Technology, Skill and the Wage Structure

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Discussion by
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Motivation

- Great paper

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- Rich yet tractable theoretical framework

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- Rich yet tractable theoretical framework
- Yields a sharp analytical characterization of the effects of task-specific changes in technology

Task-based Approach

- Task-based approach to the labor market versus canonical model of skilled/unskilled (Acemoglu and Autor 2011)
  - A task is a unit of work activity that produces output (goods and services)
  - A skill is a worker's endowment of capabilities for performing various tasks

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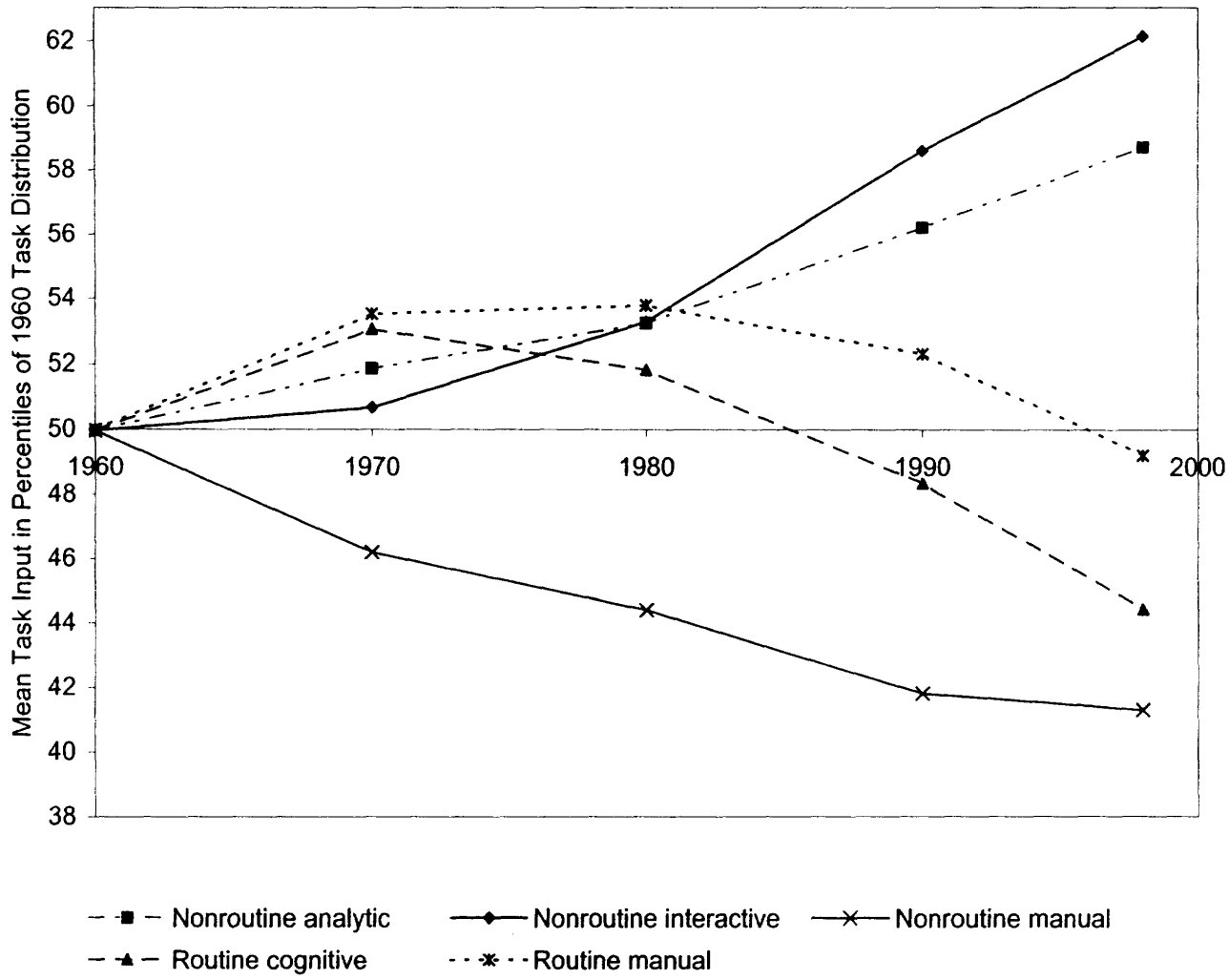
- New technologies typically complement or substitute for particular tasks in a pattern that can be poorly summarized by aggregate measures of skills (college degree or equivalent)
  - Luddites: 19th-century English textile workers
  - Information and computing technology (ICT)

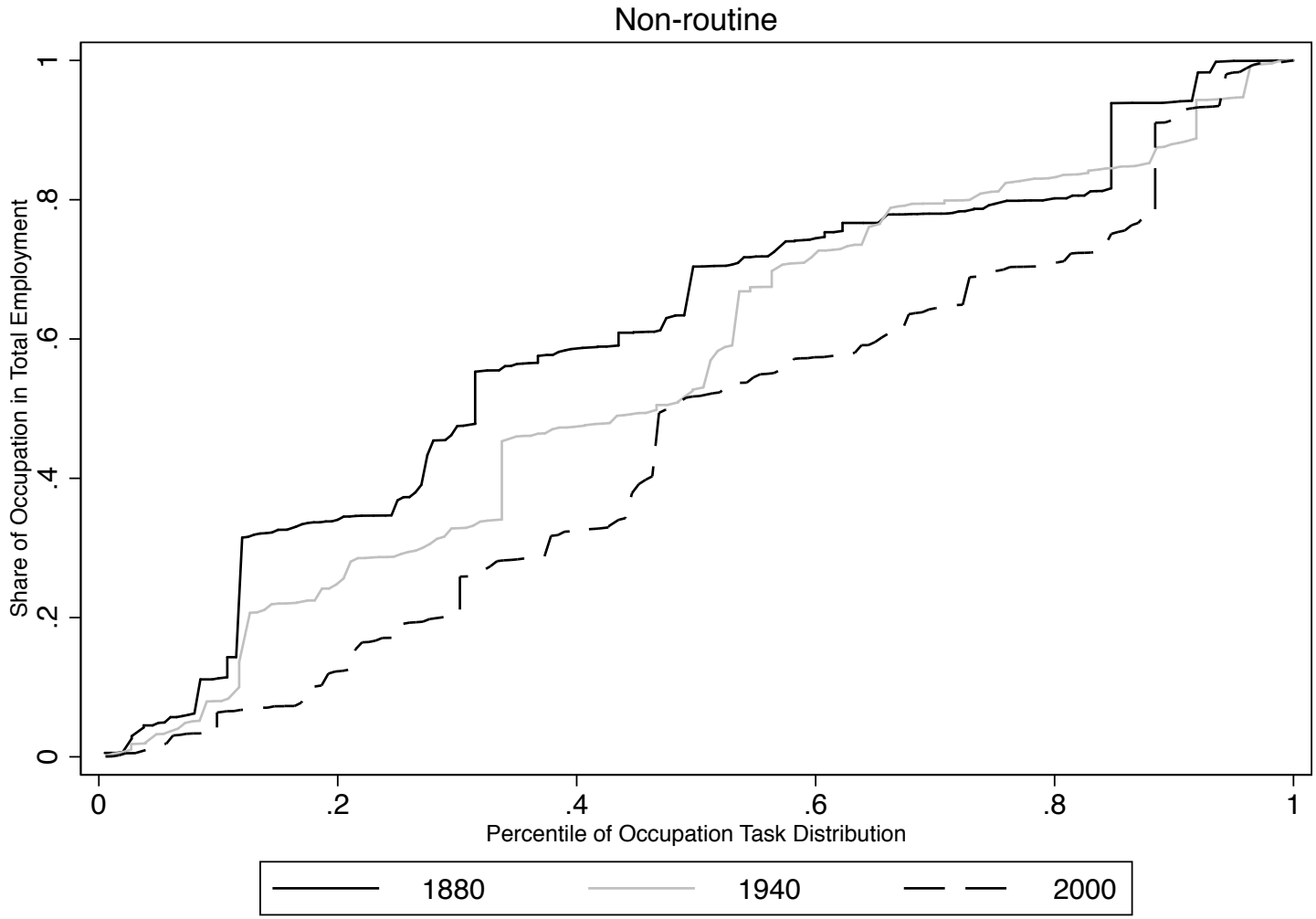
Autor, Levy and Murnane (2003)

- Employment-weighted mean of DOT task percentiles across occupations



Michaels, Rauch and Redding (2016)

- Cumulative distributions of 1880, 1940 and 2000 employment across DOT occupation task percentiles



Model

- Final good produced using tasks

$$y_F = \left(\sum_{j=1}^{J} \left(N\gamma_j \right) y_j^{\frac{\rho-1}{\rho}} \right)^{\frac{\rho}{\rho-1}}$$

- Tasks produced with skill h and technology x

$$y_j = \int \ell_j(h)\phi(h, x_j)dh, \qquad \text{all } j,$$

$$\phi(h, x_j) \equiv \left[\omega h^{\frac{\eta-1}{\eta}} + (1-\omega) x_j^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}, \qquad \eta, \omega \in (0, 1).$$

- Production is log supermodular in technology and skill as in Costinot and Vogel (2010)
  - Additional CES structure on the productive technology
  - Discrete number of tasks

Theoretical Predictions

- Equilibrium exhibits Positive Assortative Matching (PAM) and can be characterized recursively
  - Skill thresholds $h_{\min} = b_0 < b_1 < \cdots < b_{J-1} < b_J = h_{\max}$
  - Technology x_j employs workers in skill bin j (b_{j-1}, b_j)
- Suppose that technical change increases technology x_k by a small increment $\epsilon > 0$
  - Output increases and price falls for task k
  - Ripple effects that are dampened for more distant tasks
  - For $\rho = 1$, all skill thresholds shift upward (task downgrading for some workers)
  - For $\rho > 1$, thresholds at and above k^{th} shift upward, while those at and below $(k-1)^{\text{th}}$ can shift either way
  - For $\rho < 1$, thresholds at and below $(k-1)^{\text{th}}$ shift upward, while those at and above k^{th} can shift either way
  - Determine employment, output, price and wage effects
- Quantitative empirical evidence on these predictions?

Roy Model

- Related formulation in terms of a Roy model
  - Hsieh, Hurst, Klenow and Jones (2013), Burstein, Morales and Vogel (2016) and Michaels, Rauch and Redding (2016)
- Indirect utility depends on wage per effective unit of labor, idiosyncratic ability draw and cost of living

$$U_{so}(i) = \frac{w_{so} z_{so}(i)}{P}$$

- Idiosyncratic ability draw from Fréchet distribution

$$F_{so}(z) = e^{-T_{so} z^{-\theta}}, \qquad \theta > 1$$

- Probability a worker chooses sector s and occupation o

$$\pi_{so} = \frac{T_{so} w_{so}^{\theta}}{\sum_{r=1}^{S} \sum_{m=1}^{O_s} T_{rm} w_{rm}^{\theta}}$$

Existing Evidence

- Burstein, Morales and Vogel (2016) quantitative decomposition of changes in between-group inequality
  - Computerization and shifts in occupation demand account for roughly 80 percent of the rise in the skill premium
  - Computerization alone accounts for roughly 60 percent

- Hsieh, Hurst, Jones and Klenow (2013) use Roy model to quantify changes in misallocation across occupations
  - Around 15-20 percent of growth in aggregate output per worker explained by improved allocation of talent

- Connection between the model and evidence on between-firm changes in wage inequality
  - Helpman, Itskhoki, Muendler and Redding (2016)
  - Song, Price, Guvenen, Bloom and Wachter (2016)
  - Embed assignment model in Melitz firm heterogeneity framework (Sampson 2014)

Comments

- Great paper
- Flexible and tractable framework
- Sharp analytical results for the general equilibrium impact of technical change for a limited set of tasks
- Interesting to provide evidence on the quantitative magnitude of these effects in the data