



Prices, Market Wages, and Labor Supply

James J. Heckman (1974), Econometrica

Econ 350

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1 About the paper

2 Model

3 Estimation

4 Extensions

- ▶ Pretty cool paper
- ▶ Why?
 - ▶ Models wage rates, hours worked and the decision to work all together!
 - ▶ First time someone did this in the field!
 - ▶ Specially important for women's labor supply
- ▶ How?
 - ▶ Focus on women's labor supply
 - ▶ Derives a common set of parameters which underlie the functions determining
 - ① the probability that a woman works
 - ② her hours of work
 - ③ her observed wage rate
 - ④ her asking wage rate or shadow price of time

Outline



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- ▶ Shadow wage (value of marginal units of wife's time in household production and consumption) function depends on
 - ▶ hours of work (time in no-market activities, h)
 - ▶ wage of husband, W_m
 - ▶ vector of goods prices, P
 - ▶ asset income of the household, A
 - ▶ constraints from previous economic decision, Z (e.g., number of children)

$$W^* = g(h, W_m, P, A, Z) \quad (1)$$

- ▶ Market wage depends on
 - ▶ Education, E
 - ▶ Experience, S

$$W = B(E, S) \quad (2)$$

- ▶ Assume that the woman is free to adjust her working hours

- ▶ If she works

$$W = W^* \quad (3)$$

- ▶ If she does not work

$$W^* \geq W \quad (4)$$

- ▶ Interpret hours of work as a slack variable

$$h(W^* - W) = 0 \quad (5)$$

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- ▶ Let $l(\cdot)$ be some strictly increasing transformation so that

$$\begin{aligned}l(W_i^*) &= \beta_0 + \beta_1 h_i + \beta_2 W_{mi} + \beta_3 P_i + \beta_4 A_i + \beta_5 Z_i + \varepsilon_i \\l(W_i) &= b_0 + b_1 S_i + b_2 E_i + u_i\end{aligned}\tag{6}$$

- ▶ If $W^* > W$ at zero hours of work, the reduced form equations for observed wages and hours is

$$\begin{aligned}h_i &= \frac{1}{\beta_1} (b_0 - \beta_0 + b_1 S_i + b_2 E_i - \beta_2 W_{mi} \\&\quad - \beta_3 P_i - \beta_4 A_i - \beta_5 Z_i) + \frac{u_i - \varepsilon_i}{\beta_1} \\l(W_i) &= b_0 + b_1 S_i + b_2 E_i + u_i\end{aligned}\tag{7}$$

- If there are T women and K work, it is possible to estimate the parameters of interest maximizing

$$\begin{aligned} L(\cdot) &= \prod_{i=1}^K j(h_i, l(W_i) | (W_i > W_i^*)_{h=0}) \cdot \Pr[(W_i > W_i^*)_{h=0}] \\ &\times \prod_{i=K+1}^T \Pr[(W_i < W_i^*)_{h=0}] \end{aligned} \quad (8)$$

where $j(\cdot)$ is the conditional joint distribution of $h_i, l(W_i)$

- How?

- ① Assume that ε, u_i are i.i.d. joint normal
- ② Use Yike's results on normality to simplify expressions (this is joint censored distribution)

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- ▶ Gazillions of papers talk about selection
- ▶ One important extension is Heckman and Selacek (1985) which considers:
 - ▶ Embed the Roy Model in a setting with
 - ① Non-market sector
 - ② Employees select based on utility (instead of earnings)
 - ③ Permit unmeasured attributes to be log-normal
- ▶ All the extensions help to better fit data of wage distribution from the U.S. labor market (CPS 1968-1981)