Economics 101A
(Lecture 2)

Stefano DellaVigna

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Outline

1. Questions on Syllabus
2. The economics of discrimination
3. Multivariate optimization II
4. Comparative Statics
5. Implicit function theorem

1 Questions on Syllabus

2 The economics of discrimination

- What do economists know about discrimination?
  - Model of discrimination in workplace (inspired by Becker, *Economics of Discrimination*, 1957)

- Workers:
  - A and B. They produce 1 widget per day
  - Both have reservation wage $\bar{u}$

- Firm:
  - sells widgets at price $p > \bar{u}$ (assume p given)
  - dislikes worker B
  - Maximizes profits ($p*$ no of widgets $-$ cost of labor) – disutility d if employs B

- Wages and employment in this industry?

- Employment
  - Net surplus from employing A: $p - \bar{u}$
  - Net surplus from employing B: $p - \bar{u} - d$
  - If $\bar{u} < p < \bar{u} + d$, Firm employs A but not B
  - If $\bar{u} + d < p$, Firm employs both

- What about wages?

- Case I. Firm monopolist/monopsonist and no union
  - Firm maximizes profits and gets all the net surplus
  - Wages of A and B equal $\bar{u}$
- Case II. Firm monopolist/monopsonist and union
  - Firm and worker get half of the net surplus each
  - Wage of A equals $\bar{u} + .5 * (p - \bar{u})$
  - Wage of B equals $\bar{u} + .5 * (p - \bar{u} - d)$
- Case III. Perfect competition among firms that discriminate ($d > 0$)
  - Prices are lowered to the cost of production
  - Wage of A equals p ($= \bar{u}$)
  - B is not employed

- The magic of competition

- Case IIIb. Perfect competition + At least **one** firm does not discriminate ($d = 0$)
  - This firm offers wage p to both workers
  - What happens to worker B?
  - She goes to the firm with $d = 0$!
  - In equilibrium now:
    * Wage of A equals p
    * Wage of B equals p as well!

- Competition eliminates the pay and employment differential between men and women

- Is this true? Any evidence?

- S. Black and P. Strahan, *American Economic Review*, 2001.

  - Local monopolies in banking industry until mid 70s

  - Mid 70s: deregulation

  - From local monopolies to perfect competition.

  - Wages?

    * Wages fall by 6.1 percent

  - Discrimination?

    * Wages fall by 12.5 percent for men

    * Wages fall by 2.9 percent for women

    * Employment of women as managers increases by 10 percent

TABLE 4—THE MARGINAL IMPACT OF DEREGULATION ON THE WAGES OF BANKING EMPLOYEES (CPS DATA)

	Simple specifications		Specifications with unit banking interactions	
Post-M&A branching deregulation	−0.061* (0.011)	—	−0.051* (0.014)	—
Post-interstate banking	−0.0002 (0.015)	−0.002 (0.015)	−0.0001 (0.015)	−0.002 (0.017)
Branching deregulation index	—	−0.030* (0.006)	—	−0.022* (0.007)
Unit banking*post-M&A branching deregulation	—	—	−0.018 (0.016)	—
Unit banking*branching deregulation index	—	—	—	−0.018* (0.007)
N	809,367	790,565	809,367	790,565
F (H_0: all regulatory variables = 0)	14.1*	13.1*	9.6*	10.5*
R^2	0.38	0.38	0.38	0.38

Notes: Standard errors are in parentheses. The dependent variable equals the log weekly wage for all full-time employees in the March Current Population Survey (CPS). The log wage equation also allows for time-varying returns to worker

TABLE 5—THE MARGINAL IMPACT OF DEREGULATION ON THE WAGES OF BANKING EMPLOYEES DIFFERENTIAL EFFECTS FOR MEN AND WOMEN (CPS DATA)

	Females only		Males only	
Post-M&A branching deregulation	−0.029* (0.012)	—	−0.125* (0.024)	—
Post-interstate banking	0.012 (0.017)	0.009 (0.017)	−0.026 (0.027)	−0.027 (0.029)
Branching deregulation index	—	−0.017* (0.006)	—	−0.056* (0.013)
N	336,121	328,208	473,246	462,357
F (H_0: all regulatory variables = 0)	3.42*	4.23*	14.33*	10.14*
R^2	0.28	0.28	0.34	0.34

Notes: Standard errors are in parentheses. The dependent variable equals the log weekly wage for all male or female full-time employees in the March Current Population Survey (CPS). The log wage equation also allows for time-varying

- Summary: Competition is not great for workers (wages go down)

- BUT: Drives away the gender gap

- More evidence on discrimination: Does black-white and male-female wage back derive from discrimination?

- Field experiment (Bertrand and Mullainathan, *American Economic Review,* 2004)

- Send real CV with randomly picked names:
  - Male/Female
  - White/African American

Appendix Table 1
First Names Used in Experiment[a]

White Female			**African American Female**		
Name	$\frac{L(W)}{L(B)}$	Perception White	Name	$\frac{L(B)}{L(W)}$	Perception Black
Allison	∞	0.926	Aisha	209	0.97
Anne	∞	0.962	Ebony	∞	0.9
Carrie	∞	0.923	Keisha	116	0.93
Emily	∞	0.925	Kenya	∞	0.967
Jill	∞	0.889	Lakisha	∞	0.967
Laurie	∞	0.963	Latonya	∞	1
Kristen	∞	0.963	Latoya	∞	1
Meredith	∞	0.926	Tamika	284	1
Sarah	∞	0.852	Tanisha	∞	1

- Measure call-back rate from interview
  - Results (Table 1):
    * Call-back rates 50 percent higher for Whites!
    * No effect for Male-Female call back rates

Table 1
Mean Callback Rates By Racial Soundingness of Names [a]

	Callback Rate for White Names	*Callback Rate for African American Names*	*Ratio*	*Difference (p-value)*
Sample:				
All sent resumes	**9.65%** [2435]	**6.45%** [2435]	**1.50**	**3.20%** (0.0000)
Chicago	**8.06%** [1352]	**5.40%** [1352]	**1.49**	**2.66%** (0.0057)
Boston	**11.63%** [1083]	**7.76%** [1083]	**1.50**	**4.05%** (0.0023)
Females	**9.89%** [1860]	**6.63%** [1886]	**1.49**	**3.26%** (0.0003)
Females in administrative jobs	**10.46%** [1358]	**6.55%** [1359]	**1.60**	**3.91%** (0.0003)
Females in sales jobs	**8.37%** [502]	**6.83%** [527]	**1.22**	**1.54%** (0.3523)
Males	**8.87%** [575]	**5.83%** [549]	**1.52**	**3.04%** (0.0513)

[a]Notes:

1. The table reports, for the entire sample and different subsamples of sent resumes, the callback rates for applicants with a White sounding name (column 1) and an African American sounding name (column 2), as well as the ratio (column 3) and difference (column 4) of these callback rates. In brackets in each cell is the number of resumes sent in that cell.
2. Column 4 also reports the p-value for a test of proportion testing the null hypothesis that the callback rates are equal across racial groups.

- Strong evidence of discrimination against African Americans

- No evidence (in this study) of discrimination against women

- Example of Applied Microeconomics

  - Not covered in this class: See Ec140-141-142 (Econometrics and Applied Metrics) and 131 (Public), 157 (Health), and 172 (Development)

  - Also: URAP – Get involved in a professor's research

  - If curious: read Steven Levitt and Stephen Dubner, *Freakonomics*

- At end of semester, more examples

3 Multivariate optimization II

- **Necessary condition for maximum** x^* is

$$\frac{\partial f(x^*)}{\partial x_i} = 0 \; \forall i \qquad (1)$$

or in vectorial form

$$\nabla f(x) = 0$$

- These are commonly referred to as first order conditions (f.o.c.)

- Sufficient conditions? Define Hessian matrix H:

$$H = \begin{pmatrix} f''_{x_1,x_1} & f''_{x_1,x_2} & \dots & f''_{x_1,x_n} \\ \dots & \dots & \dots & \dots \\ f''_{x_n,x_1} & f''_{x_n,x_2} & \dots & f''_{x_n,x_n} \end{pmatrix}$$

- Subdeterminant $|H|_i$ of Matrix H is defined as the determinant of submatrix formed by first i rows and first i columns of matrix H.

- Examples.
  - $|H|_1$ is determinant of f''_{x_1,x_1}, that is, f''_{x_1,x_1}
  - $|H|_2$ is determinant of

$$H = \begin{pmatrix} f''_{x_1,x_1} & f''_{x_1,x_2} \\ f''_{x_2,x_1} & f''_{x_2,x_2} \end{pmatrix}$$

- **Sufficient condition for maximum** x^*.
  1. x^* must satisy first order conditions;
  2. Subdeterminants of matrix H must have alternating signs, with subdeterminant of H_1 negative.

- Case with $n = 2$

- Condition 2 reduces to $f''_{x_1,x_1} < 0$ and $f''_{x_1,x_1} f''_{x_2,x_2} - (f''_{x_1,x_2})^2 > 0$.

- Example 2: $h(x_1, x_2) = p_1 * x_1^2 + p_2 * x_2^2 - 2x_1 - 5x_2$

- First order condition w/ respect to x_1?

- First order condition w/ respect to x_2?

- $x_1^*, x_2^* =$

- For which p_1, p_2 is it a maximum?

- For which p_1, p_2 is it a minimum?

4 Comparative statics

- Economics is all about ‘comparative statics’

- What happens to optimal economic choices if we change one parameter?

- Example: Car production. Consumer:

  1. Car purchase and increase in oil price

  2. Car purchase and increase in income

- Producer:

  1. Car production and minimum wage increase

  2. Car production and decrease in tariff on Japanese cars

- Next two sections

5 Implicit function theorem

- Implicit function: Ch. 2, pp. 31-32

- Consider function $x_2 = g(x_1, p)$

- Can rewrite as $x_2 - g(x_1, p) = 0$

- **Implicit function** has form: $h(x_2, x_1, p) = 0$

- Often we need to go from implicit to explicit function

- Example 3: $1 - x_1 * x_2 - e^{x_2} = 0$.

- Write x_1 as function of x_2:

- Write x_2 as function of x_1:

- **Univariate implicit function theorem (Dini)**: Consider an equation $f(p, x) = 0$, and a point (p_0, x_0) solution of the equation. Assume:

  1. f continuously differentiable in a neighbourhood of (p_0, x_0);

  2. $f'_x(p_0, x_0) \neq 0$.

- Then:

  1. There is one and only function $x = g(p)$ defined in a neighbourhood of p_0 that satisfies $f(p, g(p)) = 0$ and $g(p_0) = x_0$;

  2. The derivative of $g(p)$ is

$$g'(p) = -\frac{f'_p(p, g(p))}{f'_x(p, g(p))}$$

- Example 3 (continued): $1 - x_1 * x_2 - e^{x_2} = 0$

- Find derivative of $x_2 = g(x_1)$ implicitely defined for $(x_1, x_2) = (1, 0)$

- Assumptions:

  1. Satisfied?

  2. Satisfied?

- Compute derivative

6 Next Class

- Next class:
  - Implicit Function Theorem II
  - Envelope Theorem
  - Convexity and Concavity
  - Constrained Maximization
  - Envelope Theorem II

- Going toward:
  - Preferences
  - Utility Maximization (where we get to apply maximization techniques the first time)