Request that you should not refuse

- PLEASE SWITCH OFF AND PUT AWAY YOUR CELL PHONES
- LAPTOPS OK IF WORK IS ACADEMIC
- REMOVE BAGS AND OTHER MATERIALS THAT CAN CAUSE DISTRACTION
- STOP HAVING SIDE CONVERSATIONS
- PARTICIPATE IN CLASS

Class 7

Review

Automation: Robots and the Labor Market

Identifying Labor Demand Elasticities

(Women, War and Wages)

Minimum Wages if time permits

- **Read for Wednesday's Class (Class 8)**
- **3.2.3 – Characteristics of Minimum Wage Workers 2014**
- **3.2.4 – David Neumark – Minimum Wage Controversy**

Work on The Problem Set – Disregard Quantitative Problems on Labor Supply (turn PS 1 in on Class 8 Wed)

We will start with Labor Supply on Class 8 (Wed) & continue with it till Week 6 (Class 11 & Class 12)

Updated lecture 5 and lecture 6 after correcting for a small algebraic error

Right before MT 2 and After MT 2 Exam we will discuss labor supply issues: returns to education, grade inflation, discrimination, poverty

$$q = \left(\delta_1 E^{\rho} + \delta_2 K^{\rho}\right)^{\frac{1}{\rho}}$$

$$\frac{\partial q = f(E,K)}{\partial E} = \frac{1}{\rho} q^{\frac{1}{\rho}-1} \delta_1 E^{\rho-1} = MP_E$$

$$\frac{\partial q = f(E,K)}{\partial K} = \frac{1}{\rho} q^{\frac{1}{\rho}-1} \delta_2 K^{\rho-1} = MP_K$$

$$\Gamma = pq + \lambda[TC - wE - rK]$$

$$\left.\begin{array}{l} \dfrac{\partial \Gamma}{\partial E} = pMP_E - \lambda w = 0 \ldots.(1) \rightarrow pMP_E = \lambda w \\ \dfrac{\partial \Gamma}{\partial K} = pMP_K - \lambda r = 0 \ldots.(2) \rightarrow pMP_K = \lambda r \end{array}\right\} \rightarrow \frac{\delta_1}{\delta_2}\left(\frac{K^*}{E^*}\right)^{1-\rho} = \frac{w}{r} \ldots\ldots\ldots\ldots(4)$$

$$\frac{\partial \Gamma}{\partial \lambda} = 0 \Rightarrow TC - wE^* - rK^* = 0 \ldots\ldots\ldots(3)$$

E* will give Demand for Labor Function. Using 3 and 4

$$\left.\begin{array}{l} TC = wE^* + rK^* \\ K^* = \left(\dfrac{\delta_2 w}{\delta_2 r}\right)^{\frac{1}{1-\rho}} E^* = mE^* \end{array}\right\} \begin{array}{l} \rightarrow TC = wE^* + rmE^* \\ \rightarrow E^* = \dfrac{TC}{(w + rm)} \end{array}$$

Suppose the manufacturing industry in a US city has labor demand and supply curves estimated as

$$w = A - Bh^d \ldots(1)$$

$$w = C + Dh^s \ldots(2)$$

In the baseline the industry does not use any machines. Suppose the firms in the industry start employing **R** robots to substitute humans. Which equation will you modify (equation 1 or equation 2) and how? You might want to draw a graph to know. Find the equilibrium wage and employment in baseline and in the case of new equilibrium.

Short Run Demand for Labor

$$q = A\log E + \overline{K}^{\beta}$$

$$\frac{\partial f(E,K)}{\partial E} = \frac{A}{E} = MP_E$$

$$\Gamma = p\left(A\log E + \overline{K}^{\beta}\right) - wE - r\overline{K}$$

$$\frac{\partial \Gamma}{\partial E} = p\frac{A}{E} - w = 0 \ldots.(1)$$

$$\rightarrow E^{*} = \frac{A}{pw} \ldots..(2)$$

$$\rightarrow If \;\; A = 100; p = 1 \;\; Then \;\; E^{*} = \frac{100}{w}$$

$$q = E^{\alpha}\overline{K}^{\beta}$$

$$\frac{\partial f(E,K)}{\partial E} = \alpha E^{\alpha-1}\overline{K}^{\beta} = MP_E$$

$$\Gamma = p\left(E^{\alpha}\overline{K}^{\beta}\right) - wE - r\overline{K}$$

$$\frac{\partial \Gamma}{\partial E} = p\alpha E^{\alpha-1}\overline{K}^{\beta} - w = 0 \ldots.(1.1)$$

$$\rightarrow E^{*} = \left(\frac{w}{p\alpha\overline{K}^{\beta}}\right)^{\frac{1}{\alpha-1}} \ldots..(2.1)$$

$$\rightarrow If \;\; p = 1; \alpha = 0.5$$

$$\rightarrow Then \;\; E^{*(1-\alpha)} w = \frac{\overline{K}^{\beta}}{2}$$

SHIFT of DD : The sign on beta is CRITICAL

Why are there so many jobs?

Labor Markets and Automation

Figure 1

Average Change per Decade in US Occupational Employment Shares for Two Periods: 1940–1980 and 1980–2010

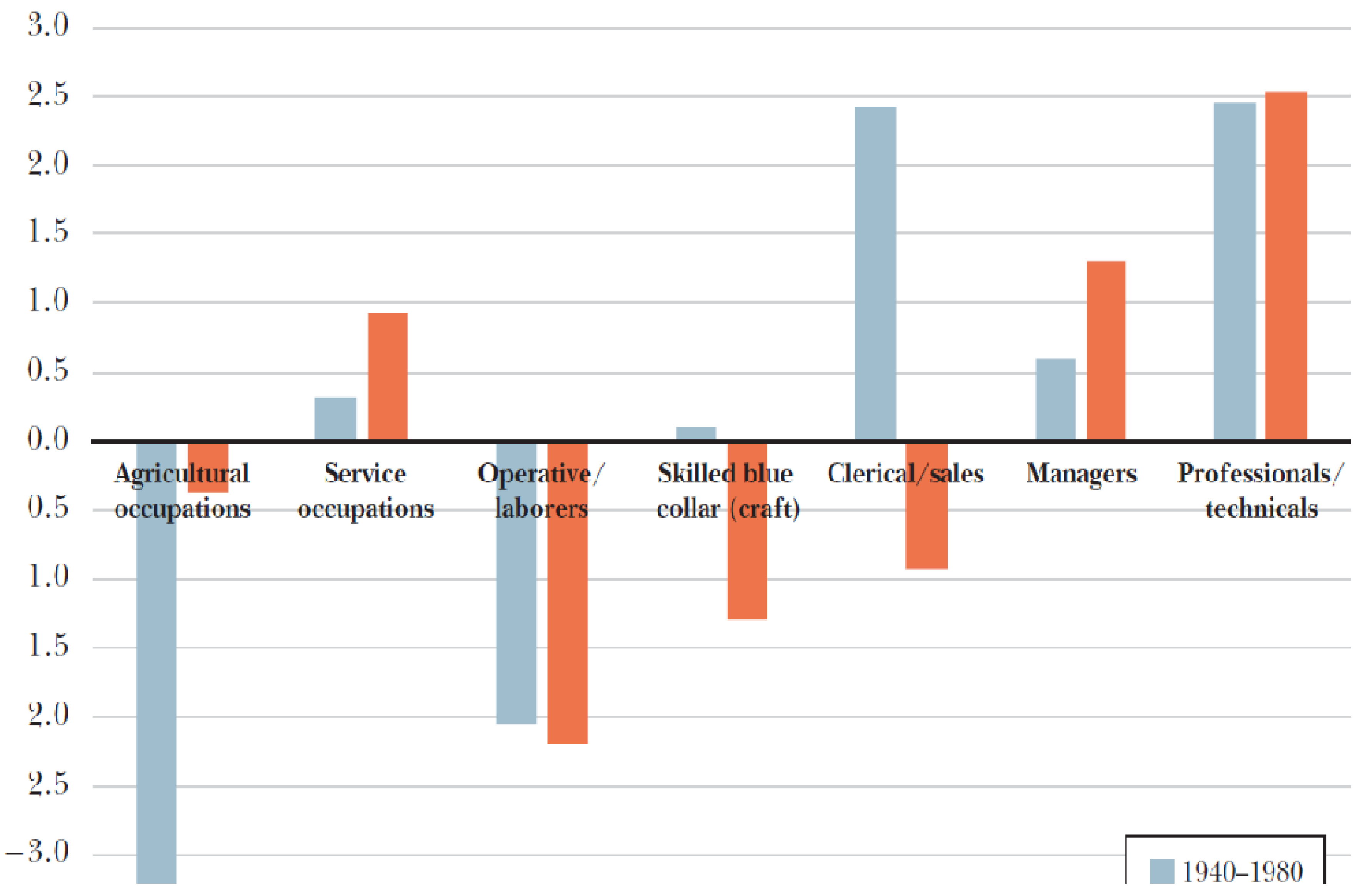


Figure 2

Change in Employment by Major Occupational Category, 1979–2012

(the y-axis plots 100 times log changes in employment, which is nearly equivalent to percentage points for small changes)

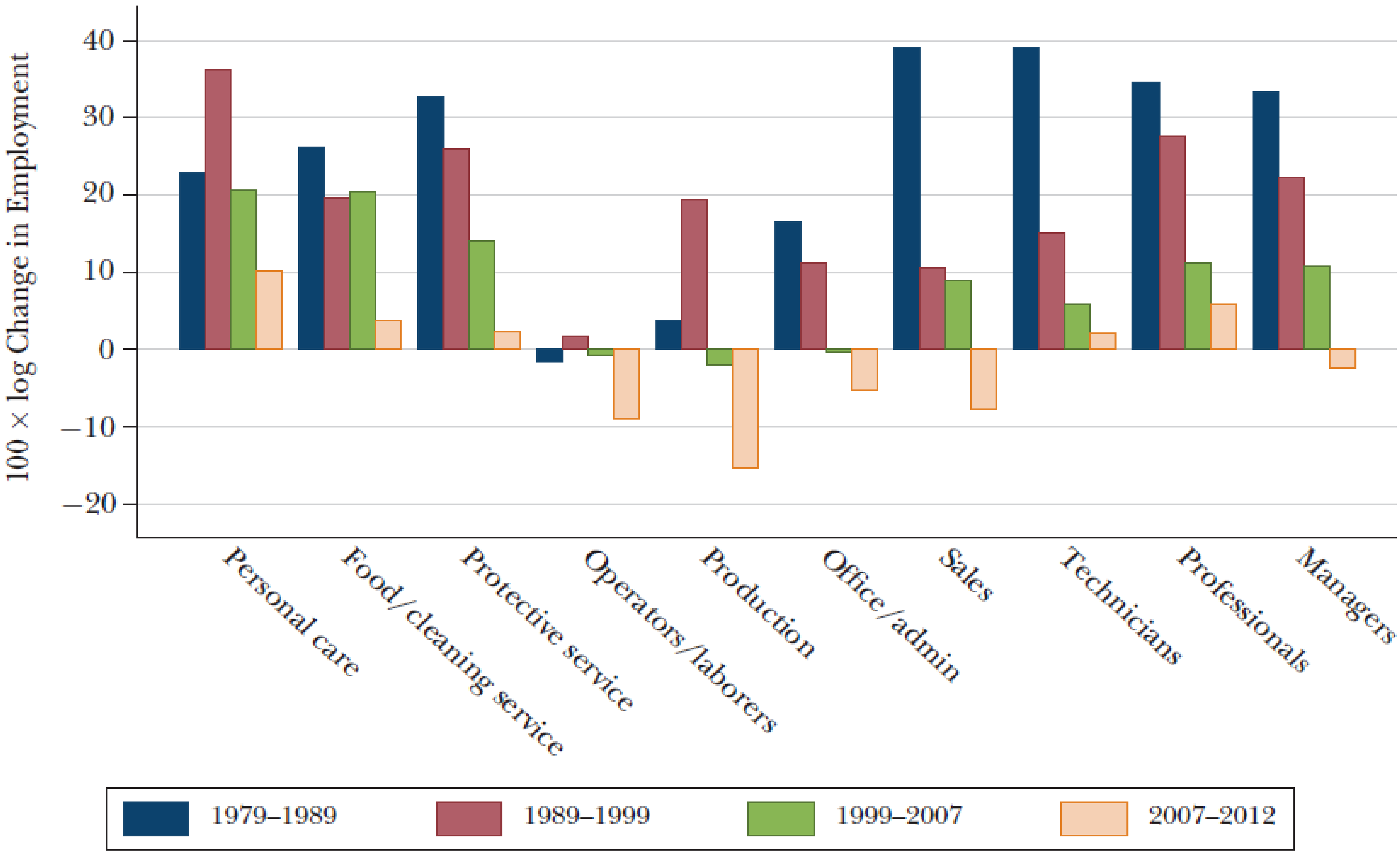
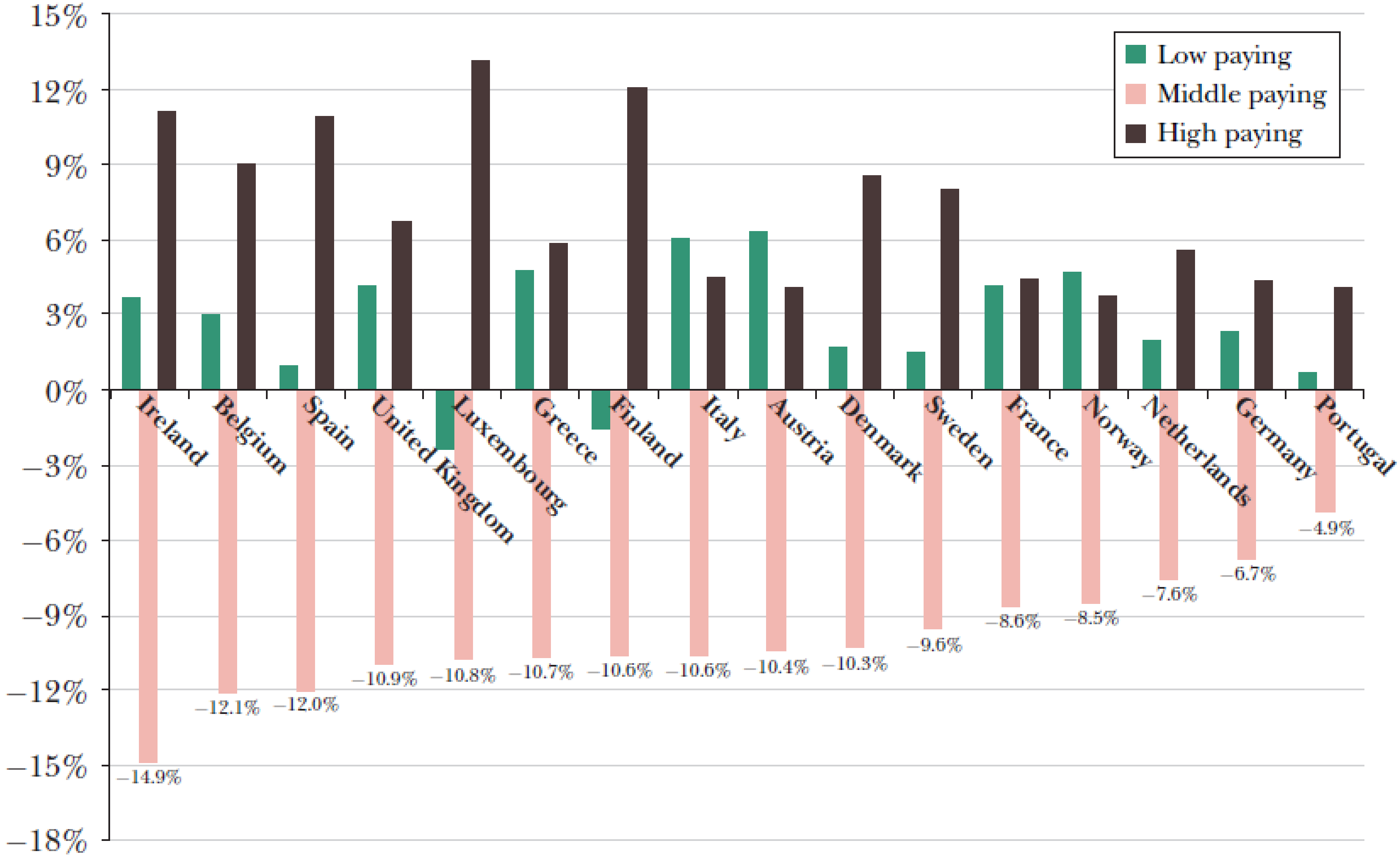


Figure 3

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



Changes in Mean Wages by Occupational Skill Percentile among Full-Time, Full-Year (FTFY) Workers, 1979–2012

(the y-axis plots 100 times log changes in employment, which is nearly equivalent to percentage points for small changes)

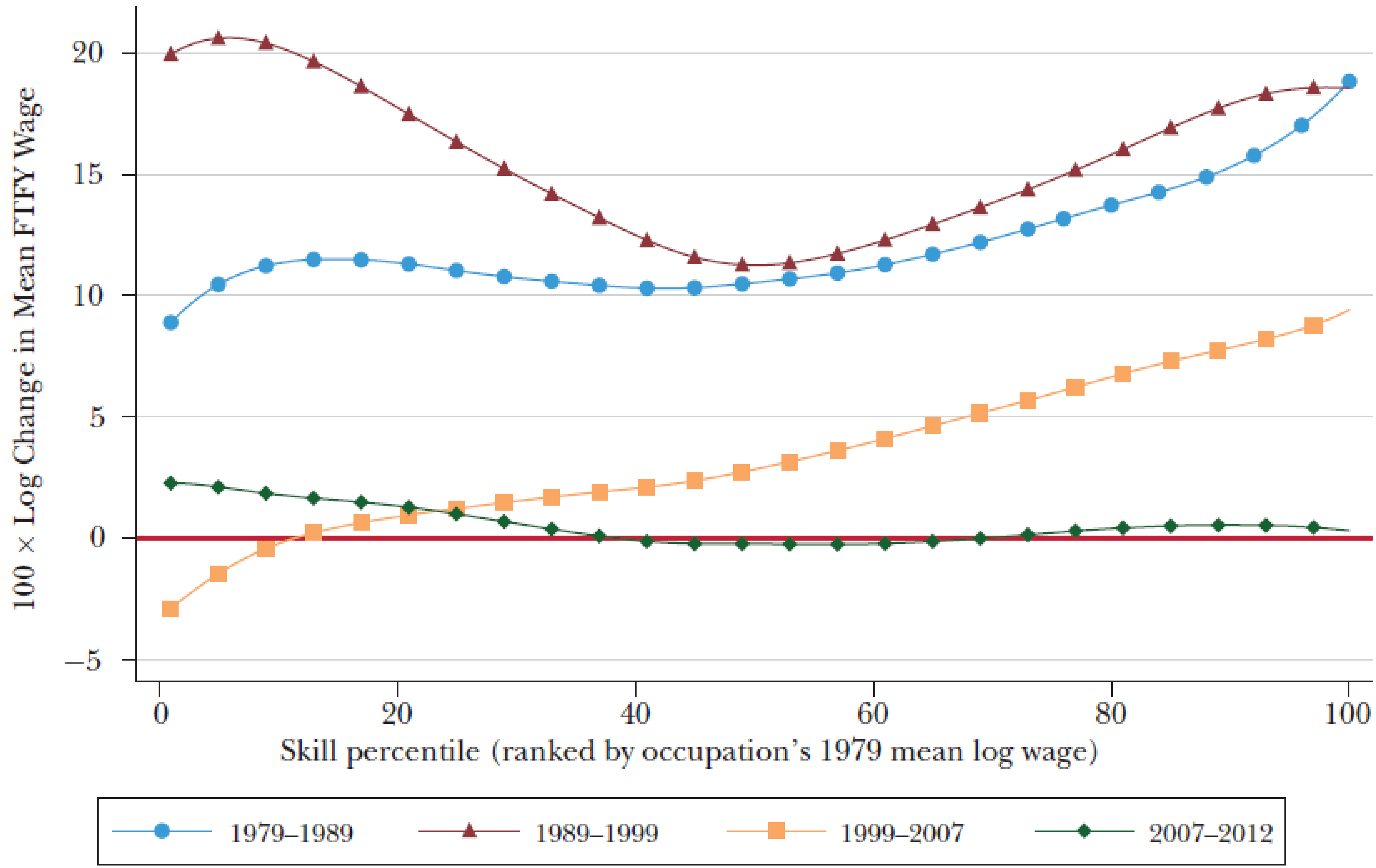


Figure 5

Smoothed Employment Changes by Occupational Skill Percentile, 1979–2012

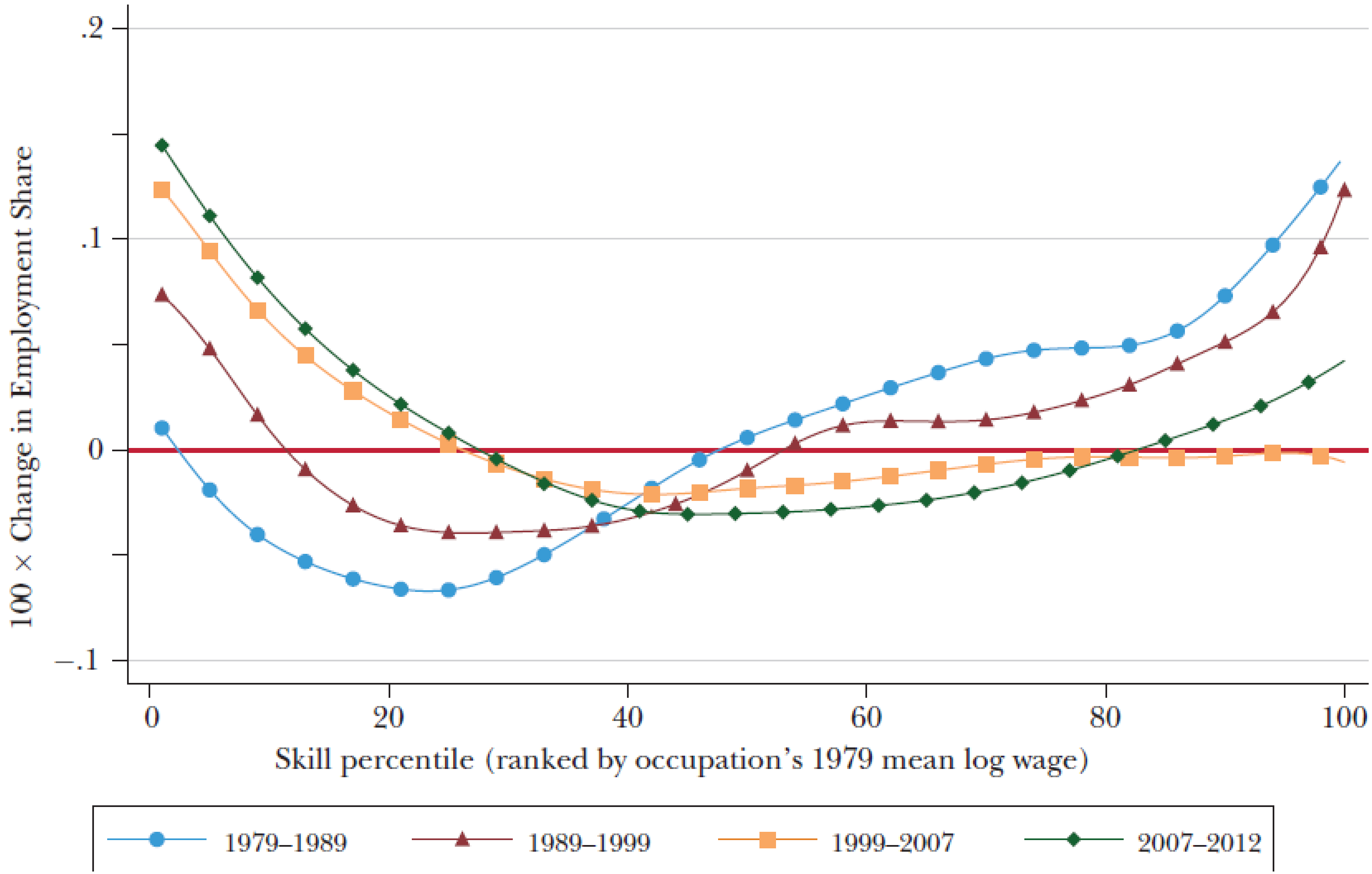
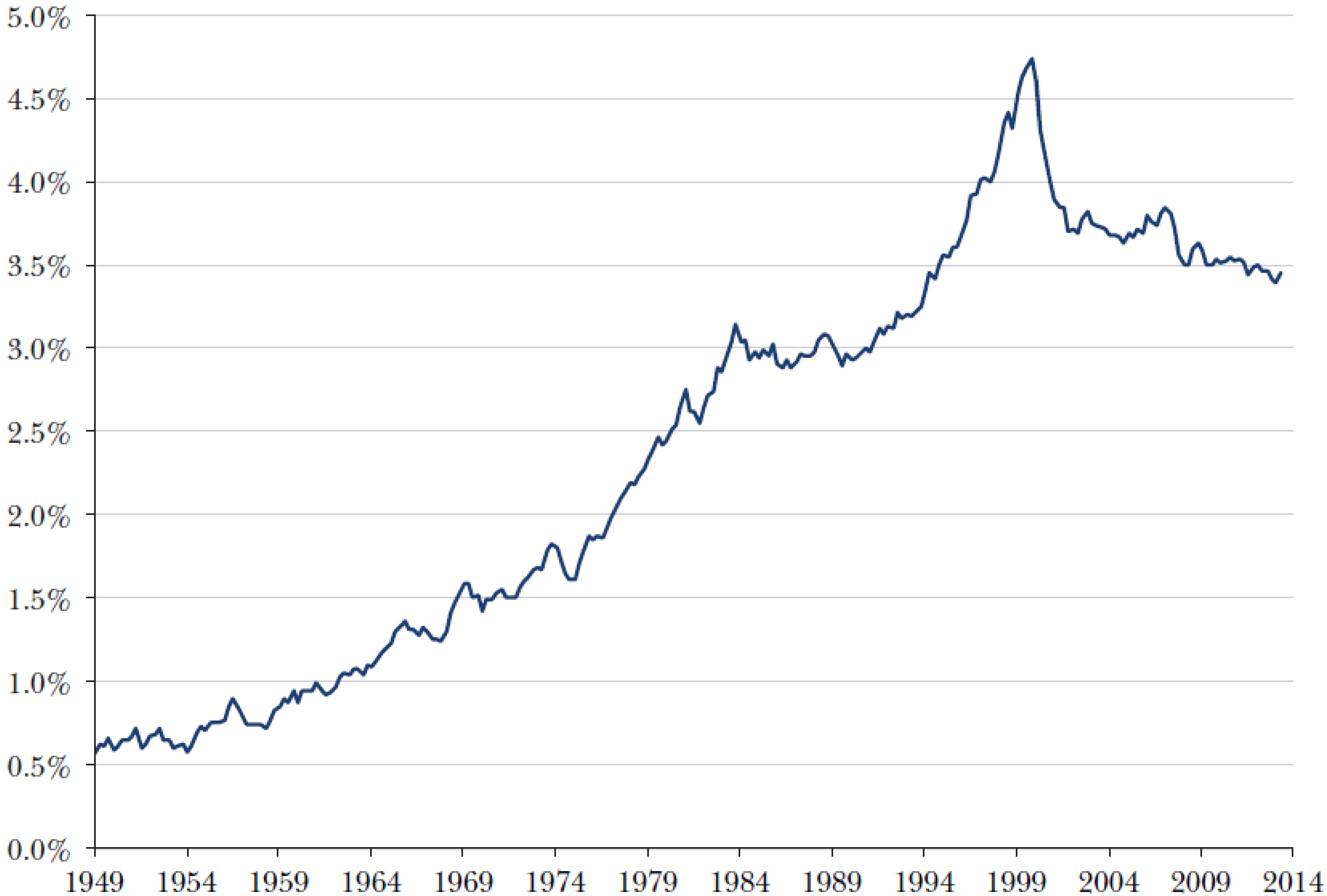


Figure 6
Private Fixed Investment in Information Processing Equipment and Software as a Percentage of Gross Domestic Product, 1949–2014

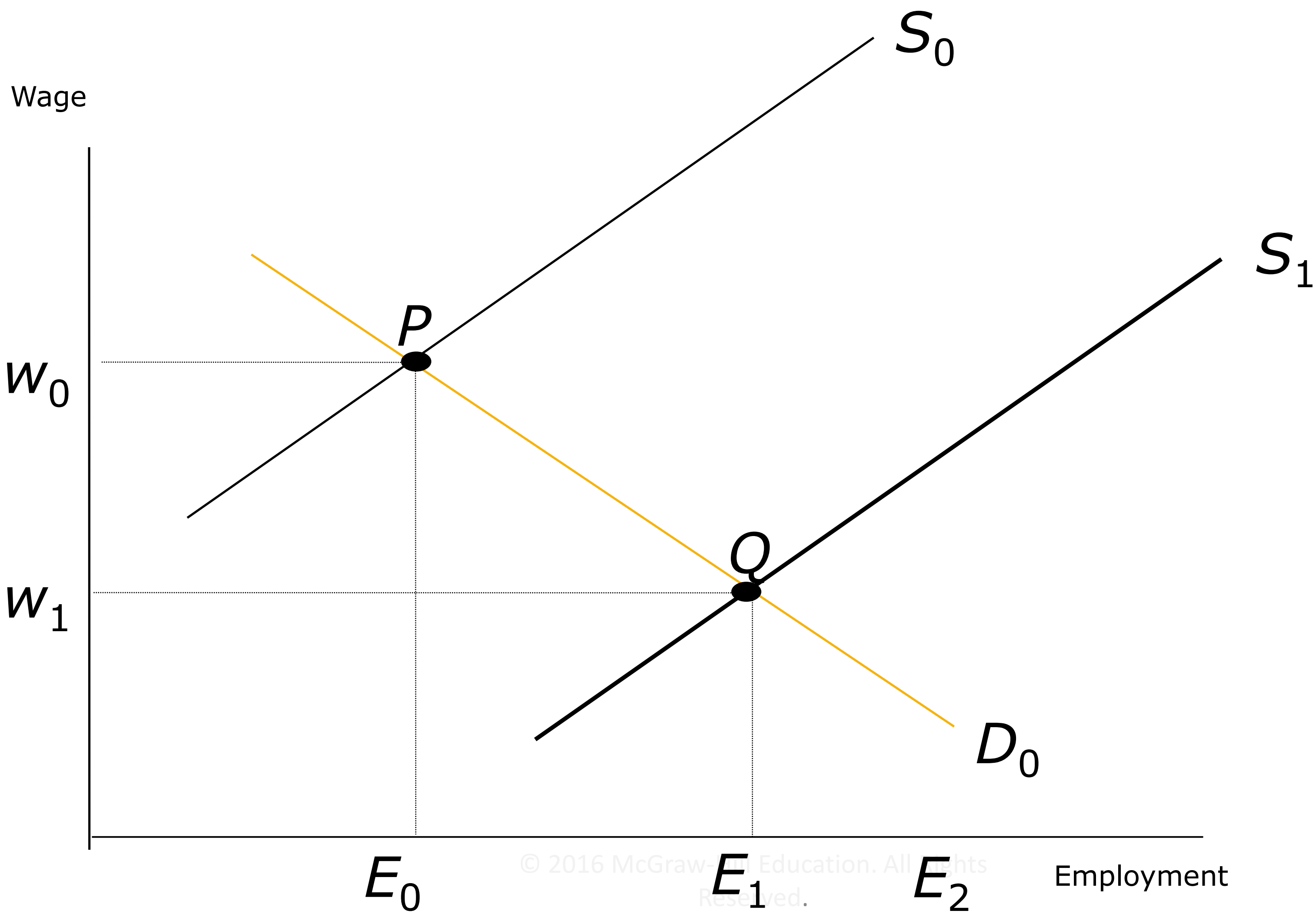


https://www.youtube.com/watch?v=7Pq-S557XQU

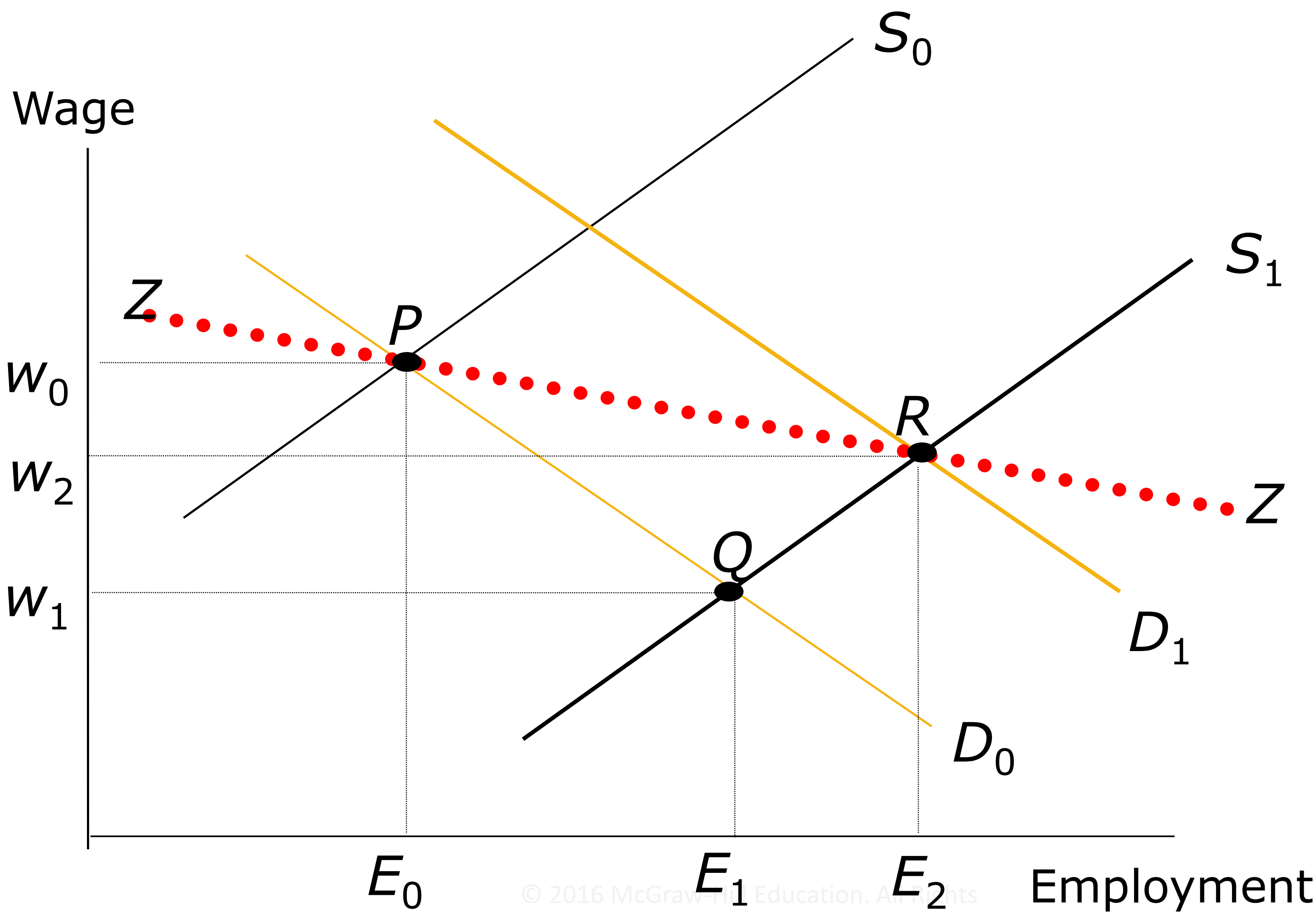
Humans need not apply (15 mins) – You Tube https://www.nytimes.com/2017/02/23/magazine/universal-income-global-inequality.html?_r=0

The future of not working - NYT

Estimating Labor Demand for Women



Empirical Identification of Labor Demand Elasticities



Women War and Wages

(Acemoglu, Autor and Levy)

The main variables

- How female labor force participation affects the structure of male and female wages?
- **Dependent Variable (y)**: Wages of males and females
- **Independent Variable (x)**: Endogenous Regressor: Labor Force Participation of Women
- **Instrument (z)**: Exogenous mobilization of men 18-44 in different states of US in 1940

The IV: Mobilization of men as a predictor for labor participation for women

- only 28 percent of U.S. women over the age of 15 participated in the labor force in 1940
- By 1945 this figure exceeded 34 percent
- Temporary increase in labor supply
- Exogenous b/c the men were selected by draft committees which had different rules in different states

Challenge I – State Level Factors other than mobilization of men have affected growth in female labor supply : causing weak instrument

- First Stage partial R square; F Stat significant and right sign
- Include more state level characteristics

- fraction of farmers before the war

- Racial, educational and occupational structures

Challenge II – Increase in woman’s labor demand because of problems of employability of men: causing simultaneity

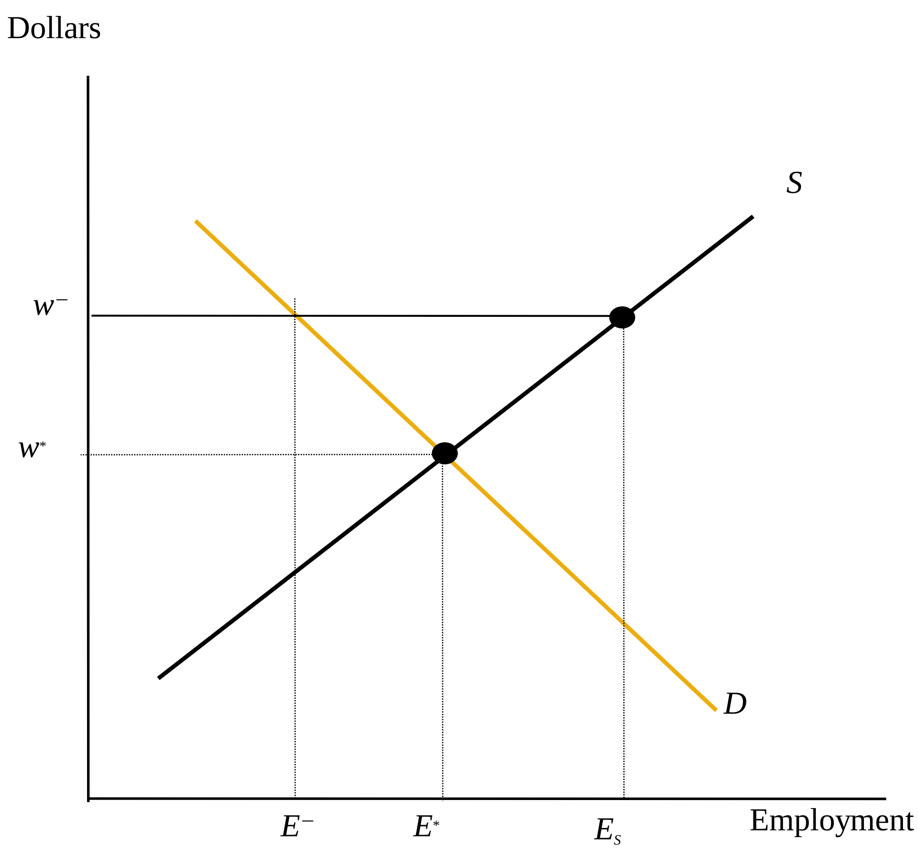
- If greater female participation in 1950 were driven by **demand** rather than supply factors, we would expect **relatively greater wage growth for both women and men in high-mobilization states**
- In reality, both men and women earned relatively **less** in high-mobilization states in 1950 than in 1940

Results

1. Greater female labor supply reduces female wages. A 10 percent increase in female labor supply relative to male labor supply lowers female wages by 7–8 percent, implying a labor demand elasticity of -1.2 to -1.5.
2. Greater female labor supply also reduces male wages. A 10 percent increase in relative female labor supply typically lowers male earnings by 3–5 percent.

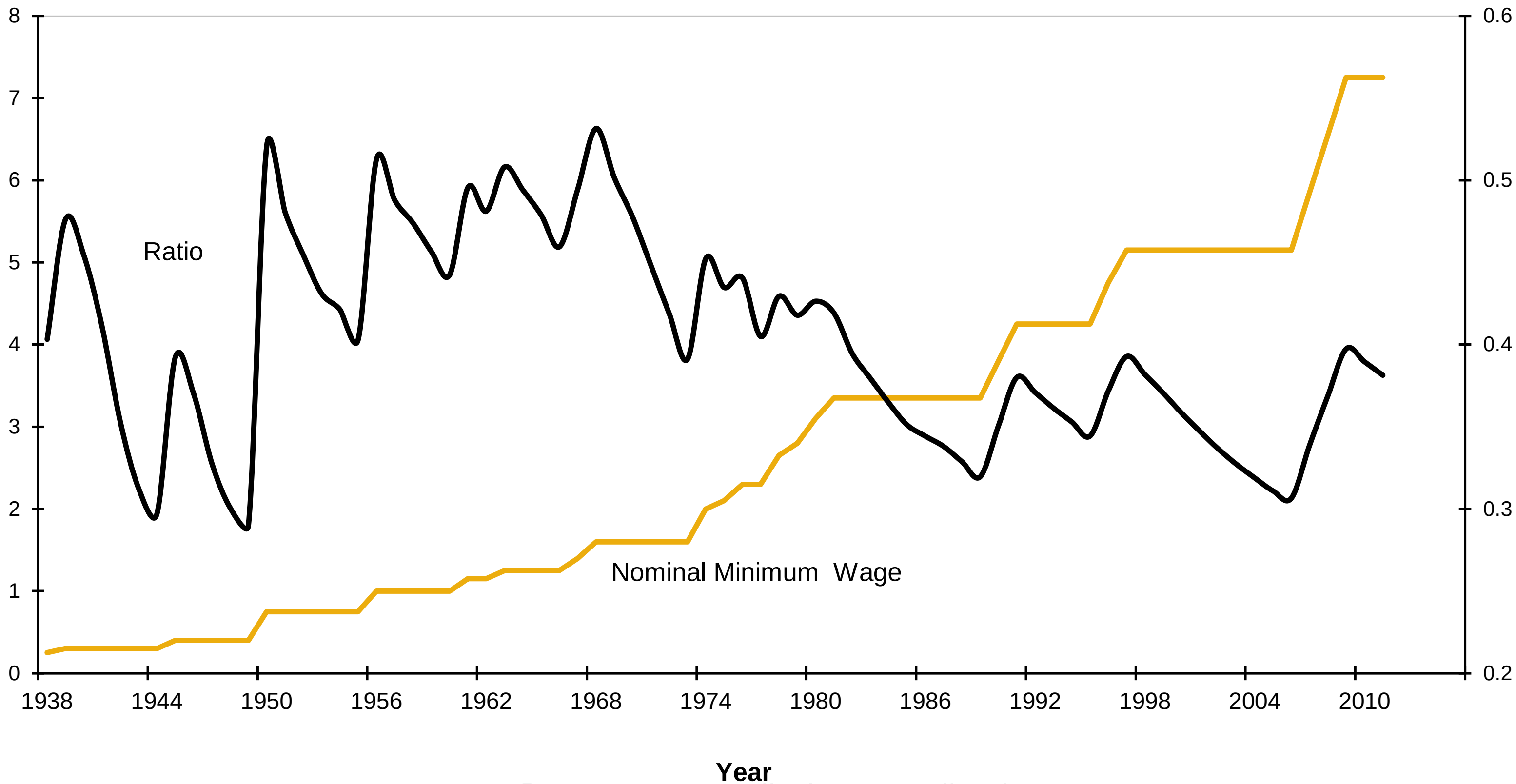
The Impact of the Minimum Wage on Employment

$$Unemoplyment\ \ Rate = \frac{E_s - \overline{E}}{E_s}$$



A minimum wage set at w^{-} results in employers cutting employment from E^* to E^{-}. The higher wage also encourages $E_S - E^*$ workers to enter the market. Thus, under a minimum wage, $E_S - E^{-}$ workers are unemployed.

Nominal Minimum Wages & Ratio of Minimum wage to Average Manufacturing Wage in the United States , 1938-2011



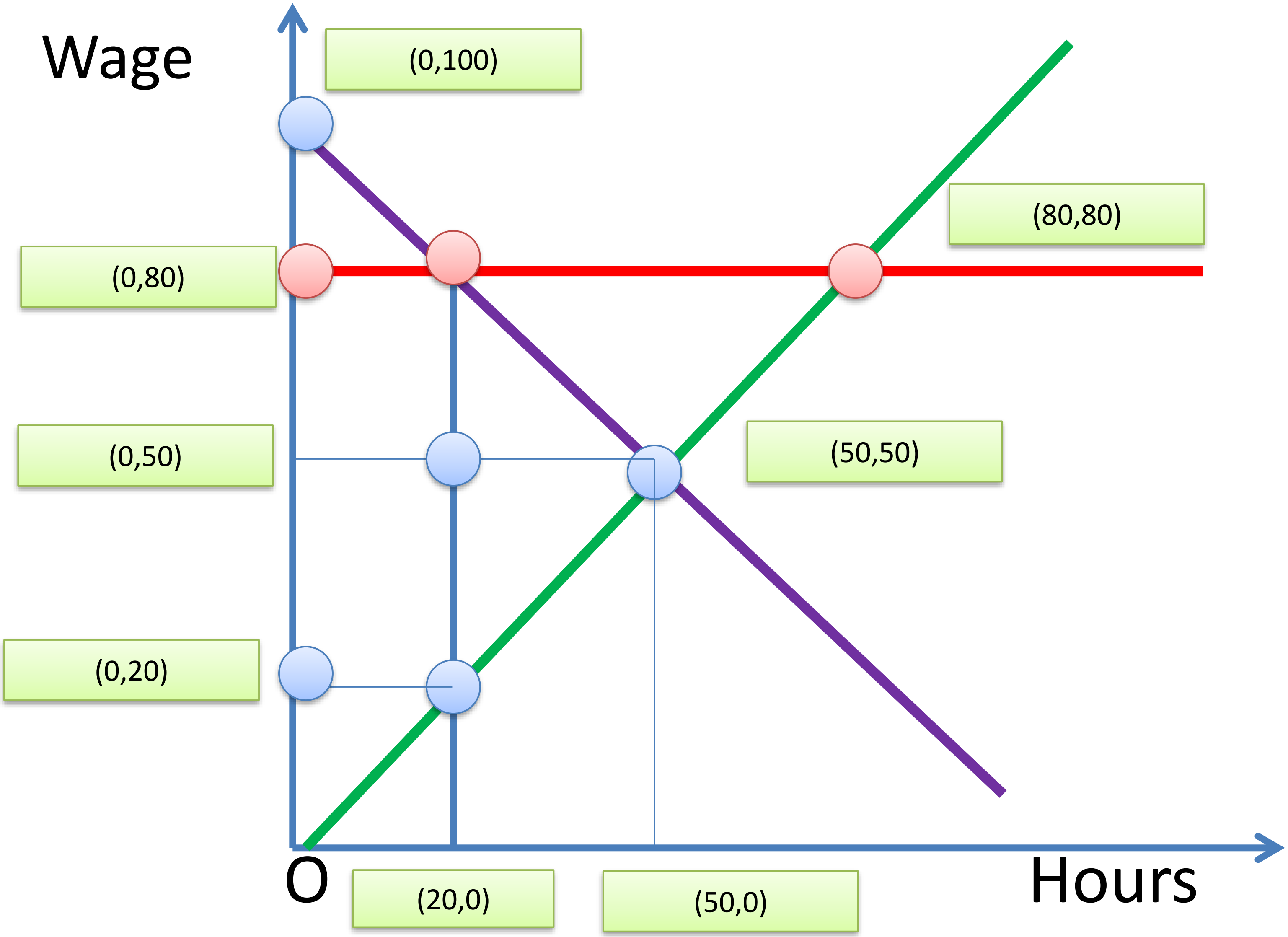
Solving Two Unknowns from Two Linear Equations

$$w = 100 - h^d \ldots (1)$$

$$w = h^s \ldots (2)$$

$$\overline{w} = 80$$

a. Draw DD and SS on Graph
b. Solve for Equilibrium wage rate and hours
c. What quantity is demanded and supplied at the wage floor (w bar) i.e. find out E bar and Es and E*
d. Find the unemployment rate


Wage
(0,100)
(80,80)
(0,80)
(0,50)
(50,50)
(0,20)
O
(20,0)
(50,0)
Hours

	Before the Price Floor (Min Wage)	After the Price Floor (Min Wage)	Change
Firm Surplus	$\frac{1}{2}\times 50\times 50=1250$	$(\frac{1}{2}\times 20\times 20)=200$	$-(\frac{1}{2}\times 30\times 30)-$ $(30\times 20)=-1050$
Worker Surplus	$\frac{1}{2}\times 50\times 50=1250$	$(\frac{1}{2}\times 20\times 20)+$ $(30\times 20)+$ $(30\times 20)=1400$	$-(\frac{1}{2}\times 30\times 30)+$ $(30\times 20)=150$
Total Surplus (WS+PS)	$1250+1250=2500$	$200+1400=1600$	$-1050+150=-900$

Suppose the manufacturing industry in a US city has labor demand and supply curves estimated as

$$w = A - Bh^{d} \ldots (1)$$

$$w = C + Dh^{s} \ldots (2)$$

In the baseline the industry does not have any minimum wage restriction. Suppose a new law is passed where this sector has to pay a wage floor of **Z which is above the baseline equilibrium wage**. Which equation will you modify (equation 1 or equation 2) and how? You might want to draw a graph to know. Find the equilibrium wage and employment in baseline and in the case of new equilibrium.