Who Marries Whom? Optimal matching and assortative marriage

Prof. Goldstein

Economic Demography

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Agenda

- Markets and marriage
- Household production
- Optimal sorting
- Positive and negative sorting

- Highlights:
  A mating game. A movie? A lab?

A motivating example: to marry, or not to marry

	Susanne (alone)	Susanne (with D)	David (with S)	David (alone)
Production:	10	8	6	2

Does it make sense for Susanne and David to marry?

1. If they each keep what they produce (no trade, bargaining, exchange)
2. If they can bargain (and "sell" their services)

Lessons from example

- For marriage to make sense, no one is worse off
- If trade and bargaining, then arrangement with highest output should be the choice (because spoils can be divided so that both will win)

The household production function

$Z_{ij} = h(A_i, A_j)$ [Becker writes Z()]

Z = Total household production of person i with attribute A_i and person j with attribute A_j

What is "production"

- Not just food, clothing and $$
- Also happiness, kids, ...

us stress again that the commodity output maximized by all households is not to be identified with national output as usually measured, but includes conversation, the quantity and quality of children, and other outputs that never enter or enter only imperfectly into the usual measures.

Properties of household production function

- Production increases with inputs
  Z increases with A_i and with A_j

- That's basically it

- (We'll see that other properties, e.g., complementarity of A_i and A_j will be important for who chooses whom)

Optimal sorting

- If no alternative is better
- Better means can't recombine with different partners and with a better outcome
- Better outcome ("Pareto")
  - at least 1 person is better off
  - and no one is worse off

An example of a very small population

Just have two males and two females.

Payoff matrix Z is

	M1	M2
F1	1	15
F2	15	20

Who should pair with whom?

Let's do it

- 4 volunteers (2 men and 2 women)
- 4 sheets of colored paper to take notes

1. Start with (M1, F1) and (M2, F2)
2. Look up household pay-offs and negotiate who gets what within this marriage
3. Repartner
4. Repeat (2) in this new marriage
5. Let's see what we get

Becker's example

Just have two males and two females.

Payoff matrix Z is

	M1	M2
F1	8	4
F2	9	7

Who should pair with whom?

A 3 x 3 example

	F1	F2	F3
M1	5	8	2
M2	7	9	6
M3	2	3	0

Who pairs with whom?

Is their a short-cut?

- Usually we don't have a social planner deciding who marries whom
- We have individuals and the "free market"
- But the optimal sorting has a characteristic that allows us to select it fairly easily
- Any ideas?

Let's watch Becker teaching

https://www.youtube.com/watch?v=g5QWMq2Tr7Y&index=15&list=PL9334868E7A821E2A

32:30 ~ 37:00 on household production fn.

1:08 ~ 1:12 on complementarity

(can watch the whole video for technical details + some entertainment)

Positive and negative sorting

$$\frac{d^2 Z}{dAi\ dAj} > 0 \rightarrow \text{Complements}$$

$$\frac{d^2 Z}{dAi\ dAj} < 0 \rightarrow \text{Substitutes}$$

A mathematical example

$Z(A_i, A_j) = (A_i^r + A_j^r)^{1/r}$, $\qquad r > 0$

Turns out :
complements when $r < 1$
substitutes when $\quad r > 1$

A mathematical example

$Z(A_i, A_j) = (A_i^r + A_j^r)^{1/r},$ $\qquad$ r > 0

Turns out that complements when r < 1
and substitutes when r > 1

Complements example: $A_1 = 1$; $A_2 = 4$; $r = ½$
$Z(1,1) = (1+1)^2 = 4$
$Z(2,1) = (1+ 2)^2 = 9$
$Z(2,2) = (2+2)^2 = 16$

A mathematical example

$Z(A_i, A_j) = (A_i^r + A_j^r)^{1/r}$, $\qquad r > 0$

Turns out that complements when $r < 1$
and substitutes when $r > 1$

Substitutes example: A1 = 1; A2 = 4; r = 2
Z(1,1) = (1+1)^(1/2) = 1.4
Z(2,1) = (1+ 16)^(1/2) = 4.1
Z(2,2) = (16+16)^(1/2) = 5.7

In words

- If gain for increase in your attribute is bigger when your partner has more of that attribute → complementarity
- Example: education and stimulating conversation
- If gain for increase is lower when partner is higher → substitutes
- Example: Talker/Listener

Wages?

- Becker argues that wage levels are substitutes

A negative correlation between w_m and w_f maximizes total output because the gain from the division of labor is maximized. Low-wage F should spend more time in household production than high-wage F because the foregone value of the time of low-wage F is lower; similarly, low-wage M should spend more time in household production than high-wage M. By mating low-wage F with high-wage M and low-wage M with high-wage F, the cheaper time of both M and F is used more extensively in household production, and the expensive time of both is used more extensively in market production.

The real world

- Our lab looks at 2015 ACS
- American Community Survey, a continuous micro-census
- We look just at California
- In class (if time), we look at traditional marriages (many thousand)
- In lab, you'll also look at same-sex marriages (a few hundred in sample)

Our variables: predictions?

- Education
- Wage income (observed, not potential)
- Race
- Age

Summary

- Households, like whole pop, can have a production function
- "free market" of choosing partners and within household $\rightarrow$ optimal sorting, which maximizes individual welfare (and aggregate)
- A framework for understanding sorting, but not predictive