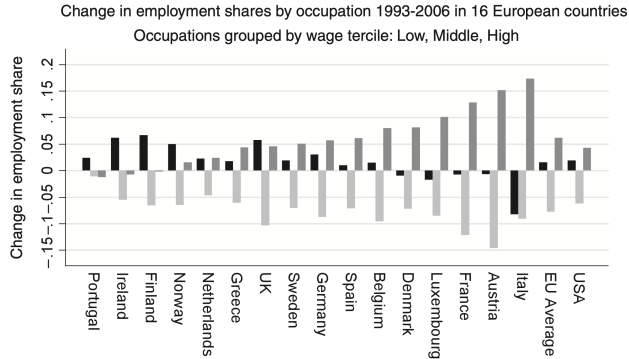


Figure 5: Source: Acemoglu and Autor (2011)

# Employment Change by Occupation

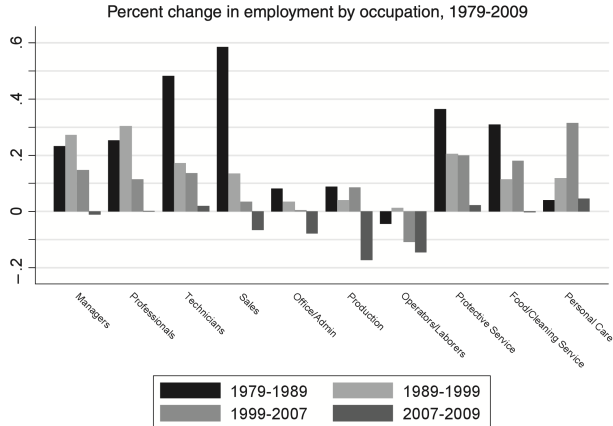


Figure 6: Source: Acemoglu and Autor (2011)

# Worldwide Employment Change by Occupation

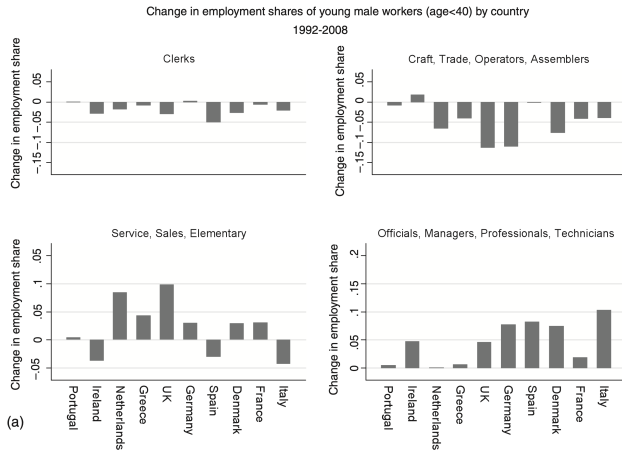


Figure 7: Source: Acemoglu and Autor (2011)



## What Cannot be Explained by Katz and Murphy?

- The wage change is actually driven by greater than college
- The dispersion driven by the decrease of high schooler
- In recent year, a reversal!

## Challenges to Katz and Murphy Model

- Real wage decline
  - Could be non-wage component increase, but unlikely the whole picture
- Cannot explain the U-shape in earning observed recently
- Silent on the shifts in employment structure across occupations
  - Factor augmenting structure cannot have substitution
- Exogeneous technology progress
- Cannot answer questions such as outsourcing,...

# Story and Intuition

## Task and Skills

- Task is a unit of work activity to produce output
- Skills are the endowment of capabilities to perform tasks
- Task demand and supply
- Katz and Murphy is a special case where skill corresponds to task

## Divide Jobs into Four Categories

- Routine/Non-Routine  $\times$  Cognitive/Manual
- Routine jobs are replaced with machines
- How non-routine jobs play out depends on complementarity

# Four Categories

## PREDICTIONS OF TASK MODEL FOR THE IMPACT OF COMPUTERIZATION ON FOUR CATEGORIES OF WORKPLACE TASKS

	Routine tasks	Nonroutine tasks
	Analytic and interactive tasks	
Examples	<ul style="list-style-type: none"> <li>• Record-keeping</li> <li>• Calculation</li> <li>• Repetitive customer service (e.g., bank teller)</li> </ul>	<ul style="list-style-type: none"> <li>• Forming/testing hypotheses</li> <li>• Medical diagnosis</li> <li>• Legal writing</li> <li>• Persuading/selling</li> <li>• Managing others</li> </ul>
Computer impact	• Substantial substitution	• Strong complementarities
	Manual tasks	
Examples	<ul style="list-style-type: none"> <li>• Picking or sorting</li> <li>• Repetitive assembly</li> </ul>	<ul style="list-style-type: none"> <li>• Janitorial services</li> <li>• Truck driving</li> </ul>
Computer impact	• Substantial substitution	• Limited opportunities for substitution or complementarity

## Model

$$Y = \exp\left[\int_0^1 \log y(i) di\right]$$

$$y(i) = A_L \alpha_L(i) l(i) + A_M \alpha_M(i) m(i) + A_H \alpha_H(i) h(i) + A_K \alpha_K(i) k(i)$$

- $Y$  denotes the output of a unique final good
- $y(i)$  is production level of task  $i$
- $A_L, A_M, A_H, A_K$  are technology of low, middle, high skill and capital
- $\alpha_L(i), \alpha_M(i), \alpha_H(i), \alpha_K(i)$  are production schedules

## Model Implications

- One can then derive the allocation of skills to tasks
- Due to comparative advantage, eqm will have threshold for skills
  - $I_L$  and  $I_H$  exist so that  $i < I_L$  are all performed by low skill workers
- One can then derive the price in equilibrium
- Note that capital now enters as a potential substitution
- Again, routine jobs are replaced with machines
- How non-routine jobs play out depends on complementarity
- Compare with the Katz and Murphy model

$$Y = [(A_l L)^\rho + (A_h H)^\rho]^{1/\rho}$$

## Potential Future Directions

- Outsourcing
- Organizational change
- Labor union
- Labor market imperfection
- Change in labor market differentials

## Are the Critiques Fair?

- It takes a model to beat a model
- Katz and Murphy did not aim to explain job polarization
- Measure of routine and manual rather arbitrary
  - Doubts of making up measures according to results



# Progress of Science

- You observe an important and interesting phenomenon
- Previous explanations are not satisfactory
- You come up with something new and evaluate them