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ENTREPRENEURSHIP, MARRIAGE, AND EARNINGS

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Abstract—Previous studies have shown that a wife's education increases the labor market productivity of men. This paper finds that such effects are stronger within families who are entrepreneurs in the family business. The analysis also examines factors which determine the decisions of men and women to work in the family business versus seeking alternative employment as a worker. The study considers both the effects of wife's education on husband's earnings and of husband's education on wife's earnings conditional on the choice of employment status.

I. Introduction

Becker (1974) showed that household division of labor increases the incentive to invest in specialized skills. Marriage, in general, tends to increase the incentive for men to invest in market skills and for women to invest in household skills. Benham (1974) and Scully (1979) postulated further that the gains from marriage to any individual household member would be further augmented if the human capital of some other member could be productively utilized for one's benefit, i.e., a cross productivity effect. If human capital can be transmitted in such a manner, even to a limited extent, then the effective stock of human capital possessed by an individual will be a function of both his own human capital and those belonging to other household members. The extent to which a household member can benefit from another household member's acquired skills would depend on the nature of those skills, the incentive to have those skills shared, and the cost of sharing those skills.

In many developing countries there are large numbers of small family enterprises, where household members participate in running the family business. In such households the marketable skills acquired by different members are more likely to be similar. The overlap of household and firm membership strengthens the identification of mutual interest and increases the incentive to share acquired knowledge. The close proximity of household members also reduces the transaction costs of communicating information and of monitoring each others activities. Therefore, given the total stock of human capital of all household members, the effective stock that is available to each member would be larger in entrepreneur families than in worker families.

These observations imply that the market productivity gains associated with marriage will be greater in entrepreneur families than in worker families. Specifically consider a husband and wife household firm. The earnings, E_t, of any member at time t will be a function of the total effective stock, H_t^*, of that member. H_t^* depends on the member's own human capital stock, H_t^o, and the spouse's human capital stock, H_t^s. Hence,

$$E_{jt} = f_j(H_{jt}^*) = g_j(H_{jt}^o, H_{jt}^s)$$

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where $j = e, w$ denotes entrepreneur families and worker families, respectively. It is postulated that

$$\frac{\partial g_e/\partial H^o_{et}}{\partial g_e/\partial H^s_{et}} < \frac{\partial g_w/\partial H^o_{wt}}{\partial g_w/\partial H^s_{wt}}.$$

This relationship is expected to be true for both men and women, although, as we shall see, it will be more difficult to test it among women because of the data we have. On theoretical grounds it is also more difficult to test the relationship among women. This is because if women tend to specialize more in home production, then the major cross productivity effects will not be reflected in gains in market skills.

The hypothesis that cross productivity effects are more important in entrepreneur than in worker families suggests that small family businesses may utilize human capital resources to greater effect, provide stronger incentives for members to accumulate human capital, and increase the gains from marriage and promote marital stability. It also provides a partial explanation that is independent of risk preference as to why entrepreneurial families have higher incomes than worker families.

II. Model Specification

A. Earnings Functions

To test the above hypothesis a slightly augmented version of the Mincer (1974) earnings function is specified as follows:

$$\begin{aligned}\text{log monthly earnings} &= b_{0j} + b_{1j} \cdot \text{own education} \\ &\quad + b_{2j} \cdot \text{spouse education} \\ &\quad + b_{3j} \cdot \text{years of experience} \\ &\quad + b_{4j} \cdot \text{years of experience}^2 \\ &\quad + b_{5j} \cdot \text{years married} \\ &\quad + b_{6j} \cdot \text{years married}^2 \\ &\quad + b_{7j} \cdot \text{China born} + \epsilon_j.\end{aligned}$$

The above equation can be estimated separately for men and women in different j, where $j = e$ denotes entrepreneurs and $j = w$ denotes workers. The term ϵ_j is included to capture random errors. We postulate that $b_{1e} - b_{2e} < b_{1w} - b_{2w}$, the difference in the effects of own education and spouse education on log earnings is greater among workers than entrepreneurs for both sexes. Years of experience is defined as age minus years of schooling minus 4. For women the experience variables are probably poor measures of market activity. The dummy variable indicating whether one was born in China is entered to capture location-specific human capital differences and possible labor market screening or discrimination effects. The omitted category is birth place in Hong Kong.

For a number of reasons the cross-productivity gains derived from spouse's human capital stock need not be fully realized at the start of marriage, but may grow with years of marriage until the onset of end-of-horizon effects. An individual's investment in and rate of depreciation of human capital may be a function of spouse's education. The costs and incentives for communicating knowledge among family members may vary directly with length of association. This can be tested in two ways. First, the years married variables are entered as shown in the above equation. The estimated coefficients are expected to satisfy $b_{6j} > 0$ and $b_{7j} < 0$. Becker (1974) and Keeley (1977) have suggested that age of marriage is endogenously determined. Hence, the use of years married variables as regressors may suffer from simultaneous equations bias. Given the paucity of data we do not attempt to perform two-stage estimation corrections because of the arbitrariness of identification restrictions. Second, the years married variables are omitted and a simpler equation is estimated in subsamples grouped according to number of years married. The term $(b_{1w} - b_{2w}) - (b_{1e} - b_{2e})$ is expected to be larger in groups which have been married longer.

B. Selectivity Bias

Men have two choices: to be an entrepreneur or a worker, and women have three choices: to be an entrepreneur, a worker, or a non-labor force participant. The choice is clearly not random and depends on the differences in pecuniary and non-pecuniary net gains among alternative states. This means that direct estimation of the earnings functions without conditioning them on the choice of a particular work status will lead to biased estimates.

Heckman's (1976) two-stage estimation methods can be used to handle this problem. The specific model used here is due to Lee (1983), who developed a tractable method for correcting selectivity bias in models with polychotomous choice. It entailed the estimation of a reduced-form multinomial logit choice model, binomial for men and trinomial for women. The estimated parameters are then used to construct a correction factor, λ_j, which is used as a regressor in the earnings function. The resulting OLS estimates of the parameters of the earnings functions will be consistent. A negative coefficient for the λ_j variable indicates positive correlation between the choice function and the earnings function.

TABLE 1.—OLS ESTIMATES OF EARNINGS FUNCTIONS

	Men				Women			
	Entrepreneur		Worker		Entrepreneur		Worker	
Constant	7.5001 (34.12)	7.5626 (34.56)	6.1011 (140.81)	6.2625 (132.01)	3.6081 (6.13)	3.7522 (6.90)	5.3134 (52.07)	5.2536 (45.03)
Own Education	0.0245 (4.67)	0.0242 (3.75)	0.0321 (15.77)	0.0360 (15.20)	−0.0114 (0.83)	−0.0521 (1.68)	0.0533 (10.91)	0.0589 (10.89)
Spouse Education	0.0431 (8.42)	0.0420 (8.00)	0.0270 (14.03)	0.0260 (13.35)	0.0161 (1.54)	0.0152 (1.31)	0.0337 (7.89)	0.0325 (7.75)
Years of Experience	0.0020 (0.30)	0.0093 (1.01)	0.0162 (7.02)	0.0103 (3.50)	0.0191 (1.32)	0.0305 (1.33)	0.0045 (0.99)	0.0070 (1.04)
Years of Experience^2	−0.00014 (1.50)	−0.00004 (0.34)	−0.00022 (7.12)	−0.00014 (3.36)	−0.00011 (0.50)	−0.00032 (0.96)	−0.00001 (0.20)	−0.00011 (1.06)
China Born	−0.0597 (1.01)	−0.0628 (1.11)	−0.1471 (8.73)	−0.1560 (9.22)	.0366 (0.33)	0.0505 (0.47)	−0.1299 (3.89)	−0.1285 (3.88)
Years Married		0.0106 (1.32)		0.0068 (2.45)		0.0618 (2.85)		0.0025 (0.36)
Years Married^2		−0.00024 (1.67)		−0.00032 (5.29)		−0.00093 (2.04)		−0.00019 (1.22)
λ_e	−0.5513 (7.38)	−0.5600 (7.32)			0.6093 (2.00)	0.9288 (2.95)		
λ_w			0.3488 (7.22)	0.3972 (8.22)			0.2318 (3.60)	0.2631 (4.04)
R^2	0.2468	0.2453	0.2969	0.3009	0.0440	0.0621	0.3605	0.3761
N	1159		4121		517		1126	

Note: Absolute value of asymptotic t-statistics are in parentheses.

III. Data

The data used in the present study are the 1/100 sample of the 1976 By-Census of the Hong Kong population. It was the first census to include individual monthly earnings information. Only married individuals who live with their spouse were included in the current sample. It was further restricted to the male working population who were not in agriculture or fisheries, which were either born in China or Hong Kong. Altogether this resulted in a sample size of 5,280. Among men there were 1,159 entrepreneurs and 4,121 workers. Among women there were 647 entrepreneurs, 1,128 workers, and 3,505 non-labor force participants. The term entrepreneur included all those who classified themselves as either employers, self-employed workers (including hawkers), and family workers. Among women, 130 entrepreneurs (mostly unpaid family workers) and 2 workers classified themselves as working without pay. Hours of work of entrepreneurs was difficult to obtain and was not asked. So hourly wage rates cannot be constructed for entrepreneurs. This is a particularly serious problem among women entrepreneurs who are likely to have a high variance in hours of work. Consequently, their earnings will be a poor indicator of productivity effects and will be heavily contaminated by labor supply effects. The average earnings of women entrepreneurs is about a half of that of women workers, which indicates that most of the entrepreneurs only work part-time.[1]

IV. Results

A. Choice of Employment Status

Multinomial logit models developed in McFadden (1982) are used to model men's and women's choice of employment status. Two sets of estimates were obtained using the method of maximum likelihood. One set included number of years married as an explanatory variable and the other set omitted it. The difference between the two sets of estimated coefficients was slight. The set of estimates which included the number of years married variable is given in appendix II. The normalization rule requires the sum of all corresponding coefficients across all categories to equal zero. For men the estimates reflect preference for being an entrepreneur over a worker. For women the estimates reflect preference for being an entrepreneur or a worker over a non-labor force participant. The results are interesting in their own right and indicate how various factors affect the differential gains among alternative choices.

[1] Appendix I gives the means and standard deviations of the variables that are subsequently used in the analysis.

They are, however, not the focus of this paper and for the sake of brevity we shall omit any discussion of them.[2] Somewhat similar results have been obtained by Hill (1983) with Japanese data for women.

B. Cross Productivity Effects and Earnings

(*i*) *Men*: Table 1 presents ordinary least squares (OLS) estimates of the earnings functions for both entrepreneurs and workers, which are corrected for sample selection bias by entering either the λ_e or λ_w variable as an additional regressor in the earnings functions. These variables are constructed from the estimated logit coefficients.[3] The estimated coefficient for λ_e is significantly negative and that for λ_w is significantly positive. This implies that selection is not random, and that observed earnings of workers are greater than the population mean, but that of entrepreneurs are less than the population mean.

The estimates show that own education has a larger effect on log earnings than spouse's education among workers, but the opposite is true for entrepreneurs.[4] All education coefficients are highly significant. The results are clearly consistent with the family firm hypothesis that cross productivity effects are more important among entrepreneur families. But there is still a puzzle. The spouse's education effect on men's log earnings is substantially greater than the own education effect among entrepreneurs. This is because even if there were complete and costless transmission of knowledge between spouses, there is little reason to believe that spouse's education is more important than own education in generating earnings.[5]

The problem here is one of interpretation. If assortative mating is admitted into the analysis, then the positive association between men's log earnings and spouse's education is simply a result of more productive men marrying more educated women. Positive assortative mating will complement the cross-productivity effect and magnify the observed positive association. Such an interpretation is consistent with the evidence, but is unfortunately difficult to substantiate using the limited body of information available in census data sets. Nevertheless, the case for the existence of larger cross productivity effects among entrepreneur families than among worker families cannot be dismissed.

Years married was also entered in quadratic form as another measure of the accumulated stock of marriage induced human capital. The estimated coefficients have the expected concave profile, but are only significant among the workers and are insignificant among the entrepreneurs. We noted earlier the problem that age at marriage is also endogenously determined and may therefore lead to biased estimates. The coefficients of other variables were not much altered by the inclusion of the years married variables.

The other test of length of marriage effects is to split the sample into those who have been married for ≤ 15 years and > 15 years. Separate regressions were estimated for each subsample. Table 2 gives the estimated education coefficients. Note that the effect of spouse's education on men's log earnings is relatively higher than that of own education for those who have been married longer. The result is more pronounced among entrepreneurs than among workers.

Other unreported results are briefly summarized. Years of experience was entered in quadratic form and the usual concave experience profile is observed. The estimated coefficients are statistically significant among the workers, but not among the entrepreneurs. The China born dummy variable has a significant negative coefficient among the workers, but an insignificant negative one among the entrepreneurs.

Previous analyses of earnings functions usually indicate that the number of children and the spacing of children are important determinants of male earnings. The inclusion of such variables in both the employment status choice and earnings functions may cause multicollinearity problems. Results not reported here indicate that the number of children age ≤ 6 and age 7–12 had significant positive effects on men's log earnings among the workers, but had insignificant negative effects among the entrepreneurs.[6] A positive effect is consistent with the idea that young children are mother's time intensive, and the resulting reallocation of time of family members induces the father to spend more time in the labor

[2] A short note discussing the estimates may be obtained from the author upon request.

[3] To be consistent, those earnings regressions which included the years married variables used the λ_e or λ_w variable constructed from estimates obtained from the logit model which contained the years married variable. Similarly, the corresponding logit estimates were used to construct the λ_e or λ_w variable in the earnings regressions which omitted the years married variables.

[4] A Chow test of the hypothesis that $b_{1e} - b_{2e} < b_{1w} - b_{2w}$ cannot be rejected at the 99% level of significance. When the married years variables are omitted we have $F(1, 5266) = 29.03$. When the married years variables are included we have $F(1, 5262) = 27.82$.

[5] Benham's (1974) study of the United States and Scully's (1979) study of Iran both found that the own education effect on men's log earnings was greater than the spouse's education effect; a result similar to that of workers in Hong Kong. The U.S. and Iran studies, however, do not distinguish between workers and entrepreneurs. One wonders if a similar pattern would emerge if the distinction was made. In all three studies, the zero order correlation coefficient between own education and spouse's education is around 0.65, a remarkable finding for such different societies.

[6] These regression results and those for women may be obtained from the author upon request. Three children variables were used: the number of children age ≤ 6, 7–12, and ≥ 13.

TABLE 2.—OLS ESTIMATES OF THE EFFECT OF EDUCATION ON EARNINGS

	Years Married ≤ 15		Years Married > 15	
	Entrepreneur	Worker	Entrepreneur	Worker
Men:				
Own Education	0.0428	0.0471	0.0143	0.0169
	(4.32)	(15.82)	(2.01)	(5.40)
Spouse Education	0.0289	0.0277	0.0497	0.0244
	(3.39)	(10.01)	(7.19)	(8.71)
Women:				
Own Education	−0.0300	0.0773	0.0351	0.0327
	(0.78)	(11.38)	(0.79)	(4.13)
Spouse Education	0.0170	0.0311	0.0100	0.0281
	(0.96)	(5.50)	(0.68)	(4.70)

Notes:
1. Other unreported regressors include experience years, experience years squared, whether China born dummy, and a correction factor for sample selection bias.
2. Absolute value of asymptotic t-statistics are in parentheses.

market. That such effects are less important in entrepreneur families may stem from the lesser demands that are made on mother's time, and so weakens the resulting time reallocation effects. The estimated coefficients on the λ_e and λ_w variables were not affected by the inclusion of the children variables; other estimated coefficients remained the same.

(*ii*) *Women:* From table 1 we find that both the λ_e and λ_w coefficients are significantly positive. Selection is again not random. For both workers and entrepreneurs, the observed earnings are greater than the population mean.

With the exception of the years married variables, all estimated coefficients are statistically insignificant among women entrepreneurs. This is probably because measured earnings of these women reflect both productivity and labor supply effects. Results obtained through splitting the sample by years married are also similar (see table 2). No attempt is made to interpret these estimates.

Among women workers, the own education and spouse's education estimates are both positive and significant. Own education has a greater effect on log earnings than spouse's education. Splitting the sample by years married shows that the stronger effect of own education relative to spouse's education is more evident among women who have been married for ≤ 15 years than among those > 15 years. This is consistent with the idea that the full benefits of spouse's education is obtained later in marriage and not at the beginning.[7]

Both years of experience and years married profiles are concave in log earnings, but all the estimates are insignificant. This is not unexpected since both are inadequate measures of the extent of investment in market productivity for women. Women workers who were born in China earn significantly lower earnings than those born in Hong Kong.

Including variables on the number of children of different ages in the log earnings regressions gives rise to multicollinearity problems in the entrepreneur regressions; the λ_e coefficient becomes insignificant and none of the estimates of the children variables are found to be significant. In the worker regressions the outcome is quite different. An increase in the number of children in any age group reduces women's log earnings significantly; the effect of young children age ≤ 6 is strongest. The λ_w coefficient remains significantly positive. Some of the point estimates of the coefficients are altered, but do not affect our interpretation.

[7] Including variables on the number of children of different ages in the regression does not affect this interpretation.

V. Conclusions

This paper shows that the effect of education on spouse's labor market productivity should take into account how a family chooses to engage in market work. Entrepreneurial families derive greater benefits from marriage than worker families. Male entrepreneurs obtain more labor market benefits than workers from marrying well-educated women. These benefits have implications not only for earnings, but also for when and whom to marry and also marital stability. For women, the tests are marred by data limitations. But there is evidence that women workers also benefit from marrying more educated men.

Previous studies of the cross productivity hypothesis can be challenged on the grounds that the alternative assortative mating hypothesis yields similar predictions. By recognizing the distinction between entrepreneur and worker type families, this study sheds additional light on the sorting and cross productivity effects.

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APPENDIX I.—MEANS AND STANDARD DEVIATIONS

	Men		Women		
	Entrepreneur	Worker	Entrepreneur	Worker	Not in Labor Force
Log Earnings	6.9647 (0.7696)	6.9278 (0.5254)	5.4142 (0.8789)	6.4550 (0.5910)	
Own Education	8.18 (4.93)	9.12 (4.78)	4.78 (4.43)	8.01 (5.49)	6.37 (4.97)
Spouse Education	5.55 (5.15)	6.79 (5.06)	7.36 (4.13)	9.78 (4.94)	8.92 (4.84)
Years of Experience	34.81 (13.32)	28.38 (13.31)	31.34 (12.52)	23.49 (13.94)	28.15 (14.27)
China Born	0.8352	0.7239	0.8362	0.7048	0.7461
Years Married	21.03 (12.29)	15.29 (11.33)	18.88 (10.35)	13.45 (10.89)	16.86 (11.82)
Subsidized Housing	0.2657	0.4749	0.5054	0.4069	0.4220
Home Ownership	0.3940	0.2252	0.2365	0.2456	0.2725
No. of Children Age ≤ 6	0.5280 (0.8820)	0.6171 (0.9020)	0.6321 (0.8837)	0.3679 (0.7038)	0.6650 (0.9437)
No. of Children Age 7–12	0.7584 (1.0341)	0.6484 (0.9573)	1.0124 (1.1044)	0.5417 (0.8937)	0.6519 (0.9618)
No. of Children Age ≥ 13	1.6575 (1.8443)	1.3477 (1.7225)	1.5873 (1.7896)	1.2092 (1.6377)	1.4505 (1.7788)
N	1159	4121	647	1128	3505

APPENDIX II.—LOGIT ESTIMATES OF CHOICE OF EMPLOYMENT STATUS

	Men	Women	
	Entrepreneur	Entrepreneur	Worker
Constant	−2.5374	−1.3975	−0.2572
	(0.2319)	(0.2888)	(0.2094)
Own Education	−0.0065	−0.0421	0.0395
	(0.0119)	(0.0169)	(0.0134)
	[−0.0011]	[−0.0045]	[0.0067]
Spouse Education	−0.0027	−0.0381	−0.0108
	(0.0097)	(0.0118)	(0.0100)
	[−0.0005]	[−0.0028]	[−0.0005]
Years of Experience	0.0184	−0.0166	−0.0097
	(0.0067)	(0.0105)	(0.0083)
	[0.0032]	[−0.0011]	−0.0009]
China Born	0.4059	0.3516	−0.0163
	(0.0944)	(0.1075)	(0.0837)
	[0.0695]	[0.0290]	[−0.0115]
Years Married	0.0281	0.0169	−0.0213
	(0.0064)	(0.0099)	(0.0082)
	[0.0048]	[0.0019]	[−0.0035]
Subsidized Housing	−1.1089	0.1019	0.1571
	(0.0918)	(0.1090)	(0.0888)
	[−0.1900]	[0.0042]	[0.0196]
Home Ownership	0.3000	−0.0056	−0.1473
	(0.0871)	(0.1243)	(0.0962)
	[0.0514]	[0.0034]	[−0.0207]
No. of Children Age ≦ 6	0.1543	−0.0267	−0.7217
	(0.0461)	(0.0563)	(0.0546)
	[0.0264]	[0.0167]	[−0.1017]
No. of Children Age 7–12	0.1464	0.2512	−0.0296
	(0.0362)	(0.0416)	(0.0406)
	[0.0250]	[0.0212]	[−0.0108]
No. of Children Age ≧ 13	0.0401	−0.0219	−0.0900
	(0.0225)	(0.0289)	(0.0251)
	[0.0069]	[0.0006]	[−0.0122]
−2 log likelihood	4986.20	8430.43	
McFadden's ρ^2	.345	.282	

Notes:

1. Asymptotic standard errors are in parentheses.

2. Partial derivatives evaluated at sample means in square brackets. For the binomial case these are obtained by the formula $P_i(1 - P_i)\beta_i$. For the trinomial case these are obtained by the formula $P_i(\beta_i P_i + \beta_j P_j - \beta_i)$. The P_i's denote mean probabilities and β_i's the estimated logit coefficients.

3. McFadden's ρ^2 is analogous to the multiple correlation coefficient in the linear statistical model. See McFadden (1974), p. 121.