College Attendance of Women

José-Víctor Ríos-Rull
Penn, CEPR,
IAERP, NBER

Virginia Sánchez Marcos
Universidad Carlos III
de Madrid

June 2001, Preliminary

2001 SED Conference, Estocolmo

- Up to the seventies women went to college less often than men.

Why?

- Is it the optimal behavior of parents that

1. Are equally altruistic towards their children
2. Invest optimally. They note that
   (a) Education Affects earnings.
   (b) Education Affects matching behavior.
   (c) Education Affects fertility behavior.
   (d) Education Affects Intra–household allocation.

• Related question by Behrman, Pollak, and Taubman (1986) and Behrman (1988) They find that equal concerns accounts for differential investments in the data.

• They found that curvature of utility is crucial to account for the data. They did account for the data.

In this paper we want to argue

1. That the channels thorough which education affects welfare that we cited above make it hard to account for the low investment in women's education up to the seventies.

2. That there is a trade–off between for the sex–college–attendance–ratio (SCAR) and the degree of intergenerational persistence that is has to be resolved as part of the answer of how to understand the gender gap.

3. That a comparative advantage of educating the children by educated parents is a crucial feature to understand the SCAR.

- SCAR shows a big gender gap during the mid-seventies for people 25-35. This fact is not particular of generations graduating during the Vietnam war era. We also see this gap in previous generations.

- Several features of the economy are going to be relevant in our analysis:
  - Individual life-cycle earnings by sex and educ.
  - Marital status and sorting.
  - Fertility differences across education groups.
  - Intergenerational persistence of education.

Let's look at the data

Education Distribution, 1976	25-35 years		35-65 years	
	Male	Female	Male	Female
Four or more years of College	31.0	19.7	20.0	10.1
High or some College	54.9	63.0	44.0	55.7
Elemental	14.1	17.3	36.0	34.2

Individual life-cycle earnings, 1976	Male	Female
Four years of College	1.00	0.34
High or some College	0.67	0.17
Elemental	0.49	0.10

Average number of children per Female, 1976	
Four years of College (a)	1.35
High or some college(b)	2.14
Elemental	2.38

Persistence: Fathers to Sons	College	High School	Dropout
College	66.9	32.1	1.0
High School	37.8	57.4	4.8
Dropout	20.4	57.8	21.8

Assortative Sorting by Sex in 1976

Females'	Single	Mar to Coll	Mar to High	Mar to Drop	Total
College	4.61	12.44	2.96	0.00	19.7
High	12.90	11.51	31.36	7.21	63.0
Dropout	3.86	0.20	5.51	7.41	17.3

Males'	Single	Mar to Coll	Mar to High	Mar to Drop	Total
College	5.1	11.94	12.99	0.5	30.5
High	6.81	3.17	36.36	6.35	52.7
Dropout	1.41	0.14	7.36	7.89	16.8

Now, the basic model

- Agents differ in sex, educ, marital status and num of child.
- Perf Cons sharing $\longrightarrow$ same problem for 1 or 2 person hhold.
- Three parts.
  - Current ut: agents derive utility from per capita cons in the hhold in which they live. There are hhold scale econ.
  - Future own ut: If agent survives to next period, he/she will enjoy utility, that is uncertain.
  - Future chil Ut: If agent dies next period, he/she will enjoy ut through their chil ut which depends on educ, (earnings and future marital status). Parents invest affects educ.
- Budget Constraint: total consumption plus expenditures in education must be equal to total household's resources.

A Simple Model of Parental Investment

Type: $g \in \{f, m\}, e \in \{c, h, d\}, z \in \{0, c, h, d\}, n \in \{0, 2\}, s = (z, n)$

Female Decision Problem: $V(f, e, z, 2) =$

$$\max_{c, y^f, y^m} u(c, s) + \beta(1-p) \left[\phi \sum_{z'} \Gamma^{f,e}_{z,z'} V(f, e, z', 0) + (1-\phi) \sum_{z'} \Gamma^{f,e}_{z,z'} V(f, e, z', 2) \right] +$$

$$+\beta \ [\phi(1-p) + p] \ \sum_{g'} \sum_{e'} \sum_{z'} \sum_{n'} \ \gamma_{e'}(y^{g'}) \ \mu(g', e', z', n') \ V(g', e', z', n').$$

subject to $c + y^f + y^m = \varepsilon_{f,e} + \varepsilon_{m,z} \, 1_{z \neq 0}$

- Ut function: we use the CRRA function with OCDE equivalence scales. In addition there is a value of being alive, $\bar{U}$, to account for differential fertility and the fact that there is intrinsic value in having children.

- Prob of coll: more investment on education implies higher prob of attending college.

- Prob of high: given that individual doesn't attend college, more invest implies higher probability of high.

- Symmetric for males and females.

Functional Forms

$$u\left(c,s\right)=\frac{1}{1-\sigma}\quad\left(\frac{c}{1+.7\ 1_{z\neq 0}+1\ 1_{n=2}}\right)^{1-\sigma}+\quad\bar{U}$$

$$\gamma_{c}\left(y\right)=1-\ \exp\left(-\alpha_{1}\ y^{\alpha_{2}}\right)$$

$$\gamma_{h}(y)=\left[1-\gamma_{c}\left(y\right)\right]\ \left[1-\exp\left(-\alpha_{3}\ y^{\alpha_{2}}\right)\right]$$

We start estimating a baseline model that icludes all the basic ingredients. Note that we DO NOT impose the SCAR. We just target males' statistics, a level variable and persistence. The other parameters are standard in macro, $\beta = .95$, $\sigma = 1.5$.

Baseline Calibration	Data	Model
Targets		
Fraction of College Males	31.0	31.0
Fraction of High Males	49.0	49.0
Expenditures on Education / Earnings	.14	.14
Pc|fc/fh	1.77	1.77
Parameters		
α_1		5.52
α_2		.92
α_3		51.40
$\bar{U}$		.73

With the estimates for investment technology and role of fertility $\bar{U}$ of baseline, we look at a sequence of economies with increasing features, using β to get male college attendance and we report the implied SCAR.

1. Education just affects earnings, with varying curvature in ut.

2. Education Affects matching behavior. How education changes the odds of being single and of getting a certain spouse's educ.

3. Education Affects fertility behavior (Take into account that agents of different education have different number of children.

4. Education Affects Intra–household allocatio: higher earnings imply higer consumption. (Echevarría and Merlo (1999)).

	(SCAR) Male/Female
Data	1.57
1. EDUCATION AFFECTS EARNINGS	
Direct Return to Investment (linear utility)	1.87
Utility curvature $\sigma = .25$	1.40
Behrman et al Curvature (.95)	.68
Our baseline Curvature	.49
2. EDUCATION AFFECTS MATCHING BEHAVIOR	
All people married, random sorting	2.83
All people married, data sorting	1.12
Data marital status, random sorting	1.11
Data marital status, data sorting $\sigma = .25$	1.04
Data marital status, data sorting, Behrman et al Curvature	0.99
Data marital status, data sorting	0.93
3. EDUCATION AFFECTS FERTILITY BEHAVIOR	
Baseline	0.66
4. EDUCATION AFFECTS INTRA–HOUSEHOLD ALLOCATION	
Small Role of bargaining	.65
Large Role of bargaining	.61

We find that systematically the model overpredicts female attendance

Next, let's tackle directly the question of how to get the SCAR. We take a clue from Behrman, Pollak, and Taubman (1986) and try to use curvature in preferences to get the answer. So we add a target, the female college attendance ratio, and we add a parameter σ, to achieve this target.

Unfortunately, there is no solution to this task. There is no constellation of parameters capable of achieving our targets. And σ is not that determinant. It is hard to get are the persistence and female attendance simultaneously.

	Data	Calib I $\sigma = .95$	Calib II $\sigma = .95$	Calib III $\sigma = 1.92$	Calib IV $\sigma = 3.85$
Targets					
% of Coll Males	31.0	30.8	28.0	28.1	19.3
% of Coll Fem	19.7	19.5	54.8	20.0	46.4
Pc|fc/fh	1.77	1.14	1.77	1.22	1.75

We then explore a variation on the model that pushes in the direction of both more persistence and more education of women.

We use a comparative advantage of college educated women in educating their children. We had

$$\gamma_c(y) = 1 - \exp(-\alpha_1 y^{\alpha_2})$$

we assume that α_1 varies with the education of one of the parents. So that

$$\alpha_1^c \neq \alpha_1^h = \alpha_1^d \qquad\qquad \alpha_1^c \geq \alpha_1^h.$$

If this is for the male it may increase the returns to educate men as well as it increases the persistence.

If for females assortative matching increases male educational persistence. It turns out that it works better for mothers (there is independent evidence of this).

College Mothers have Comparative Advantage Educating their Children

	Data	Model
Targets		
Fraction of College Males	31.0	31.0
Fraction of High Males	49.0	49.0
Expenditures on Education / Consumption	.11	.10
Fraction of College Females	19.7	19.7
Pc|fc/fh	1.77	1.77
Pc|fc/fd	3.27	2.26
Parameters		
σ		.94
α_1^c		7.69
$\alpha_1^{h,d}$		2.51
α_2		.82
α_3		12.22
$\bar{U}$		-16.04

SUCCESS

Conclusions

• To understand the low investment in female education it seems to be crucial to model comparative advantage of educated parents in educating kids.

• Persistence introduces element of discipline to understand the rationale for differential investments.

Next?

• Need To improve the modelling of the size of the family and its implied utility flows to avoid spurious returns to education.

• Look for overidentifying restrictions to separate the relative advantage of each of the two parents.

References

Behrman, J. (1988): "Intrahousehold allocation of nutrients in rural India: are boys favored? Do parents exhibit inequality aversion?," *Oxford Economic Papers*, 40, 32–54.

Behrman, J., R. Pollak, and P. Taubman (1986): "Do parents favor boys?," *International Economic Review*, 27(1), 33–54.

Echevarría, C., and A. Merlo (1999): "Gender Differences in Education in a Dynamic Household Bargaining Model," *International Economic Review*, 40(2), 265–86.

‘