Testing household models

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Most attention has been focused on (2), which is not necessarily fortunate.

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Difficulties:

DUNCAN THOMAS
"Intrahousehold allocation: an inferential approach"

Table 2
Effect of Mother's and Father's Unearned Income on Household and Child Health

	Log (caloric intake)	Log (protein intake)	# Children Ever Born	Survival Rate	Log (weight for height)	Log (height for age)
Linear Model						
Unearned income of						
Mother	0.456	1.218	−5.911	0.437	0.317	0.110
	[2.4]	[3.7]	[3.7]	[3.3]	[3.6]	[2.0]
Father	0.063	0.170	−0.734	0.024	0.039	0.026
	[1.8]	[2.0]	[2.3]	[1.9]	[1.7]	[2.8]
Other	−0.100	0.074	−1.169	0.066	−0.027	0.022
	[0.7]	[0.7]	[2.6]	[1.4]	[1.3]	[2.7]
Tests for equality of income effects						
Mother = father	2.75	14.17	10.26	9.69	9.18	2.17
[p-value]	[9.7]	[0.0]	[0.1]	[0.2]	[0.2]	[14.0]
Tests for joint significance						
All coefficients	102.80	132.87	339.85	168.82	38.84	187.12
Income	8.96	26.34	26.50	17.30	12.49	7.68

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  - ➜ Marriage market

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Men always prefer women with more assets, so that a woman with more assets will have more choices, and will select a match that is better aligned to her preferences.

Therefore, controlling for the total assets level, the higher a woman's assets at the time of marriage, the better the allocation will reflect women's preference, despite the fact that the household, once formed, is dictatorial, and not collective.

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- ➜ Duflo (2000). Pension in South Africa.

Grandmothers and Granddaughters

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- ➜ Many pension recipients live in 3-generation households and many (1/3) children live with a pension recipient.
- ➜ Permanent income shock; gender of recipient vary.
- ➜ Eligible families are poorer (extended families, more likely to be rural, poor), therefore children in these families would have been in worst shape without the pension.

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Idea: compare children who live in 3 generations households (with an elderly), where nobody is eligible yet, to children who live in 3 generation households where a man, or a woman, is eligible.

Table 1: Probability of receiving the pension, and fraction of children, by age and gender

	Percentage receiving pension (1993)	% children living with
	(1)	(2)
PANEL A: Men		
Age in 1993		
50-54	2.8	9.77
55-59	4.7	7.62
60-64	22	5.5
65 and above	60	8.02
PANEL B: Women		
Age in 1993		
50-54	13.6	8.24
55-59	16.4	10.86
60 and above	77	21.4

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$$w_{ifk} = \pi_w E_f + \pi_m E_m + \sum_{j=1}^{4} \gamma_j 1_{(j=k)} + W_{ifk}\lambda + X_{ifk}\delta + \epsilon_{ifk}, \quad (1)$$

Table 3: Effect of the program on weight for height
OLS and 2SLS regressions

	Dependent variable: Weight for Height Z-score						
	OLS						2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: GIRLS							
Eligible household	0.14	0.35*	0.34*				
	(0.12)	(0.17)	(0.17)				
Woman eligible				0.24*	0.61*	0.61*	1.19*
(in col. 7: woman receives pension)				(0.12)	(0.19)	(0.19)	(0.41)
Man eligible				-0.011	0.11	0.056	-0.097
(in col. 7: man receives pension)				(0.22)	(0.28)	(0.19)	(0.74)
N. Obs	1574	1574	1533	1574	1574	1533	1533
Panel B: Boys							
Eligible household	0.0012	0.022	0.030				
	(0.13)	(0.22)	(0.24)				
Woman eligible				0.066	0.28	0.31	0.58
(in col. 7: woman receives pension)				(0.14)	(0.28)	(0.28)	(0.53)
Man eligible				-0.059	-0.25	-0.25	-0.69
(in col. 7: man receives pension)				(0.22)	(0.34)	(0.35)	(0.91)
N. Obs	1670	1670	1627	1670	1670	1627	1627
Presence of older members	No	Yes	Yes	No	Yes	Yes	Yes
Family background variables	No	No	Yes	No	No	Yes	Yes
Child Age dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors (robust to correlation of residuals within households and heteroscedasticity) in parentheses.
Indicator for presence of old men and women: presence of a woman above 50, a man above 50, a woman above 56, a man above 56, a man above 61
Family background variables: father's age and education, mother's age and education and rural or metro residence.
Member age variables: family size, number of members aged 0 to 5, 6 to 15, 15 to 24, 24 to 49.
Age dummies: Dummies for whether the child is born in 1991, 1990, or 1989.
The instruments in column (7) are woman eligible and man eligible (the first stage is in table A).

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$$w_{ifk} = \pi_w E_f + \pi_m E_m + \sum_{j=1}^{4} \gamma_j 1_{(j=k)} + W_{ifk}\lambda + X_{ifk}\delta + \epsilon_{ifk}, \quad (1)$$

Results: grandmothers feed girls.

Table 4: Effect of eligibility by gender of the intermediate generation.
OLS regressions

	GIRLS	BOYS
	(1)	(2)
Mother's mother eligible	0.48*	0.099
	(0.21)	(0.27)
Father's mother eligible	0.15	0.29
	(0.25)	(0.30)
Mother's father eligible	0.097	0.00052
	(0.34)	(0.43)
Father's father eligible	0.22	0.25
	(0.48)	(0.44)
Control variables:		
Presence of older members	Yes	Yes
Family background variables	Yes	Yes
Age dummies	Yes	Yes
N. Obs.	1457	1552

Notes: Standard errors (robust to correlation of residuals within households and heteroscedasticity) in parentheses.
Family background variables: father's age and education, mother's age and education and rural or metro residence.
family size, number of members aged 0 to 5, 6 to 15, 15 to 24, 24 to 49,
Age dummies: Dummies for whether the child is born in 1991, 1990, or 1989.
Presence of older members: Dummies for whether there is a woman above 50, a man above 50, a woman above 55, a man above 55, a man above 60.

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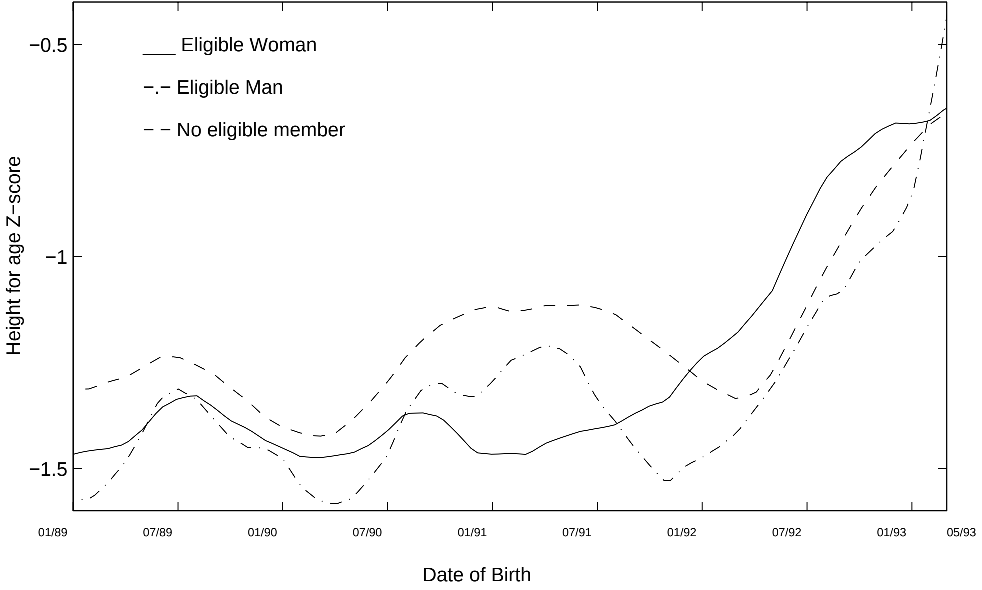
Height for age is a stock measure of nutrition, will respond slowly. Difference in difference-type estimate, with older children serving as control group : they have been exposed to better nutrition a smaller fraction of their lives than younger children.

Figure 1: Height for age of children living with eligible womenn, eligible men, no eligible member



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$$h_{ifk} = \pi_w(YOUNG * E_f) + \pi_m(YOUNG * E_m) + \beta_w E_f + \beta_m E_f + \tag{2}$$

$$\sum_{j=1}^{4} \gamma_j 1_{(j=k)} + X_{ifk}\delta + \sum_{j=1}^{4} 1_{(k=j)} * X_{ifk}\lambda_j + \epsilon_{ifk}, \tag{3}$$

Table 5: Effect of eligibility on height for age.
OLS regressions

	Pension Variable			
	Eligibility	Eligibility	Old Grandparent	Receives Pension
		OLS		2SLS
	(1)	(2)	(3)	(4)
Panel A: Girls				
Eligible household*YOUNG	0.68*			
	(0.37)			
Woman pension variable *YOUNG		0.71*	0.40	1.16*
		(0.34)	(0.27)	(0.56)
Man pension variable*YOUNG		0.097	-0.12	-0.071
		(0.57)	(0.35)	(0.95)
Eligible household	-0.17			
	(0.16)			
Woman pension variable		-0.15	-0.039	-0.15
		(0.17)	(0.13)	(0.17)
Man pension variable		-0.11	0.027	-0.11
		(0.24)	(0.15)	(0.24)
N.obs	1533	1533	1533	1533
Panel B: Boys				
Eligible household*YOUNG	0.11			
	(0.31)			
Woman pension variable *YOUNG		0.18	0.026	0.28
		(0.32)	(0.27)	(0.47)
Man pension variable*YOUNG		-0.30	0.18	-0.47
		(0.32)	(0.30)	(0.71)
Eligible household	-0.15			
	(0.15)			
Woman pension variable		-0.14	-0.084	-0.15
		(0.32)	(0.69)	(0.17)
Man pension variable		-0.073	-0.011	-0.057
		(0.21)	(0.14)	(0.21)
N. Obs	1627	1627	1627	1627
Age dummies	Yes	Yes	Yes	Yes
Family background variables	Yes	Yes	Yes	Yes
Family background variable*age dummies	Yes	Yes	Yes	Yes

Notes: Standard errors (robust to correlation of residuals within households and heteroscedasticity) in parentheses.
Family background variables: father's age and education, mother's age and education and rural or metro residence, family size, number of members aged 0 to 5, 6 to 15, 15 to 24, 24 to 49, above 50
Age dummies: Dummies for whether the child is born in 1991, 1990,or 1989.

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$$h_{ifk} = \pi_w(YOUNG * E_f) + \pi_m(YOUNG * E_m) + \beta_w E_f + \beta_m E_f \qquad (2)$$

$$\sum_{j=1}^{4} \gamma_j 1_{(j=k)} + X_{ifk}\delta + \sum_{j=1}^{4} 1_{(k=j)} * X_{ifk}\lambda_j + \epsilon_{ifk}, \qquad (3)$$

Results: Same as weight for height

EFFICIENCY: RATIOS

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- PSID data, State level sex ratio. State level divorce law.
- Divorce laws that are more favorable to women leads to lower female labor supply, higher male labor supply.
- Sex ratio have the same effects.

TABLE 2
GMM PARAMETER ESTIMATES
HOURS/1000

	Unrestricted Model With Divorce Law Dummies		Unrestricted Model With Aggregated Law Dummies		General Collective Model		Collective Model With Caring		Sharing Rule With Caring
	Wives	Husbands	Wives	Husbands	Wives	Husbands	Wives	Husbands	
$\log \omega_f$	1.409	-0.810	1.427	-0.756	1.427	-0.760	0.873	-1.056	-56.638
	(0.346)	(0.321)	(0.340)	(0.323)	(0.340)	(0.322)	(0.289)	(0.315)	(29.524)
$\log \omega_h$	0.782	-0.597	0.749	-0.564	0.748	-0.568	0.271	-0.827	-25.346
	(0.296)	(0.287)	(0.296)	(0.288)	(0.296)	(0.288)	(0.258)	(0.273)	(22.543)
$\log \omega_f \times \log \omega_h$	-0.440	0.273	-0.433	0.255	-0.433	0.257	-0.215	0.374	20.063
	(0.126)	(0.123)	(0.125)	(0.124)	(0.125)	(0.123)	(0.104)	(0.119)	(10.744)
Nonlabor	-0.009	-0.006	-0.008	-0.006	-0.008	-0.006	-0.007	-0.006	0.698
Income/1000	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.170)
Sex Ratio	-1.796	4.549	-2.143	4.379	-2.283	4.267	-2.314	4.034	216.280
	(0.965)	(1.177)	(0.956)	(1.139)	(0.700)	(1.024)	(0.727)	(1.032)	(88.221)
Divorce Laws Index			-45.685	80.672	-43.994	81.894	-46.004	79.733	4309.954
			(14.136)	(15.529)	(11.769)	(14.337)	(12.579)	(14.679)	(1713.692)
Divorce Laws									
Property Division	-0.102	0.047							
(Community=1)	(0.084)	(0.082)							
Mutual/Unilateral	-0.117	0.022							
(Mutual=1)	(0.050)	(0.053)							
Enforcement	-0.050	0.091							
(Court payment=1)	(0.036)	(0.035)							
Spousal Interest	0.003	0.112							
(Degree as asset=1)	(0.029)	(0.027)							
Intercept	1.174	1.102	1.326	1.071	1.391	1.134	2.720	1.970	
	(0.849)	(0.941)	(0.832)	(0.927)	(0.777)	(0.883)	(0.570)	(0.914)	
Children (≤ 6)	-0.539	0.126	-0.510	0.129	-0.512	0.127	-0.592	0.092	
	(0.158)	(0.112)	(0.155)	(0.112)	(0.155)	(0.111)	(0.151)	(0.112)	
Children (7–17)	-0.098	0.036	-0.087	0.041	-0.087	0.041	-0.098	0.031	
	(0.039)	(0.038)	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)	(0.038)	
Education	-0.018	0.036	-0.023	0.036	-0.022	0.036	-0.019	0.037	
	(0.018)	(0.012)	(0.018)	(0.012)	(0.018)	(0.012)	(0.018)	(0.012)	
Age	-0.128	0.064	-0.130	0.065	-0.131	0.064	-0.160	0.047	
	(0.048)	(0.042)	(0.047)	(0.042)	(0.046)	(0.042)	(0.045)	(0.043)	
White	-0.017	-0.021	-0.010	-0.015	-0.005	-0.011	-0.018	-0.013	
	(0.049)	(0.051)	(0.049)	(0.051)	(0.043)	(0.048)	(0.044)	(0.047)	
Value of Function	22.902		23.473		23.497		26.057		
Newey–West Test					0.024		2.584		

Notes: • Asymptotic standard errors in parentheses.
• Instruments: Second order polynomial in age and education (M-F), Father Education (M-F), White (M-F),Spanish (M-F), City size (3 dummies), North-East, North-Central, West, Protestant (M-F), Jewish (M-F), Catholic (M-F),Sex ratio, Divorce Laws.
• The parameters of the sharing rule are divided by 1,000 (except the one associated with nonlabor income).
• Each regression includes three region dummies (North East, North Central and West).

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Browning and Chiappori (1998), Bourguignon, Chiappori and Lechene (1993). Test generally pass. Specification problems are the same as those encountered above.

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- PSID data, State level sex ratio. State level divorce law.
- Divorce laws that are more favorable to women leads to lower female labor supply, higher male labor supply.
- Sex ratio have the same effects.
- Test: ratio of the coefficient of sex ratio and divorce law should be the same for men and for women.

TABLE 2
GMM PARAMETER ESTIMATES
HOURS/1000

	Unrestricted Model With Divorce Law Dummies		Unrestricted Model With Aggregated Law Dummies		General Collective Model		Collective Model With Caring		Sharing Rule With Caring
	Wives	Husbands	Wives	Husbands	Wives	Husbands	Wives	Husbands	
$\log \omega_f$	1.409	-0.810	1.427	-0.756	1.427	-0.760	0.873	-1.056	-56.638
	(0.346)	(0.321)	(0.340)	(0.323)	(0.340)	(0.322)	(0.289)	(0.315)	(29.524)
$\log \omega_h$	0.782	-0.597	0.749	-0.564	0.748	-0.568	0.271	-0.827	-25.346
	(0.296)	(0.287)	(0.296)	(0.288)	(0.296)	(0.288)	(0.258)	(0.273)	(22.543)
$\log \omega_f \times \log \omega_h$	-0.440	0.273	-0.433	0.255	-0.433	0.257	-0.215	0.374	20.063
	(0.126)	(0.123)	(0.125)	(0.124)	(0.125)	(0.123)	(0.104)	(0.119)	(10.744)
Nonlabor	-0.009	-0.006	-0.008	-0.006	-0.008	-0.006	-0.007	-0.006	0.698
Income/1000	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.170)
Sex Ratio	-1.796	4.549	-2.143	4.379	-2.283	4.267	-2.314	4.034	216.280
	(0.965)	(1.177)	(0.956)	(1.139)	(0.700)	(1.024)	(0.727)	(1.032)	(88.221)
Divorce Laws Index			-45.685	80.672	-43.994	81.894	-46.004	79.733	4309.954
			(14.136)	(15.529)	(11.769)	(14.337)	(12.579)	(14.679)	(1713.692)
Divorce Laws									
Property Division	-0.102	0.047							
(Community=1)	(0.084)	(0.082)							
Mutual/Unilateral	-0.117	0.022							
(Mutual=1)	(0.050)	(0.053)							
Enforcement	-0.050	0.091							
(Court payment=1)	(0.036)	(0.035)							
Spousal Interest	0.003	0.112							
(Degree as asset=1)	(0.029)	(0.027)							
Intercept	1.174	1.102	1.326	1.071	1.391	1.134	2.720	1.970	
	(0.849)	(0.941)	(0.832)	(0.927)	(0.777)	(0.883)	(0.570)	(0.914)	
Children ($\leq$ 6)	-0.539	0.126	-0.510	0.129	-0.512	0.127	-0.592	0.092	
	(0.158)	(0.112)	(0.155)	(0.112)	(0.155)	(0.111)	(0.151)	(0.112)	
Children (7–17)	-0.098	0.036	-0.087	0.041	-0.087	0.041	-0.098	0.031	
	(0.039)	(0.038)	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)	(0.038)	
Education	-0.018	0.036	-0.023	0.036	-0.022	0.036	-0.019	0.037	
	(0.018)	(0.012)	(0.018)	(0.012)	(0.018)	(0.012)	(0.018)	(0.012)	
Age	-0.128	0.064	-0.130	0.065	-0.131	0.064	-0.160	0.047	
	(0.048)	(0.042)	(0.047)	(0.042)	(0.046)	(0.042)	(0.045)	(0.043)	
White	-0.017	-0.021	-0.010	-0.015	-0.005	-0.011	-0.018	-0.013	
	(0.049)	(0.051)	(0.049)	(0.051)	(0.043)	(0.048)	(0.044)	(0.047)	
Value of Function	22.902		23.473		23.497		26.057		
Newey–West Test					0.024		2.584		

Notes: • Asymptotic standard errors in parentheses.
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- Test does not reject equality of ratio.

Efficiency: Ratios

Browning and Chiappori (1998), Bourguignon, Chiappori and Lechene (1993). Test generally pass. Specification problems are the same as those encountered above.

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- PSID data, State level sex ratio. State level divorce law.
- Divorce laws that are more favorable to women leads to lower female labor supply, higher male labor supply.
- Sex ratio have the same effects.
- Test: ratio of the coefficient of sex ratio and divorce law should be the same for men and for women.
- Test does not reject equality of ratio.
- Specification check for Singles: no similar effects.

TABLE 3
PARAMETER ESTIMATES – SINGLES
HOURS/1000

	OLS		GMM	
	Wowen	Men	Wowen	Men
$\log \omega$	-0.036	-0.040	-0.177	0.171
	(0.049)	(0.048)	(0.253)	(0.207)
Nonlabor Income (/1000)	-0.001	-0.001	-0.001	-0.003
	(0.001)	(0.001)	(0.004)	(0.002)
Sex Ratio	4.187	1.121	5.857	0.695
	(2.569)	(2.070)	(2.819)	(2.488)
Divorce Laws Index	-0.018	0.015	-0.152	-0.025
	(0.039)	(0.034)	(0.160)	(0.118)
Intercept	-0.374	1.186	-0.739	1.405
	(1.243)	(1.020)	(1.294)	(1.137)
Education	0.077	0.038	0.095	0.000
	(0.020)	(0.021)	(0.035)	(0.045)
Age	0.052	-0.015	0.079	-0.047
	(0.038)	(0.030)	(0.062)	(0.036)
White	0.123	0.182	0.111	0.206
	(0.111)	(0.089)	(0.166)	(0.110)
North East	-0.083	-0.052	-0.094	-0.114
	(0.104)	(0.082)	(0.123)	(0.111)
North Central	-0.202	0.038	-0.193	0.015
	(0.078)	(0.075)	(0.081)	(0.080)
West	-0.243	-0.166	-0.184	-0.146
	(0.101)	(0.092)	(0.121)	(0.117)
Value of Function			4.470	9.591
Number of Observations	572	498	572	498

Production Efficiency: Udry

Idea: Investment should not be affected by bargaining power. An efficient household should first maximize the total size of the pie, and then divide the pie according to bargaining power.

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Test: for a given year, household and crop, is the yield (and potentially the inputs) a function of the gender of the person who owns the plot?

$$Q_{htci} = X_{htci}\beta + \gamma G_{htci} + \lambda_{htc} + \epsilon_{htci}$$

Where h: household, t: time, c: crop, i: plot

Q_{htci}: yield on plot

X_{htci}: control variable on plot

λ_{htc}: household-time-crop fixed effect.

Test: is γ equal to zero?

Udry, Burkina Faso

TABLE 3

OLS Fixed-Effect Estimates of the Determinants of Plot Yield and Ln(Plot Output) (× 1,000 FCFA)

Dependent Variable: Value of Plot Output/Hectare

	Household-Year-Crop Effects: All Crops (1)		Household-Year Effects: Millet Only (2)		Household-Year Effects: White Sorghum (3)		Household-Crop-Year Effects: Vegetables (4)		Household-Crop-Year Effects: All Crops: CES* (5)	
Mean of dependent variable	89		31		41		134		1.67	
Gender: (1 = female)	−27.70	(−4.61)	−10.36	(−2.53)	−19.38	(−4.43)	−34.27	(−2.21)	−.20	(−3.56)
Plot size:										
1st decile	133.99	(3.50)	−28.35	(−2.67)	−17.90	(−1.92)	237.10	(4.66)		
2d decile	69.10	(4.38)	8.64	(.82)	52.30	(3.16)	63.97	(2.38)		
3d decile	63.45	(5.52)	16.95	(1.81)	47.68	(4.77)	35.87	(1.52)		
4th decile	34.08	(2.88)	9.79	(1.12)	26.73	(3.12)	4.21	(.18)		
6th decile	−2.04	(−.29)	−.99	(−.11)	−6.38	(−1.16)	−6.65	(−.26)		
7th decile	−13.44	(−1.78)	−13.01	(−1.73)	−11.31	(−1.69)	−33.54	(−.90)		
8th decile	−17.23	(−2.59)	−12.97	(−1.34)	−28.58	(−4.82)	31.04	(.73)		
9th decile	−26.68	(−3.81)	−21.50	(−2.65)	−28.65	(−4.98)				
10th decile	−31.52	(−4.49)	−20.56	(−2.55)	−37.70	(−6.03)				
Ln(area)									.78	(29.52)
Toposequence:										
Uppermost	−41.35	(−2.18)	2.50	(.24)	−14.60	(−1.73)	−131.34	(−1.82)	−.46	(−2.71)
Top of slope	−26.35	(−1.27)	9.53	(.96)	−11.27	(−1.47)	−121.05	(−1.85)	−.29	(−1.92)
Mid-slope	−24.38	(−1.19)	5.39	(.64)	−8.62	(−1.15)	−119.68	(−1.88)	−.28	(−1.97)
Near bottom	−21.70	(−.90)	4.48	(.40)	−5.36	(−.71)	−93.96	(−1.30)	−.18	(−1.27)
Soil types:										
11	−32.20	(−.93)	−6.13	(−.92)					−.89	(−2.34)
12	41.82	(1.11)	4.92	(1.18)	47.04	(5.26)			.23	(.74)
13	102.92	(1.10)	7.43	(1.11)	−21.08	(−1.82)			.69	(1.01)
31	1.86	(.36)	10.65	(1.55)	−.00	(−.00)	−36.66	(−.66)	.08	(.83)
32	6.38	(.99)	10.26	(1.23)	−.37	(−.06)	−19.36	(−.38)	.07	(.74)
33	29.42	(2.14)	8.56	(.67)	21.29	(1.52)			.18	(1.14)
37	7.69	(1.37)	6.20	(.80)	−.87	(−.17)	−76.60	(−.49)	.13	(1.36)
45	5.66	(1.03)	7.42	(1.15)	1.36	(.26)	52.92	(.46)	.06	(.67)
46	−17.03	(−1.20)	−25.95	(−1.98)	−7.16	(−.73)			−.32	(−1.16)
51	8.57	(.90)	43.77	(1.72)	−10.35	(−1.20)	12.96	(.26)	.05	(.42)
Location:										
Compound	1.54	(.19)	9.69	(2.67)	−4.98	(−1.04)	32.48	(.38)	.23	(3.02)
Village	−1.82	(−.40)	6.07	(1.45)	−1.68	(−.62)	50.37	(1.58)	.16	(2.35)

Note.—*t*-ratios (in parentheses) and test statistics reported in the text are based on heteroskedastic-consistent estimates of the variance-covariance matrix. The omitted plot size category is the 5th decile. The omitted toposequence is bottom land. The omitted soil type is "all others," and the omitted location is "bush" (far from the village).

* Dependent variable of col. 5 is ln(value of plot output).

TABLE 6

LEAST-SQUARES TOBIT FIXED-EFFECT ESTIMATES OF THE DETERMINANTS OF PLOT INPUT INTENSITIES

	HOUSEHOLD-YEAR-CROP EFFECTS									
	Male Labor per Hectare (1)		Female Labor per Hectare (2)		Child Labor per Hectare (3)		Nonhousehold Labor per Hectare (4)		Manure (1,000 kg per Hectare) (5)	
Gender (1 = female)	−668.47	(−9.60)	70.23	(1.53)	−195.46	(−2.34)	−428.41	(−1.70)	−16.33	(−2.54)
Plot size:										
1st decile	1,209.72	(2.53)	1,462.21	(5.71)	740.80	(1.17)	193.35	(.43)	24.79	(2.42)
2d decile	417.18	(3.25)	1,131.01	(5.82)	143.12	(1.11)	487.39	(1.28)	7.99	(.96)
3d decile	245.94	(2.74)	799.12	(6.72)	133.16	(1.53)	689.39	(1.27)	2.58	(.48)
4th decile	96.53	(1.71)	407.87	(5.02)	72.51	(.68)	378.18	(1.07)	−6.18	(−1.12)
6th decile	−.55	(−.01)	−69.25	(−1.36)	−72.15	(−.98)	57.48	(.80)	−2.14	(−.33)
7th decile	−153.12	(−2.97)	−306.51	(−5.96)	−59.53	(−.60)	65.51	(.64)	−11.08	(−1.54)
8th decile	−375.53	(−6.23)	−386.78	(−6.61)	−184.61	(−1.61)	−43.81	(−.30)	−11.01	(−1.61)
9th decile	−413.36	(−6.79)	−373.57	(−5.16)	−269.99	(−1.83)	−255.15	(−.87)	−11.64	(−1.80)
10th decile	−490.11	(−7.72)	−418.06	(−6.08)	−219.27	(−1.86)	−220.64	(−1.07)	−16.41	(−2.45)
Toposequence:										
Uppermost	41.62	(.35)	−1.92	(−.02)	−55.52	(−.51)	20.20	(.12)	−9.22	(−.62)
Top of slope	29.36	(.30)	91.02	(1.07)	35.15	(.38)	144.02	(.83)	.26	(.02)
Mid-slope	36.08	(.38)	.57	(.01)	.10	(.00)	−15.45	(−.11)	1.14	(.11)
Near bottom	16.42	(.18)	75.94	(.86)	−98.03	(−1.05)	23.27	(.17)	2.88	(.27)
Soil Types:										
3	103.49	(.60)	−31.68	(−.23)	235.74	(.86)	175.29	(.50)	−11.80	(−1.18)
7	−65.79	(−.85)	−30.39	(−.28)	21.88	(.44)	66.04	(.47)	−.07	(−.01)
11	−28.77	(−.09)	−52.06	(−.34)	−778.86	(−4.36)	262.71	(.70)	−.70	(−.08)
12	1,051.98	(.82)	367.34	(1.63)	62.36	(.44)	368.47	(1.13)	16.32	(1.48)
13	274.48	(1.33)	−38.50	(−.29)			−187.07	(−.89)		
21	196.37	(.95)	−43.41	(−.49)	−42.87	(−.35)	37.73	(.27)	2.86	(.18)
31	83.16	(1.59)	68.24	(.92)	205.90	(2.29)	115.56	(1.00)	6.43	(1.29)
32	24.77	(.50)	−10.36	(−.15)	173.14	(1.07)	−51.08	(−.44)	.73	(.12)
33	250.40	(2.57)	163.76	(1.36)	206.68	(.78)	−113.92	(−.37)	17.28	(1.61)
35	179.46	(1.50)	303.86	(1.90)	248.38	(2.60)	195.14	(.58)	−12.75	(−.94)
37	82.49	(.70)	50.84	(.30)	114.53	(1.19)	31.14	(.20)	8.34	(1.44)
45	78.13	(1.34)	−8.33	(−.10)	79.85	(1.02)	41.90	(.25)	8.00	(1.83)
46	−187.14	(−1.84)	141.73	(.76)	42.70	(.09)	223.23	(1.27)	−15.45	(−.79)
51	95.73	(1.83)	−27.01	(−.33)	2.93	(.05)	126.70	(1.05)	.80	(.17)
Location:										
Compound	35.35	(.78)	37.16	(.90)	−18.82	(−.31)	−162.88	(−1.38)	.99	(.24)
Village	19.69	(.70)	12.18	(.45)	42.92	(.93)	25.80	(.30)	5.86	(1.60)
Mean of dependent variable	427.39		466.18		85.55		84.88		1.70	
when >0	506.62		517.17		202.88		213.11		7.78	

NOTE.—This is the least-squares implementation of Honoré's (1992) fixed-effect Tobit estimator. *t*-ratios are in parentheses.

$$Q_{htci} = X_{htci}\beta + \gamma G_{htci} + \lambda_{htc} + \epsilon_{htci}$$

Where h: household, t: time, c: crop, i: plot

Q_{htci}: yield on plot

X_{htci}: control variable on plot

λ_{htc}: household-time-crop fixed effect.

Test: is γ equal to zero?

Estimation of a production function suggests that 5.8% gain in production could be obtained just by reallocating inputs across plots (NB: doing the same exercise in the village would lead to a 13% increase in production).

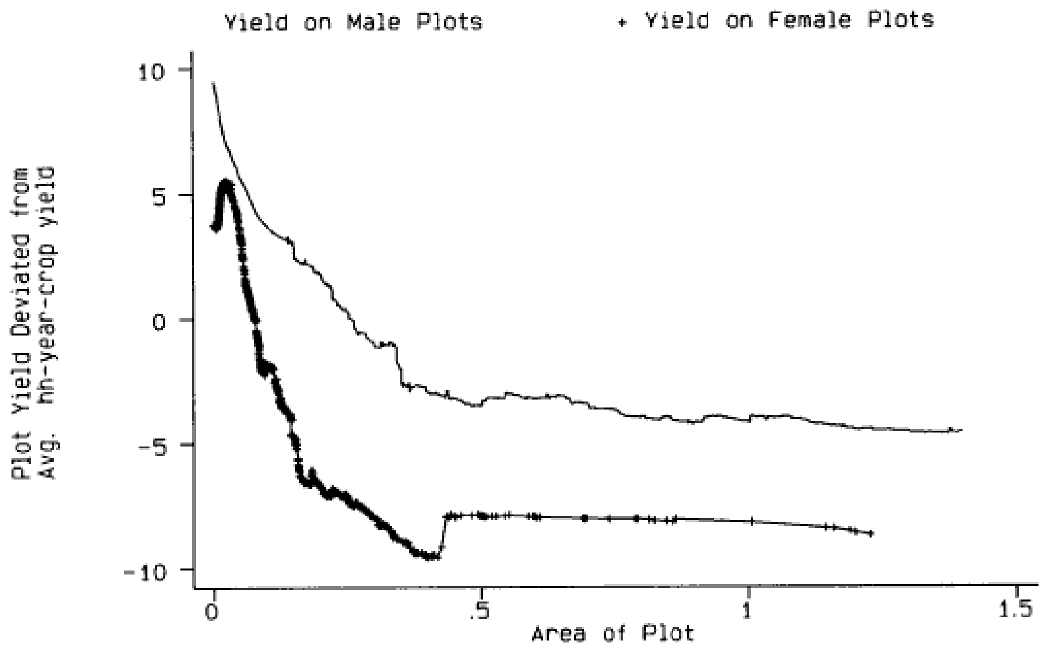

FIG. 2.—Regression of yield on area with household-year-crop effects

TABLE 6

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Plot size:										
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3d decile	245.94	(2.74)	799.12	(6.72)	133.16	(1.53)	689.39	(1.27)	2.58	(.48)
4th decile	96.53	(1.71)	407.87	(5.02)	72.51	(.68)	378.18	(1.07)	−6.18	(−1.12)
6th decile	−.55	(−.01)	−69.25	(−1.36)	−72.15	(−.98)	57.48	(.80)	−2.14	(−.33)
7th decile	−153.12	(−2.97)	−306.51	(−5.96)	−59.53	(−.60)	65.51	(.64)	−11.08	(−1.54)
8th decile	−375.53	(−6.23)	−386.78	(−6.61)	−184.61	(−1.61)	−43.81	(−.30)	−11.01	(−1.61)
9th decile	−413.36	(−6.79)	−373.57	(−5.16)	−269.99	(−1.83)	−255.15	(−.87)	−11.64	(−1.80)
10th decile	−490.11	(−7.72)	−418.06	(−6.08)	−219.27	(−1.86)	−220.64	(−1.07)	−16.41	(−2.45)
Toposequence:										
Uppermost	41.62	(.35)	−1.92	(−.02)	−55.52	(−.51)	20.20	(.12)	−9.22	(−.62)
Top of slope	29.36	(.30)	91.02	(1.07)	35.15	(.38)	144.02	(.83)	.26	(.02)
Mid-slope	36.08	(.38)	.57	(.01)	.10	(.00)	−15.45	(−.11)	1.14	(.11)
Near bottom	16.42	(.18)	75.94	(.86)	−98.03	(−1.05)	23.27	(.17)	2.88	(.27)

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  - The "labor market" within the household is not perfect, because of a lack of secure property rights on the land. Men have more labor, but women don't want men to work on their plots because they fear that the plots will then be confiscated by the husband.

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- ➜ One third player: yams(!!)

	Food consumption	Adult goods	Clothing	Prestige goods	Education
	(1)	(2)	(3)	(4)	(5)
PANEL A: RESTRICTED EXCLUSION RESTRICTION TEST: SEMI PARAMETRIC FORMULATION					
Prediced male non-yam	-0.037	0.178	0.112	0.550	-0.139
income	(0.029)	(0.464)	(0.267)	(0.233)	(0.099)
Predicted yam	0.047	-0.705	0.094	-0.491	0.212
income	(0.032)	(0.588)	(0.282)	(0.155)	(0.136)
Predicted female	-0.006	0.845	0.214	0.534	-0.210
income	(0.034)	(0.623)	(0.370)	(0.192)	(0.130)
F tests (pvalue) :	1.147	0.837	0.203	7.057	1.895
Predicted income variables	(0.339)	(0.479)	(0.894)	(0.000)	(0.143)
jointly significant					
Predicted income variables	1.711	1.252	0.041	10.584	2.635
significantly different	(0.190)	(0.294)	(0.960)	(0.000)	(0.082)
Coefficient of female crops	1.268	2.501	0.054	17.596	4.059
and yam income equal.	(0.265)	(0.120)	(0.818)	(0.000)	(0.049)

Table 4: Restricted exlusion restriction tests

	Staples	Meat	Vegetables	Processed foods	Purchased foods	Food consumed at home
PANEL A: RESTRICTED EXCLUSION RESTRICTION TEST: SEMI PARAMETRIC FORMULATION						
Prediced male non-yam	0.015	-0.053	-0.054	0.004	-0.176	0.068
income	(0.077)	(0.090)	(0.142)	(0.131)	(0.090)	(0.133)
Predicted yam	0.142	-0.093	-0.167	-0.005	-0.018	0.100
income	(0.061)	(0.073)	(0.097)	(0.110)	(0.071)	(0.073)
Predicted female	-0.117	0.195	0.574	0.266	0.127	-0.013
income	(0.080)	(0.103)	(0.144)	(0.164)	(0.135)	(0.104)
F tests (pvalue) :	2.696	2.880	5.640	1.014	1.803	0.952
Predicted income variables jointly significant	(0.055)	(0.044)	(0.002)	(0.393)	(0.157)	(0.422)
Predicted income variables	3.871	4.280	8.229	1.055	1.790	0.630
significantly different	(0.027)	(0.019)	(0.001)	(0.355)	(0.177)	(0.537)
Coefficient of female crops	7.066	8.440	15.467	2.092	1.180	0.996
and yam income equal.	(0.010)	(0.005)	(0.000)	(0.154)	(0.282)	(0.323)

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- ➜ Income variation predicted by rainfall variation should not have effect on bargaining power (there should be short term insurance).
- ➜ Therefore, controlling for changes in total expenditures, we should not see an impact on predicted female income variation and female income variation on changes in expenditures on particular goods.
- ➜ One third player: yams(!!)
- ➜ Results: male and female income affect private "prestige" goods, presumably investment in bargaining power (pagnes and jewelry). female income affect food purchase. Yam associated with only good things.