

# Occupational Choice and Sorting

Ph.D. Quantitative Macro

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November 8, 2016

# Quantity and Quality

1. The occupational choice idea is based on a mismatch of *quality and quantity*
2. We could also think of *quality and quantity*
  - Managers and Firms
  - Workers and Vacancies
  - Workers and Coworkers...etc.
3. Let's look at a generic matching model for CEO's and firms

# Sattinger-Tervio Competitive Assignment Model

1. CEO talent  $a \sim F(a)$  and firm quality  $b \sim G(b)$
2.  $F, G$  continuous wt no gaps
3. One-to-one matching and equal masses of each
4. Production function  $Y(a, b)$  is supermodular: i.e. complementarity for continuous production functions
5. First two assumptions are for convenience; last one is essential for the assignment model

# Profiles and Outside Options

- Instead of distribution, define profile functions  $a[i], b[i]$  s.t.

$$a[i] = a \quad \text{s.t.} F(a) = i$$

$$b[i] = b \quad \text{s.t.} G(b) = i$$

i.e.,  $x(i)$  is the  $i$ th percentile individual

- Outside options  $(W_0, \Pi_0)$ :  
assume they are constant across  $F, G$  for convenience, but not necessary

# Competitive Equilibrium

## Definition

A competitive equilibrium is defined as a joint distribution  $H(a, b)$  and a managerial compensation schedule  $W(a)$  s.t.:

1. Everyone participates
  2. No one wants to be matched with anyone else
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1. Clearly,  $W(a), \Pi(b)$  must be monotonically increasing
  2. Clearly, no output is left aside; i.e.  $W(a) + \Pi(b) = Y(a, b)$  for all  $H(a, b) > 0$

# Supermodularity and Efficiency

1. Assumption on  $Y(\cdot)$  yields positive assortative matching for efficient allocations
2. If  $a_i \leq a_j$  and  $b_i \leq b_j$ ,

$$Y(a_i, b_i) + Y(a_j, b_j) \geq Y(a_i, b_j) + Y(a_j, b_i)$$

by supermodularity. Hence, PAM is efficient.

3. Will show C.E. is PAM by contradiction.

## C.E. is PAM

Suppose C.E. is not PAM, that  $a_j$  is hired by  $b_i$  and  $a_i$  by  $b_j$ . But then

$$\begin{aligned}
 Y(a_j, b_j) - Y(a_i, b_j) &\geq Y(a_j, b_i) - Y(a_i, b_i) \\
 Y(a_j, b_j) - W(a_i) - \Pi(b_j) &\geq W(a_j) + \Pi(b_i) - Y(a_i, b_i) \\
 Y(a_j, b_j) - W(a_j) &\geq \Pi(b_j) + \underbrace{W(a_i) + \Pi(b_i) - Y(a_i, b_i)}_{\epsilon}
 \end{aligned}$$

$\epsilon > 0$  since otherwise, the  $b_i$  would hire  $a_i$  and gain. But then

$$Y(a_j, b_j) - W(a_j) \geq \Pi(b_j),$$

so  $b_j$  would also hire  $a_j$ , a contradiction.

## C.E. Compensation

Since in equilibrium,

$$Y(a[i], b[i]) - W(a[i]) \geq Y(a[j], b[i]) - W(a[j]) \quad \forall i, j \in [0, 1],$$

the schedule  $W(\cdot)$  is determined by

$$\frac{Y(a[i], b[i]) - Y(a[i - \epsilon], b[i])}{\epsilon} \geq \frac{W(a[i]) - W(a[i - \epsilon])}{\epsilon}$$

and as  $\epsilon \rightarrow 0$ ,

$$w'[i] = Y(a[i], b[i])a'[i]$$

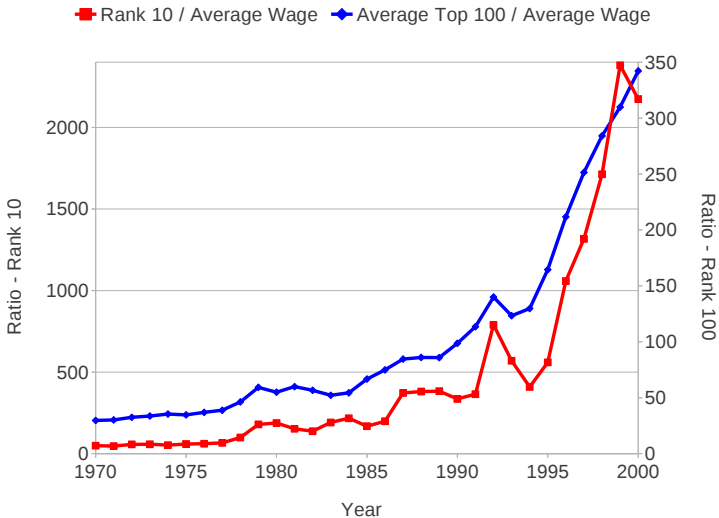
$$w[i] = w_0 + \int_0^i Y(a[j], b[j])a'[j]dj$$



## So What?

- Tervio (2008) finds that—despite several other theories of CEO compensation—this simple model fits CEO compensation pretty well, at the micro level
- Gabaix and Landier (2008) find that, with the right distributional assumptions, a version of this model fits not only cross-section but also time-series data very well
- Lots of related research going on here at TSE...go knock on their door if you're interested!

# Executive Compensation

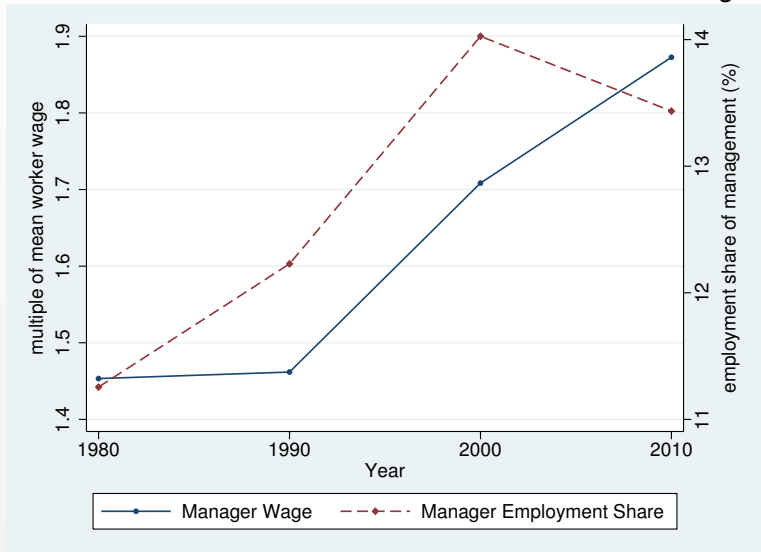


Executive compensation / average annual wage, 1970-2000

(Forbes and NIPA).

## Managers and Workers

Turns out this is true even if we include lower level managers

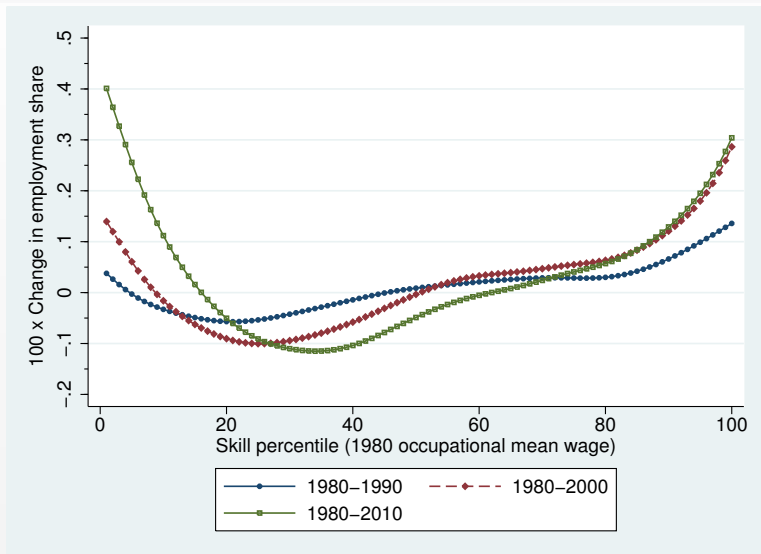


## What about Other Occupations?

- Macroeconomists have been pretty bad at this so far
- A lot of interesting research in labor and trade/labor (Goos et al., 2014; Lee, 2015)
- Most of them lack dynamics (beyond a statistical sense), so a lot of room for more research
- Not much time for details. But a lot of debate going on whether inequality stems from
  1. Occupations?
  2. Industries?
  3. Physical or Human Capital?
  4. Complementarity between any of these?

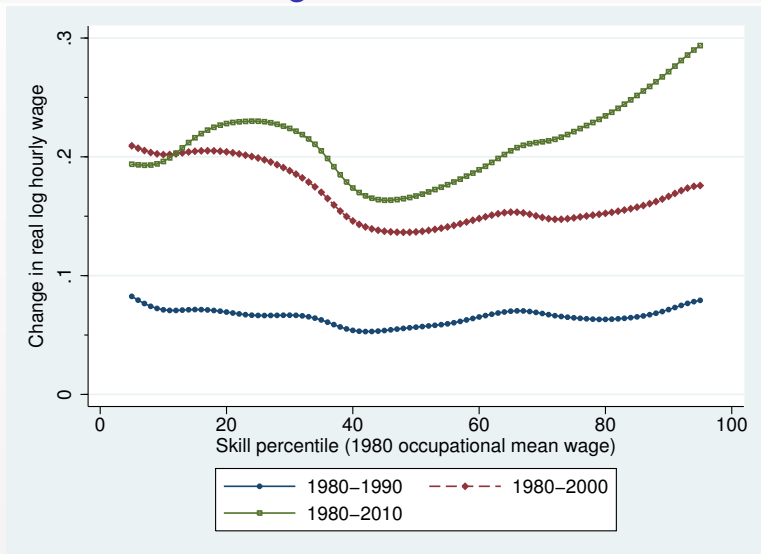
Generally impossible to decompose without some structural assumptions

# Job Polarization



U.S. Decennial Census

# Wage Polarization



U.S. Decennial Census

## What about Human Capital?

- We spent all Tuesday talking about skill accumulation
- Ignored today. Where (some of) the literature is going is to embed endogenous skill accumulation in equilibrium frameworks such as those we've seen today.
- Very new: can get quickly very complicated
- Key is to maintain insight and (computational) feasibility while incorporating important features from both (the accumulation process and economic environment)
- Data on how managers accumulate skills is scant; but also a budding literature

- Gabaix, Xavier and Augustin Landier**, “Why Has CEO Pay Increased So Much?,” *Quarterly Journal of Economics*, 2008, pp. 49–100.
- Goos, Maarten, Alan Manning, and Anna Salomons**, “Explaining Job Polarization: Routine-Biased Technological Change and Offshoring,” *American Economic Review*, 2014, 104 (8), 2509–26.
- Lee, Eunhee**, “Trade, Inequality, and the Endogenous Sorting of Heterogeneous Workers,” 2015.
- Tervio, Marko**, “The Difference That CEOs Make: An Assignment Model Approach,” *American Economic Review*, June 2008, 98 (3), 642–68.