## Income, Human Capital and Sex Discrimination:

#### Some Evidence from Costa Rica, 1963 and 1973

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#### I. Introduction

Income disparities by sex are a cause of worldwide concern because women comprise a disproportionate number of the poor, concern which becomes more critical in less developed countries given their greater absolute poverty levels. Two major interpretations have emerged regarding the nature and cause of this phenomenon. On the one hand, the human capital view explains sex-earnings differentials in terms of unequal pre-labor-market endowments, acquired skills and productivity with emphasis on formal education, job experience and labor market attachment (Becker; Chiswick and Mincer; Hall and Kasten; Schultz; Smith and Morgan). On the other hand, sex discrimination proponents attribute income disparities to current labor market discrimination with respect to education and work experience (Bergmann and Adelman; Fuchs; Hirsch and Leppel; Weisskoff). The

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<sup>&</sup>lt;sup>1</sup> The sex discrimination approach can be broadened to include role differentiation and occupational segregation as important factors (Barrett, Bergmann, Boulding). In this view, current labor market discrimination is seen as less central than the continuing effects of past discrimination in labor markets and in education that result in current productivity differences.

observations in most cases, imply that income dispersion per sexoccupation grouping was rather small.

In both 1963 and 1973 average male earnings exceeded average female earnings in all categories, the differences being statistically significant. Over the decade six occupations experienced an improvement in the female-male earnings ratio, four occupations experienced a deterioration, and one remained unchanged. Neither the female-male earnings ratio change nor size appears related to the average income or the standard deviation of the various occupations.

Interoccupational wage differences were great, with obvious implications for the prevalence of widespread poverty. As often occurs with economic development, highest/lowest earnings ratios actually widened between 1963 and 1973, from 13.4 to 14.6 for men and from 8.2 to 13.0 for women. The expanding female income range among occupations during the decade is especially striking as it became more similar to the male pattern.

### III. Sex Differentials in Labor Force Characteristics

Schooling often is used as an indicator of human capital accumulation (Becker; Chiswick and Mincer; Schultz; Smith and Morgan). Earnings are expected to vary positively with time devoted to formal education, and in fact the data show that the highest-income occupations reflected the highest levels of schooling while, even more strongly, the lowest-income occupations coincided with the lowest educational levels.<sup>7</sup>

Except for female managers, the schooling of Costa Rican workers increased between 1963 and 1973 for every occupation-

<sup>&</sup>lt;sup>5</sup> For men, monthly earnings ranged from US\$700 to US\$48 in 1973 and for women from US\$476 to US\$37.

<sup>6</sup> Real income rose for Costa Rican earners of both sexes over the 1963-1973 period, at least for the workers in our 11 occupational categories. Over the ten years the general price index increased by approximately 40 percent (Direction General de Estadistica y Censos, 1973), but monthly monetary earnings grew by 137 percent for men and 104 percent for women (94 percent for men and 98 percent for women when excluding agricultural workers).

<sup>7</sup> An exception to this generalization were teachers of both sexes, whose earnings in both years were quite low commensurate with their average educational level.

at comparable levels of want satisfaction (Kuznets). Therefore, sex-income differentials could be partly explained if a higher proportion of male than female workers resided in urban areas. The censuses, however, reveal the opposite residential pattern. For eight out of ten occupations with significant male-female differences in 1963, the ratio of urban to rural for all working women was higher than the same ratio for men, while in 1973 a higher female ratio occurred in eight out of nine occupations where male-female differences were significant. This pattern probably reflects underlying differences in cultural values and role socialization between the cities and the countryside. Compared to men, women are freer to work in urban areas due to diminished traditionalism in urban economic life and, hence, more female employment opportunities.

Relatively more working men than women were recent migrants into the region where employed. The incidence of men who migrated within five years prior to the 1963 and 1973 censuses exceeded that of women for all occupations with statistically significant male-female differences. This factor could exacerbate income disparities, since it has been shown (Carvajal and Geithman, 1974) that in Costa Rica recent migrants earn higher incomes than do settled migrants and nonmigrants. Of course, it is possible that the cause-effect sequence runs in the opposite direction — rather than higher male earnings being due to proportionately more male recent migrants, recent migrants could be paid more because proportionately more men are recent migrants.

Although relatively more men than women were recent migrants, both rural out-migration and urban in-migration were markedly selective of women. Male migration was largely urban-to-urban, urban-to-rural and rural-to-rural. Of course, the predominantly rural-to-urban character of female migration in Costa Rica matches the observed residence differentials between the sexes mentioned above. Apparently greater cultural freedom for women to work and the availability of female employment opportunities have attracted both urban-born and rural-born women into urban labor markets (Carvajal and Geithman, 1979).

Another productivity-related concept relevant to sex-wage differentials is time spent employed. If men devoted more time to sex in the ith occupation in the hth year;

E<sub>hijk</sub> is the number of years of formal schooling completed by the kth individual of the jth sex in the ith occupation in the hth year;

 $A_{hijk}$  is the age of the *k*th individual of the *j*th sex in the *i*th occupation in the *h*th year;

U<sub>hijk</sub> is a dummy variable for urban-rural residence, with a value of 1 if the kth individual of the jth sex in the ith occupation in the hth year lived in an urban area, a value of 0 otherwise;

 $S_{hijk}$  is a dummy variable for marital status, with a value of 1 if the kth individual of the the jth sex in the ith occupation in the hth year was single, a value of 0 otherwise;

M<sub>hijk</sub> is a dummy variable for migration, receiving a value of 1 if the kth individual of the jth sex in the ith occupation in the hth year migrated within five years prior to the census, a value of 0 otherwise;

 $V_{hijh}$  is a normally, independently distributed stochastic disturbance; and  $b_{0hij}$ , ....,  $b_{8hij}$  are the least-squares coefficients to be estimated for the jth sex, ith occupation, and hth year;

and where h = 1963, 1973; i = 1,..., 11; j = male, female; k = 1,...,  $K_{hij}$ ; and the usual least-squares assumptions apply.

Estimated coefficients for the 44 equations, consisting of 11 occupations for each sex in 1963 and 1973, are shown in Tables 2 and 3, respectively. The coefficients for education and age generally perform as expected with all linear, quadratic and interaction terms statistically significant. For men in 1963 the sign of the education linear term is usually negative, while the quadratic term is always positive excepting only agricultural workers. This implies that, for men in 1963, earnings tended to decline for very low educational levels (and always outside the schooling range relevant to the occupation), quickly reached a bottom, and then rose at an increasing rate for more education. For women in 1963 and for both sexes in 1973 the linear education coefficient is generally positive and the quadratic term negative, meaning that, as formal schooling increased, earnings also increased but at a decreasing rate, always reaching a peak at an educational level well above the upper schooling limit relevant for each occupation.

differentials is rich and complex. Men had more schooling than women in some occupations while women were more educated than men in other fields. Male workers were older than female workers, which points out differences between the sexes in acquired skills and productivity. Working men also were more likely than women to be married, which could be indicative of a greater female labor market withdrawal probability. Within each occupational grouping, women were more likely than men to work in cities and to have migrated into an urban area, which suggests, all other things being equal, income differences in favor of women due to higher urban relative to rural wage rates; working men, however, were more likely than women to have migrated recently into nonurban areas. Finally, there were no meaningful differences between the sexes in the amount of time spent in working per year or per week.

Applying these findings to the human capital or sex discrimination view can be facilitated through (a) interpreting the F ratios and coefficients of multiple determination; (b) developing income elasticities of education and age; and (c) calculating education-earnings projections.

#### A. F Ratios and Coefficients of Multiple Determination

The F values, which determine whether or not the effect on earnings of the entire set of variables in an equation is significant, also appear in Tables 2 and 3. The estimated high levels of confidence imply that the variables analyzed here indeed exerted a major influence on earnings. Male F ratios almost always exceeded F ratios for corresponding female equations, thus suggesting that the specification of the model in terms of its five independent variables, as these contribute to shaping wages, is more appropriate for male than female earners. This conclusion is supported by the observed pattern of the coefficients of multiple determination (R<sup>2</sup>). For every occupation in both 1963 and 1973, the equations for males exhibit greater explanatory power than the corresponding equation for females, apparently implying that other unmeasured factors play a more important role for female vis-a-vis male income determination.

#### B. Income Elasticities of Education and Age

between age-earnings elasticities and occupations except that the income of the lowest-paying category (agricultural workers) was consistently very age inelastic regardless of sex or year. An evident trend over time, however, seems favorable to female relative to male workers. In 1963 age-earnings elasticities were higher for women than men in only three occupations, but ten years later these elasticities were higher for women in six occupations. Moreover, there was a tendency for male wages to become age inelastic and female wages age elastic — men's age-earnings elasticities were higher in 1973 than in 1963 for only two occupations, but women's were higher for six occupations.

Another finding emerges clearly when comparing education-earnings and age-earnings elasticities. With some exceptions concentrated in the higher-paying categories, for both sexes age-earnings elasticities exceeded education-earnings elasticities in both years. It appears that for the few occupations requiring high levels of technical training (e.g., physicians/dentists, managers/administrators), both male and female wages were relatively more responsive to formal schooling than to age. But for all other occupations income was relatively more responsive to informal occupational training and on-the-job experience than to formal education. Teachers, however, are an exception to this generalization.

#### C. Education-Earnings Projections

Based on the estimated coefficients presented in Tables 2 and 3 for male and female workers, education-earnings projections for all 11 occupations and both sexes in both years can be calculated. These projections are illustrated in Figures 1-11 over each occupation's schooling range, defined as mean schooling plus/minus two standard deviations, and control for age (at 35 years), place of residence (rural), marital status (married), and past migration behavior (nonmigrant) so as to exclude the effects of these variables on the connection between education and earnings.

The education-income projections reveal that male wages exceeded female wages for virtually every level of schooling in every occupation in both years. For example, a woman manager with 13 years of schooling in 1963 had an earnings projection (1,378 colones per month) substantially lower than a man in the same oc-

through on-the-job training as well as implications of female labor force withdrawal, these differentials conceivably could justify higher male productivity and earnings. But there appears to be little, if any, validity to this explanation since the pattern of male superiority in earnings occurs despite controlling explicitly for both age and marital status.

The conclusion of sex discrimination is also consistent with the finding that the F ratios and coefficients of multiple determination in the least squares equations for men exceeded those in the equations for women. Variables other than the five specified in the model apparently are of greater importance in determining female than male earnings.

Some misgivings about the conclusion of sex discrimination could arise due to the broadness of the 11 occupational groupings used in this study. Several groupings probably contained a variety of skills and abilities, possibly resulting in different productivities between the sexes within a given occupational category. It is instructive, therefore, to focus on groupings in which men and women alike could reasonably be expected to have performed very similar job tasks with a small dispersion of skills and abilities bearing no systematic relationship to the sex of the workers. Examples are teachers (virtually all employed at the primary and secondary levels), telephone/telegraph operators and tailors/dressmakers. For each of these occupational categories the female-male earnings ratio was actually lower than the combined weighted average female-male earnings ratio for all occupational groupings (excluding agricultural workers) in both 1963 and 1973. Moreover, as shown in the education-earnings projections, when age, place of residence, marital status and past migration behavior are standardized, the same pattern of male income superiority prevails in these three occupational categories as in the other eight.

MEAN AND STANDARD DEVIATION OF SELECTED VARIABLES FOR WAGE EARNERS BY OCCUPATION AND SEX

Lante 1. (Cont'd)

		Education (years)	ttion s)			Age (years)				Single Earners (percentage)	amers itage)	
Occupation	1963	33	1973	ξ.	1963	20	1973	in	1963		1973	
	Male	Female	Male	Female	Male	Female	Malc	Female	Male	Female	Malc	Female
Physicians/dentists	16.4**	14.5** (4.6)	17.8**	17.1**	37.4 (11.0)	37.6 (11.5)	38.6**	32.5**	0.20**	0.54**	0.12**	
Managers/administrators	7.8**	10.7** (4.6)	11.2* (4.1)	10.4*	40.2 (12.7)	38.1 (12.7)	39.2 (12.4)	39.4 (11.4)	0.15**		0.12**	
Teachers	13.2**	14.0**	15.8** (2.9)	16.1**	31.2 (10.7)	31.4 (9.6)	32.1 (8.9)	32.2 (8.7)	0.43	0.42 (0.49)	0.34 (0.47)	0.34
Telephone/telegraph operators	6.1 (2.5)	6.2 (1.8)	7.4**	8.0**	36.1** (12.2)	30.8** (10.4)	36.1**	31.5** (11.1)	0.24**		0.23 **	
Bookkeepers/cashiers	7.5 (3.0)	7.2 (2.1)	9.5**	9.3 **	30.7" (12.5)	29.7" (10.9)	32.5** (11.3)	29.9** (10.7)	0.43**	0.66**	0.30**	0.56**
Sales clerks/street vendors	5.5**	5.8**	6.3 **	6.8**	29.5** (13.0)	28.0** (11.4)	28.2**	27.1**	0.51**		0.56**	
Tailors/dressmakers	5.3 (1.9)	5.4 (1.8)	6.0 (2.2)	6.0 (1.9)	31.0** (12.2)	32.6** (12.0)	30.3 ** (12.3)	28.3**	0.44**	0.57**	0.47**	0.67**
Workers in food and beverage industries	4.6**	4.8** (2.1)	5.3**	5.5** (2.5)	31.8** (14.4)	23.0** (10.0)	30.7** (13.4)	26.9** (11.6)	0.44**	0.86**		0.76**
Waiters/waitresses	4.9**	4.7** (2.2)	5.7**	5.3**	31.4** (13.1)	30.1**	30.6 (12.6)	30.4 (11.4)	0.48**	0.64**		0.60**
Porters/janitors	5.1 (2.3)	5.0 (1.7)	5.4**	5.8** (2.1)	32.4 (16.1)	32.8 (11.3)	38.2** (16.6)	33.4** (11.6)	0.51 (0.50)	0.53 (0.50)		0.51**
Agricultural workers	4.8*	4.7* (2.8)	5.7* (4.4)	5.3**	32.3**	26.2**	32,6** (14.9)	26.9** (12.6)	0.48**			0.74**

Male-female differences statistically significant at the .99 level.
Male-female differences statistically significant at the .95 level.
Male-female differences statistically significant at the .90 level.

ESTIMATED VALUES OF THE 1963 LEAST-SQUARES COEFFICIENTS, THEIR STANDARD ERRORS, AND LEVELS OF SIGNIFICANCE BY OCCUPATION AND SEX

Table 2

C	Occumation	Inter	Education	tion	Age		Age Education	Urban	Marizal			Coefficient of Multiple
9 R	and Sex	cept	(E)	$(\mathbb{E}^2)$	રિ	(A <sup>2</sup> )	Interaction (E.A.)	Residence (U)	Status (S)	Migration (M)	Ľ.	Determination (R2)
Physicians/dentists												
	Men	-309.9	-41.4* (20.0)	6.90*	52.5" (30.3)	-0.46**	1.28" (0.74)	70.3	-557.7**	127.9*	24.4**	0.46
	Women	Women -201.4	-53.9"	4.34"	36.2"	-0.33"	0.49"	-5.0	-76 3"	(1.00)	0 0	4
			(30.6)	(2.26)	(19.7)	(0.20)	(0.27)	(323.8)	(£.1)	(158.2)	0.0	0.42
Managers/administrators	ators											
	Men	-219.8	26.5" (15.0)	1.86* (0.91)	51.8** (7.1)	-0.30**	1.31**	170.5**	-260.1**	123.5**	98.2**	0.69
	Women	-98.7	36.8"	-0.83"	18.0	~0.30"	1.15"	36 3"	-1500"	14.28	4000	,
			(21.0)	(0.47)	(7.2)	(0.17)	(0.63)	(21.5)	(953)	(6.0)	17.8	0.04
Teachers												
	Men	501.4	-40.5* (19.9)	1.34*	14.9**	-0.17**	1.40**	119.3**	-125.5**	47.9**	111.5**	0.51
	Women	43.7	10.0*	"20 0-	# E	(2000)	(01:0)	(10.3)	(13.7)	(0./1)		
			(5.4)	(0.03)	(1.8)	(0.02)	(0.06)	13.6* (6.1)	-20.6** (5.4)	12.9*	272.5**	0.50
Telephone/telegraph												
operators	Men	325.4	-74.3* (35.4)	4.12** (1.59)	17.6* (7.9)	-0.18* (0.09)	2.02**	151.5**	-12.1" (6.3)	87.2**	21.0**	0.52
	Women	172.3	25.3"	-1.82"	18.5**	-0.14	0.75*	81.6**	-323"	12.6"	12.3**	0 24
Poolition on backing			(15.2)	(0.99)	(5.5)	(0.06)	(0.38)	(20.4)	(18.8)	(7.4)	ì	17:0
over-persy casulers	Men	1000	113 64		4	,						
	II STATE	7.677_	(6.8)	(0.15)	28.6**	-0.23 ** (0.07)	2.43**	10.8" (6.0)	-143.4** (33.8)	22.0*	87.8**	0.88
	Women	-240.2	20.8" (11.1)	-0.04" (0.02)	21.2* (8.5)	-0.30** (0.08)	0.61*	34.8" (18.2)	-1.0	5.1"	15.7**	0.33
Sales clerks/street										`		
vendors	Меп	65.7	-24.2** (4.6)	2.76**	13.7**	-0.20**	0.69**	30.7**	-96.5**	17.0**	253.2**	0.67
	Women	-22.0	12.7**	-0.19"	19.4**	-0.11**	0.26**	23.3**	-22.2**	3.1"	59.2**	0.29
				(0.11)	(7:1)	(0.01)	(0.10)	(6.9)	(6.4)	(1.7)		

ESTIMATED VALUES OF THE 1973 LEAST-SQUARES COFFFICIENTS, THEIR STANDARD ERROR, AND LEVELS OF SIGNIFICANCE BY OCCUPATION AND SEX

Table 3

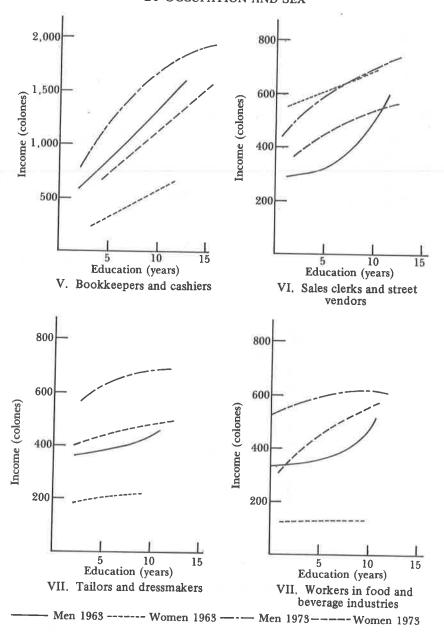
Occupation	Inter	Education	ion	Age		Age Education	Urban	Marital			Coefficient of Multiple
and Sex		(E)	(E <sup>2</sup> )	€	(A <sup>2</sup> )	Interaction (E-A)	Residence (U)		Migration (M)	Ţ	Determination (R2)
Physicians/dentists											(-44-)
Меп	-9,135.1	709.3" (390.6)	-19.23" (11.49)	271.2* (121.3)	-3.11** (0.41)	2.53*	70.1	-601.3**	66.1"	20.4**	0.36
Women	1 -2,764.9	399.1" (223.4)	-11.65" (6.05)	36.3" (21.2)	-0.89" (0.48)	5.40"	-413.4 (540.8)	-1,010.3**	386.0"	7.5**	0.32
Managers/administrators									(1:011)		
Men	-4,522.6	201.1* (94.0)	3.07" (1.65)	171.6**	-1.64**	1.19"	401.2**	-696.2**	571.0**	80.8	0.55
Women	-5,924.5	215.6* (110.0)	-6.85* (3.35)	247.4**	-2.12* (1.04)	0.47"	31.1"	-314.1	433.2"	10.3 * *	0.50
Teachers								(1:004)	(1.077)		
Men	55.8	60.5" (36.8)	-2.69* (1.23)	18.2**	-0.45**	2.44**	235.2**	-190.5**	131.1**	185,4**	0.54
Women	-1,393.7	229.9**	-7.33** (1.03)	37.9** (6.3)	-0.43**	0.48*	22.4*	-16.0"	59.3**	76.3	0.22
Telephone/telegraph	-328.9	16.0"	7 73*	**7 73		. 2			(1:01)		
		(8.5)	(1 20)	0.4.0	10.07	0.39"	181.3**	-121.4*	12.6"	16.8**	0.36
Women	-2564	31.5#	(1.50)	(10.1)	(0.10)	(0.23)	(42.0)	(51.3)	(7.4)		
		(11.9)	(1.28)	(10.0)	-0.43** (0.11)	0.07" (0.04)	187.9**	-90.1** (34.0)	49.1"	27.7**	0.30
Bookkeepers/cashiers											
Men	-1,427.7	151.8** (12.4)	-3.62** (0.63)	80.7**	-0.81**	0.05"	72.4**	-1.73.9**	54.3**	339.4**	99.0
Women	-979.4	48.8** (10.0)	0.39" (0.22)	65.6**	-0.73**	0.32*	96.7**	-84.7**	16.6"	103.7**	0.54
Sales clerks/street vendors	7 66 5 7	4	4								
TOTAL	123.0	(5.3)	(0.29)	(1.6)	-0.28** (0.02)	0.26**	37.6**	-94.9**	19.9*	130.4**	0.42
Women	28.8	33.1**	-1.26**	13.1**	-0.15**	0.12"	17.5**	-34.9**	5.8"	81.5**	0.27

Table 4

ESTIMATED VALUES OF 1963 AND 1973 EDUCATION-EARNINGS AND AGE-EARNINGS ELASTICITIES BY OCCUPATION AND SEX

		Education	Education-Earnings	SS		Age-Earnings	nings		
Occupation	1963		1973	3	1963		1973	73	
	Male	Female	Male	Female	Male	Female	Male	Femala	
Physicians/dentists	1.89	1.31	0.47	0.06	2 2			- Cinary	
Managers/administrators	200	000			7/.0	0.70	0.03	0.73	
Tond	6.0	70.0	1.15	0.51	1.51	0.35	0.72	1.79	
reachers	0.64	0.51	0.48	0.11	0.60	0.45	0.50	0.43	
Telephone/telegraph operators	0.47	0.38	0.50	0.58	0 08	105		÷ .	
Bookkeepers/cashiers	0 01	07.0			0	1.03	0.40	0.51	
Colon closed to the	0.01	0.09	0.00	0.64	1.65	0.58	69.0	0.78	
Sales cierks/street vendors	0.47	0.41	0.35	0.30	0.54	1.65	0.57	0 21	
Tailors/dressmakers	0.16	0.13	0.17	0.14	0 22	710	70.0	0.57	
Workers in food and beverage ind.	0.18	0.08	000	0.44		01.0	0.20	0.17	
Waiters/waitresses	000		0.0	ţ	0.47	0.29	0.25	0.57	
	0.20	0.05	0.14	80.0	0.45	0.33	0.45	0.33	
rorrers/janitors	0.65	0.42	0.28	0.24	99.0	0 44	0.22	0.40	
Agricultural workers	0.11	0.16	000	0 17			0.0	0.40	
		27:0	0.0	0.17	0.12	0.24	0.20	0.13	

# V-VIII 1963 AND 1973 PROJECTED URBAN MONTHLY WAGE-AND-SALARY EARNINGS AT AGE 35, WITH ALTERNATIVE YEARS OF EDUCATION, BY OCCUPATION AND SEX



Appendix I

WAGE EARNERS IN COSTA RICA IN 1963 AND 1973, BY SELECTED OCCUPATION AND SEX

Occupation	W	Male	Fen	Female
	1963	1973	1963	1973
Physicians/dentists	462	1.148	35	130
Managers/administrators	1,775	1,219	66	108
Teachers	3,134	6,709	8,144	14.176
Telephone/telegraph operators	266	711	461	526
Bookkeepers/cashiers	1,019	5,691	527	2.203
Sales clerks/street vendors	9,352	12,459	3,566	6.602
Tailors/dressmakers	1,691	2,210	3,338	5.328
Workers in food and beverage industries	3,421	7,441	2,113	2,053
Waiters/waitresses	2,192	4,038	2,316	4,736
rorters/janitors	1,720	13,016	1,180	4,899
Agricultural workers	94,839	108,517	2.422	2,542

sources, 17, Winter 1982, 3-24.

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