ENDOWMENT EFFECTS AND GENDER IN THE EFFICIENCY AND EQUITY OF TEAM ALLOCATION DECISIONS

Marcel Fafchamps (Stanford University) and
Bereket Kebede (University of East Anglia)

UN WIDER Seminar Series
Helsinki
22 January 2020

MAIN HIGHLIGHTS AND FINDINGS

- A novel lab experiment with pairs making separable allocative efficiency and equity decisions in various power structures (dictator, ultimatum, trust and negotiation)
- Subjects achieve high efficiency in general but efficiency level fall when negotiations fail
- Allocation efficiency reduced by input and output endowment effects specially in negotiated allocations
- In terms of equity, subjects appropriate all surplus when they can, and share equally when they have to negotiate

MAIN HIGHLIGHTS AND FINDINGS (CONT'D)

- When asked to choose between negotiating, deciding alone (demand for power), or relinquishing power (demand for delegation), many subjects choose to delegate –even though this drastically reduces their payoff
- Few differences between genders, but male-female pairs tend towards a more negotiated, more harmonious exchange on average than same-gender pairs; gender differences are less important than gender pairings

MOTIVATION

- Household efficiency a central issue is intra-household models and central in the (arguably) dominant model (the collective model, Chiappori, 1988, 1992, 1997; Browning et al., 2014)
- Udry, C. (1996) in Burkina Faso; describes how spouses start the agricultural season with each an individually managed field and unequal endowments of fertilizer; spouses allocate fertilizer between their two fields observes that husbands start with more fertilizer and allocate most of it to their own field even though the marginal return to fertilization is higher on their wife's field

MOTIVATION (CONT'D)

- To examine issues of allocative efficiency in combination with preferences for distribution of surplus; our experimental design integrates allocative efficiency and preferences for distribution in a unified framework
- Integrate insights from behavioural economics particularly in terms of social preferences with the female empowerment literature that focuses on power; to do that we use dictator, ultimatum, trust and negotiation games
- To understand how power structure affects efficiency and equity among married couples, we need to understand how it works among randomly selected individuals to get a lower threshold married couples can achieve

EXPERIMENTAL DESIGN AND PROCEDURES

- Each session includes identical number of males and females (8 + 8 = 16) with 10 sessions
- 8 ways of pairing males and females and 7 ways of pairing the same sex subjects
- In different rounds everyone paired with every one, hence 15 pairings
- One treatment where subject plays alone
- Six treatments each treatment played three times/rounds (18 rounds in total): Alone, Dictator, Ultimatum, Trust, Negotiation and Decide/Delegate/Negotiate

EXPERIMENTAL DESIGN AND PROCEDURES (CONT'D)

- The experiment frames allocative efficiency as an allocation of fixed amount (100) of fertiliser on two plots
- Initial endowment of fertiliser is not always equitable (0, 20, 50, 80 and 100)
- The production function on the two plots differ (i.e., marginal productivity of fertiliser differ by plots); mostly second order polynomial production functions with diminishing marginal returns to fertiliser (require allocation on both plots) but with some linear production functions with corner solutions
- Efficiency requires allocating fertiliser on the plot with the highest marginal productivity whether the plot belongs to you or the other partner

EXPERIMENTAL DESIGN AND PROCEDURES (CONT'D)

- Total surplus/output produced depends on the chosen allocation of fertiliser on the two plots which is shared between the couples
- Depending on variations on how allocation and distribution decisions are made, we have six treatments (each played three times)
- Treatment 1: subject allocates and takes the surplus alone (baseline, practice run)
- Treatment 2 (dictator): each matched subject makes a decision about allocation and how much of the output to give to the others; a randomly selected decision implemented

EXPERIMENTAL DESIGN AND PROCEDURES (CONT'D)

- Treatment 3 (Ultimatum): one randomly selected subject will make the fertiliser allocation and division of output; if the other accepts, the decision is implemented; if the other rejects, both get zero
- Treatment 4 (Trust): one randomly selected subject will make the fertiliser allocation and the other decides on the distribution of output

EXPERIMENTAL DESIGN AND PROCEDURES (CONT'D)

- Treatment 5 (Negotiation): on randomly selected subject will make the fertiliser allocation and output distribution and sends this proposal with a short message to the other; if the other agrees, the decision is implemented; if the other does not agree, s/he makes a counter-proposal and send a message; this continues maximum until 6 offers and counter-offers (if not agreement, division will be decided on initial endowment

EXPERIMENTAL DESIGN AND PROCEDURES (CONT'D)

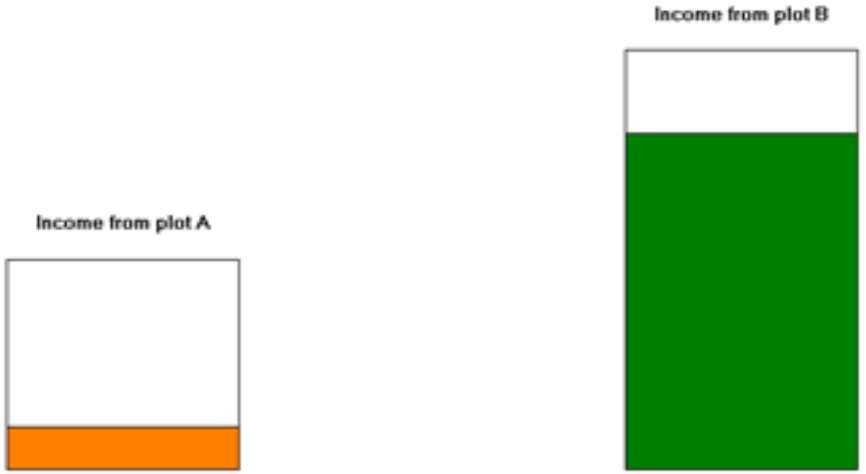
- Treatment 6 (Power, Delegation or Negotiation): each player chooses one of the games from the following:
  - play Treatment 5 (Negotiation)(where alternating players decide on fertilizer use and division of income and send messages) or
  - pay UK£0.50 from your show-up fee to play Treatment 2 (Dictator) where you decide both fertilizer use and division of income and the other player has no influence or
  - receive an additional UK£0.50 from the experimenters for the other person to play Game 2 where s/he decides both fertilizer use and division of income and you have no influence

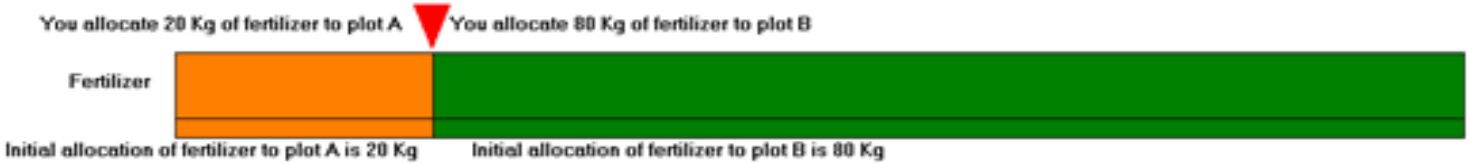
EXPERIMENTAL DESIGN AND PROCEDURES (CONT'D)

- The experiment uses a carefully designed main screen where allocation of fertiliser and distribution of output surplus is captured
- Programmed in z-Tree (Fischbacher, 2007)
- The bottom part of the screen for input decisions and the upper part for income sharing decisions

Fertilizer input allocation

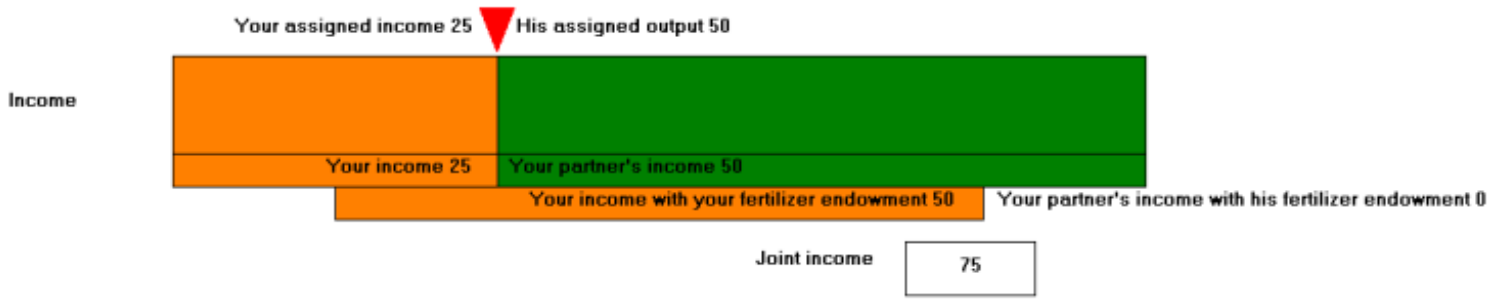
Your income 90

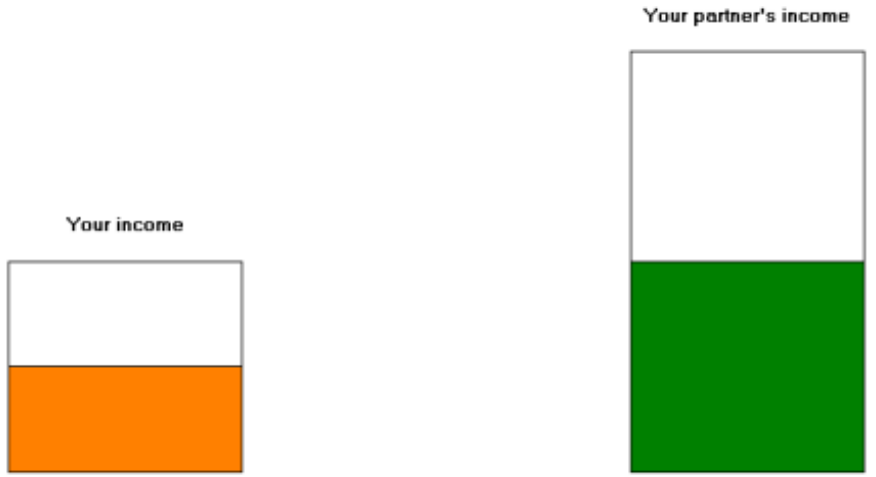




Confirm

Joint income allocation





Confirm

TESTING STRATEGY

- The testing strategy is anchored on two key concepts efficiency, which depends on the choice of input allocation, and equity in material outcomes (division of generated income)
- We also test whether initial endowments (of fertiliser) and efficiency output on separate plots/activities affect both decisions allocation of input and division of income

TESTING STRATEGY

- Individual efficiency (Treatment 1): basis for other treatments too

$$x_{it} = a_x + b_x x^*_{it} + c_x m_{it} + d_x \tilde{x}_{it} + u_{it}$$

x_{it} = share of input decision maker assigns to activity/plot i

x^*_{it} = input allocation maximising efficiency/output

m_{it} = input initially assigned to activity i

$\tilde{x}_{it}$= input allocation that maximises the output of activity i

- Efficiency implies $a_x = c_x = d_x = 0$ and $b_x = 1$ (c_x captures endowment effect; d_x captures output or activity endowment effect)

TESTING STRATEGY (CONT'D)

- Individual efficiency (Treatment 1): basis for other treatments too

$$y_k = a_y + b_y y_k^* + c_y y_{ik}^m + d_y y_k^q + v_k$$

y_k = output

y^*_k = maximum/optimal output

y^m_{ik} = income resulting from setting input allocation equal to initial endowments

y^q_k = total income achieved if decision maker maximised output of his/her activity

- Efficiency implies $a_y = c_y = d_y = 0$ and $b_y = 1$ (c_y captures endowment effect; d_y captures output or activity endowment effect)

EMPIRICAL RESULTS

- High level of efficiency – the median player chooses the optimum input and output
- Some efficiency loss with rejection of offers (ultimatum and negotiations)
- Games with income allocative power to one player (dictator and trust games) are more unequal
- Input/output gap is absolute difference between actual and optimal allocation of fertiliser/output as percentage; equity gap is absolute difference in allocation from 50% (equal split)
- Strong endowment effect; strongest in negotiation game

Table 1. Learning across rounds for each game: magnitude of the gap relative to the efficient or equitable choice

		Input gap			Output gap			Equality gap		
Single subject game	**Percentile:**	**round 1**	**round 2**	**round 3**	**round 1**	**round 2**	**round 3**	**round 1**	**round 2**	**round 3**
	50%	0%	2%	2%	0%	0%	0%			
	80%	33%	3%	5%	17%	0%	1%			
	90%	50%	3%	11%	25%	0%	2%			
	95%	63%	12%	20%	31%	6%	8%			
Dictator game										
	50%	4%	4%	4%	0%	0%	0%	31%	47%	49%
	80%	32%	12%	11%	20%	3%	3%	50%	50%	50%
	90%	50%	24%	31%	32%	12%	19%	50%	50%	50%
	95%	69%	33%	37%	37%	25%	26%	50%	50%	50%
Ultimatum game										
	50%	3%	3%	3%	0%	0%	0%	9%	8%	13%
	80%	23%	8%	6%	11%	2%	1%	25%	17%	22%
	90%	40%	16%	15%	20%	4%	5%	38%	22%	26%
	95%	67%	45%	18%	33%	27%	7%	49%	25%	41%
Trust game										
	50%	3%	4%	4%	0%	0%	0%	20%	35%	48%
	80%	18%	16%	17%	8%	5%	6%	50%	50%	50%
	90%	49%	31%	34%	25%	18%	26%	50%	50%	50%
	95%	67%	48%	52%	33%	33%	44%	50%	50%	50%
Negotiation game										
	50%	4%	5%	5%	0%	0%	0%	0%	1%	0%
	80%	9%	20%	12%	2%	7%	3%	11%	9%	7%
	90%	24%	29%	38%	10%	16%	25%	16%	16%	16%
	95%	33%	38%	62%	15%	30%	69%	24%	25%	50%

Table 2. Input allocation choice

	Single	Dictator	Ultimatum	Trust game	Negotiation	All
x* (optimal input allocation)	0.728***	0.640***	0.461***	0.477***	0.457***	0.647***
	(0.0359)	(0.0539)	(0.0884)	(0.122)	(0.0805)	(0.0315)
m (initial input endowment)	0.0443**	0.0369*	0.00478	0.0671**	0.121***	0.0526***
	(0.0171)	(0.0190)	(0.0228)	(0.0268)	(0.0325)	(0.0113)
x~ (input allocation maximizing own output)	-0.00140	0.168***	0.194***	0.114	0.0831	0.0864***
	(0.0380)	(0.0465)	(0.0566)	(0.0931)	(0.0644)	(0.0225)
Dummy if game order =2						4.278***
						(1.085)
Dummy if game order =3						2.551**
						(1.082)
Dummy if game order =4						1.767
						(1.150)
Dummy if game order =5						0.671
						(1.106)
Dummy if game 6		-2.137			-3.042	-1.498
		(1.902)			(2.849)	(1.497)
Dummy if round=2		-2.728	0.411	-1.322	4.067**	0.936
		(1.691)	(2.388)	(2.890)	(1.992)	(1.064)
Dummy if round=3	4.431**	-4.967***	-1.557	-0.777	1.197	-0.156
	(2.165)	(1.515)	(1.875)	(2.770)	(2.341)	(0.986)
Constant	11.25***	10.49***	15.18***	17.60***	14.36***	8.907***
	(3.059)	(2.338)	(2.981)	(3.925)	(5.228)	(1.735)
Observations	480	649	240	240	311	1,920
R-squared	0.732	0.530	0.526	0.359	0.276	0.529

Table 3. Joint surplus decision

	Single	Dictator	Ultimatum	Trust game	Negotiation	All
Joint surplus with:						
optimal intput allocation	1.145***	0.917***	1.063***	1.134***	0.686***	1.023***
	(0.0461)	(0.0500)	(0.0308)	(0.0815)	(0.211)	(0.0249)
initial input endowment	0.0315***	0.0473**	-0.0164	-0.00969	0.113***	0.0318***
	(0.00990)	(0.0200)	(0.0102)	(0.0266)	(0.0408)	(0.0107)
maximizing own output	-0.00624	0.146***	0.0896*	-0.0139	-0.188	0.0657***
	(0.0366)	(0.0396)	(0.0504)	(0.0819)	(0.114)	(0.0229)
Dummy if game order =2						-5.118***
						(0.920)
Dummy if game order =3						-2.503***
						(0.859)
Dummy if game order =4						-6.588***
						(1.613)
Dummy if game order =5						-6.216***
						(1.316)
Dummy if game 6		1.107			-0.723	2.268**
		(1.242)			(2.284)	(0.942)
Dummy if round=2	6.216***	1.966*	2.569	-2.410	-2.593	1.304*
	(1.653)	(1.047)	(1.616)	(2.828)	(2.167)	(0.731)
Dummy if round=3		1.046	3.529***	-5.764*	-2.676	0.114
		(1.064)	(1.191)	(3.041)	(2.075)	(0.744)
Constant	-23.26***	-16.27***	-22.11***	-20.33*	47.93	-14.53***
	(3.804)	(6.171)	(6.009)	(10.79)	(38.78)	(2.909)
Observations	480	649	240	240	311	1,920
R-squared	0.763	0.590	0.825	0.354	0.199	0.615

Notes: The dependent variable is the joint surplus resulting of the input allocation chosen by the decision

Table 4. Division of joint surplus

	Dictator	Ultimatum	Trust game	Negotiation	All	All with FE
Share of output						
with initial input endowment	-0.0412*	0.0458*	0.0566	0.0678***	0.0163	0.0227
	(0.0231)	(0.0256)	(0.0511)	(0.0228)	(0.0152)	(0.0149)
from own realized output	0.147***	0.327***	0.0825	0.395***	0.192***	0.200***
	(0.0427)	(0.0696)	(0.0869)	(0.0712)	(0.0330)	(0.0305)
Dummy if game order =3					-0.200***	-0.200***
					(0.0157)	(0.0153)
Dummy if game order =4					-0.0136	-0.0227
					(0.0180)	(0.0166)
Dummy if game order =5					-0.291***	-0.291***
					(0.0157)	(0.0153)
Dummy if game 6	0.118***			0.00406	0.0797***	0.0768***
	(0.0178)			(0.0175)	(0.0140)	(0.0137)
Dummy if round=2	0.0221	0.0105	0.0447	-0.0127	0.0146	0.0136
	(0.0148)	(0.0183)	(0.0325)	(0.0127)	(0.00918)	(0.00977)
Dummy if round=3	0.0315**	0.0323*	0.0613*	0.0123	0.0335***	0.0344***
	(0.0158)	(0.0189)	(0.0354)	(0.0166)	(0.0100)	(0.00982)
Constant	0.711***	0.388***	0.668***	0.283***	0.670***	0.665***
	(0.0341)	(0.0381)	(0.0521)	(0.0415)	(0.0267)	(0.0203)
Observations	649	240	239	311	1,439	1,439
R-squared	0.078	0.219	0.027	0.369	0.336	0.426
Number of subjects						160

Table 6. Gender pairing and choice of power structure in game 6

		Gender pairing:				
Decision made:	Game chosen:	male-male	male-fem	fem-male	fem-fem	all
Decide	Dictator game (self)	38%	31%	20%	39%	30%
Negotiate	Negotiation game	23%	27%	33%	23%	27%
Delegate	Dictator game (other)	40%	43%	48%	39%	43%
Total		80	160	160	80	480
Number observations		40	70	90	40	240

Notes: The Table presents the frequency distribution of choices made at the beginning of Game 6

CONCLUSION

- High level of efficiency though not perfect
- Strong endowment effect (both input and output)
- A good framework for looking at allocative efficiency and equity decisions

REFERENCES

- The paper is available at https://web.stanford.edu/~fafchamp/Teams.pdf
- Browning, M., Chiappori, P.-A., & Weiss, Y. (2014). *Economics of the Family*. Cambridge, UK: Cambridge University Press.
- Chiappori, P. (1988). Rational Household Labor Supply. *Econometrica, 56*(1), 63-89.
- Chiappori, P. (1992). Collective Labor Supply and Welfare. *Journal of Political Economy, 100*(3), 437-467.
- Chiappori, P. (1997). Collective Models of Household Behavior: The Sharing Rule Approach. In L. Haddad, J. Hoddinott and H. Alderman (Ed.), *Intrahousehold Resource Allocation in Developing Countries: Models, Methods and Policy*. Baltimore and London: International Food Policy Research Institute (IFPRI) and the John Hopkins University Press.
- Fischbacher, U. (2007). z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics, 10*(2), 171-178. doi:10.1007/s10683-006-9159-4
- Udry, C. (1996). Gender, Agricultural Production, and the Theory of the Household. *Journal of Political Economy, 104*(5), 1010-1046.