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WIVES' LABOR FORCE PARTICIPATION, WAGE
DIFFERENTIALS AND FAMILY INCOME INEQUALITY -
THE ISRAELI EXPERIENCE

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ABSTRACT

Recent decades have witnessed a sharp increase in the labor force participation of married women. The paper investigates the effect of wives' earnings on family income distribution. This effect depends on the inequality of women's earnings as compared with other sources of income, on the correlation between the two and on the woman's share in total income. These in turn depend on participation patterns, labor supply and sex related wage differentials. In general, only the correlation between the various sources of income has an unambiguous effect on inequality, the effects of the other factors depending on the specific values of the parameters.

In Israel where there are sharp differences in participation rates of married women and in sex related earnings differentials by schooling group, wives' earnings reduce total family income inequality, increasing at the same time the between-group (ethnic and schooling group) variability. The paper examines the effect of changes in the participation rate and the wife-husband earnings gap on family income inequality. It compares the effect of wives' earnings with other income sources (e.g., transfers) and examines the implication of separate tax returns for inequality.

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AND FAMILY INCOME INEQUALITY - THE ISRAELI EXPERIENCE

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A. INTRODUCTION

The upsurge in the labor force participation of married women that has taken place in many Western societies in the last decades proved to be an economist's bonanza. Economists ranged far and wide to explore its effect on marriage, divorce, fertility, time spent with children, and other time uses. It may, therefore, look somewhat surprising how little economists have mined their own backyard. It is only recently that they have approached the classical problem of income distribution. Though much effort has been spent explaining sex-related earnings differentials, relatively little has been done to analyze the effect of the increased participation of married women on the inequality of family income distribution, an issue of perhaps greater importance.^{1/} Given the large fraction of life one spends as a member of a multiperson household sharing resources and expenditures, the distribution of welfare among society members depends to a large extent on the distribution of resources among its families, and it is, therefore, of interest to investigate to what extent the recent changes in the labor force composition have affected this distribution.

It has been shown (Layard and Zabalza, Smith) that the answer to this problem is far from simple. The effect of women's earnings on inequality depends on the inequality of women's earnings as compared with other sources of income, on the correlation between the two, and on the women's share in total family income. These in turn depend on participation patterns, supply of labor and sex related wage differentials. It is most difficult to separate the various effects since they tend to interact in more than

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^{1/}Mincer [1974] was one of the first to discuss this topic. In his thorough analysis of male earnings, he discusses briefly the impact of growth of the female labor force, concluding that it, "while increasing earning inequality among all persons, has actually been a factor in the mild reduction of money income inequality among families."

one way. Recent studies have emphasized the role of the correlation between the wife's earnings and other sources of income as a major determinant.^{2/} Our analysis indicates that it is not generally possible to pinpoint a single factor as the crucial variable and, in particular, the sign of the correlation coefficient is far from sufficient to predict the effect of the increasing prevalence of two-earners families on income inequality. Given the complexity of the problem, little can be inferred from the American and British experience (analyzed by Smith and Layard and Zabalza) about the effect of women's earnings on family income inequality in other places, or at other times.

To demonstrate this complexity and to come to a better understanding of the problem in other respects as well, I examine the case of Israel. The labor force participation rate of Jewish married women in Israel increased over the last two decades by more than one half (from 24.5 percent in 1959 to 37 percent in 1978). Past studies (Gronau, 1978) have shown that wives' labor force participation patterns are strongly influenced by education, and there existed a large difference in participation patterns between Asian-African born and European-American born or Israeli born. We use data from the 1975/76 Family Expenditure survey to examine the differential effect of wives' earnings on the inequality of income of the various education and ethnic groups, and the inequality in the population as a whole.

The paper opens with a theoretical analysis of the implications for family income inequality of superimposing the wife's earnings distribution on the distribution of other sources of income. I identify the main players, namely wives' labor force participation rate, the wife-husband earnings ratio (when both are employed), their relative dispersion and their correlation, and examine their interactions. The next section introduces the players in the Israeli context. The wives' earning structure, the wife-husband earnings ratio, and labor force participation are analyzed. Schooling is observed to be the major factor explaining participation, earnings and changes in husband-wife wage differentials. Other things being equal, wives' hourly earnings are on average only 70-75 percent of those of husbands', but the wage gap narrows considerably with education. The effect of schooling on participation is sufficiently strong to sweep the opposite income effect, giving rise to a positive correlation between husbands' and wives' earnings. Wives' earnings are shown (in Section D) to reduce family earnings inequality. The reduced inequality is due primarily to a decline in within-group variation, which offsets the increase in between-group (education and ethnic group) variability. These changes are traced to intergroup differences in wives' participation, the other factors having only a marginal effect in the Israeli case.

^{2/} That is true for Smith and to a lesser degree for Layard and Zabalza. Smith explains the difference between white and black families in the effect of wives' earnings on inequality by the positive correlation that exists between wife's and husband's earnings in black families and the negative correlation in white families (wife's earnings having an important compensatory function in white families but much less so in black families).

Sex related wage discrimination affects inequality in many ways. The wage gap by itself tends to reduce inequality, but since this gap is not the same for all schooling and ethnic groups, between-group variability may increase. However, both these effects are observed to be marginal. More important is the dampening effect the wage gap has on wives' participation, but even this effect is only moderate. Finally, the Israeli tax structure which allows for separate tax returns, neutralizes much of the distributional effect of the wives' earning and, thus, exerts a regressive influence on family income distribution.

B. WOMEN'S EARNING AND INEQUALITY IN FAMILY INCOME

The exact effect of the wives' earnings on the family's income distribution depends, naturally, on the measure of inequality chosen. Of the traditional measures (e.g., the coefficient of variation, the variance of the logarithm of income, the Gini coefficient, Atkinson's measure of inequality) the easiest to analyze in this context is the coefficient of variation. This analysis will, hopefully, highlight the major factors accounting for inequality.

For simplicity let us assume that the family has only two potential sources of income, husband's and wife's earnings, and that the husband is always employed.^{3/} Let μ_1 and μ_2 denote the means, σ_1 and σ_2 the standard deviations and C_1 and C_2 the coefficients of variation of husband's and wife's earnings, respectively, and let ρ denote the correlation between the two. The coefficient of variation of family income (C), is the weighted average of the coefficients of variation of the individual components and the covariation among them, where the weights are determined by the individual's contribution to family income.

$$(1) \quad C^2 = \alpha^2 C_1^2 + (1-\alpha)^2 C_2^2 + 2\alpha(1-\alpha)\rho C_1 C_2$$

where α is the husband's share in total income ($\alpha = \mu_1/\mu = \mu_1/(\mu_1+\mu_2)$).^{4/}

The coefficient of variation of family income is always smaller than the weighted average of its individual components ($C < \alpha C_1 + (1-\alpha)C_2$) unless the latter are perfectly positively correlated ($\rho=1$). Comparing family income

with husband's earnings, the ratio of their coefficients of variation ($E = C/C_1$) depends on the ratio of the individual components ($\theta = C_2/C_1$), on their correlation and on the share parameter α

$$(2) \quad E^2 = (C/C_1)^2 = \alpha^2 + (1-\alpha)^2 \theta^2 + 2\rho\alpha(1-\alpha)\theta$$

Specifically, the introduction of wives' earnings reduces income inequality ($E < 1$) if

^{3/} These assumptions can be easily removed and are used only for simplicity of notation.

^{4/} To derive (1) note that the variance of family income σ^2 equals

$$\sigma^2 = \sigma_1^2 + \sigma_2^2 + 2\rho\sigma_1\sigma_2 .$$

Hence,

$$C^2 = (\sigma/\mu)^2 = \left(\frac{\mu_1}{\mu}\right)^2 \left(\frac{\sigma_1}{\mu_1}\right)^2 + \left(\frac{\mu_2}{\mu}\right)^2 \left(\frac{\sigma_2}{\mu_2}\right)^2 + 2\left(\frac{\mu_1}{\mu}\right)\left(\frac{\mu_2}{\mu}\right)\rho\left(\frac{\sigma_1}{\mu_1}\right)\left(\frac{\sigma_2}{\mu_2}\right) .$$

$$(3) \quad C_1 > \frac{C_2}{1+\alpha} [\rho\alpha + (1 - (1-\rho^2)\alpha^2)^{1/2}] .$$

The probability that this holds is a non-decreasing function of the husband's share in family income^{5/} and a decreasing function of the correlation between wives' and husbands' earnings (ρ) and their relative dispersion (θ).

Generally, the higher the correlation between the earnings of husband and wife, the more likely that women's earnings increase the inequality in family income (E). When this correlation is positive, inequality is enhanced as the inequality in the wife's earning relative to the husband's (θ) increases. However, the effect of θ is not monotonic, and when the correlation is sufficiently negative ($\rho < -\theta(1-\alpha)/\alpha$) an increase in θ reduces E .^{6/} Finally, the effect of the husband's share in family income on inequality is ambiguous, and depends on the exact magnitudes of α , ρ and θ .^{7/}

$$(4) \quad \frac{\partial E}{\partial \alpha} \gtrless 0 \quad \text{as} \quad \alpha \gtrless \frac{\theta(\theta-\rho)}{1-2\rho\theta+\theta^2} .$$

Only if $\rho > \theta$ or $\rho > 1/\theta$ is the sign of the effect on E of a change in the husband's share (α) independent of the exact size of this share ($\partial E/\partial \alpha$ is positive in the first case and negative in the second.)^{8/} If $\theta > 1$ (as is usually the case) and $\rho < 1/\theta$ an increase in α reduces E for low values of α and increases it for high values.

Variations in σ_2 , α and ρ are, in general, not independent, since all three are affected by common factors. They depend on the labor force participation rate of women, on the supply of labor of working women, and on the male-female wage differentials. Formally let P denote the rate of participation, β - the ratio of female to male earnings where the wife is employed (β depends in turn on the ratio of working hours and the relative wage), and let γ denote the ratio of the wife's coefficient of variation of earnings

^{5/}The derivative of the right hand side of equation (3) with respect to α is

$$C_2 \{ \rho - \alpha(1+\alpha)(1-\rho^2) [1 - (1-\rho^2)\alpha^2]^{-1/2} - [1 - (1-\rho^2)\alpha^2]^{1/2} \} / (1+\alpha)^2 .$$

This term is non-negative for all values of $\rho \leq 1$.

$$\frac{6/}{\partial \theta} \frac{\partial E^2}{\partial \theta} = 2(1-\alpha)[(1-\alpha)\theta + \alpha\rho] .$$

$$\frac{7/}{\partial \alpha} \frac{\partial E^2}{\partial \alpha} = 2[\alpha(1 + \theta^2 - 2\rho\theta) + \theta(\rho-\theta)] .$$

The first of these terms is always positive, hence we can derive (4).

^{8/}These two cases are, clearly, mutually exclusive since $\rho > \theta$ implies $\theta < 1$ and hence $\rho < 1/\theta$ and vice versa.

to husband's ($\gamma = C_{2e}/C_1$, where e denotes employed persons). The share of the wives' earnings in total income of two-earner families equals $\beta/(1+\beta)$, and their share in the population as a whole is $\beta P/(1+\beta P)$. Hence,

$$(5) \quad \alpha = 1/(1+\beta P) .$$

The variance of the wives' earnings distribution depends on the variance in the subset of employed wives, on their mean earnings and on the participation rate.^{9/}

$$(6) \quad \sigma_2^2 = P\sigma_{2e}^2 + P(1-P) \mu_{2e}^2 .$$

The squared coefficient of variation of wives' earnings equals, therefore,

$$(7) \quad C_2^2 = [C_{2e}^2 + (1-P)]/P = [\gamma^2 C_1^2 + (1-P)]/P .$$

$$(8) \quad E^2 = \{1 + \beta^2 P(\gamma^2 + \frac{1-P}{C_1^2}) + 2\beta P[\gamma^2 + \frac{1-P}{C_1^2}]^{1/2}\} / (1+\beta P)^2 .$$

The number of hours that women work is much less standardized than that of men, a much larger percentage of women opting for a part time job (i.e., fewer hours or fewer weeks). An increase in the variability of working hours results in an increase in γ and an increase in θ . The effect of this change on E depends on the size of ρ .

$$(9) \quad \frac{\partial E}{\partial \gamma} \gtrless 0 \quad \text{as} \quad \rho \gtrless -\frac{1-\alpha}{\alpha} \theta = -\beta P \left[\frac{\gamma^2}{P} + \frac{1-P}{P C_1^2} \right]^{1/2} .$$

Changes in hours or in weeks worked as well as changes in the wage differential effect the sex-related earnings ratio, β . An increase in β increases the wife's and reduces the husband's share in family income and has, therefore, an indeterminate effect on E. A change in the wives' participation rate reduces both the husband's share in family income and the relative dispersion, θ . These two changes may very often have opposite effects on E.

^{9/}To derive equation (6) recall that the variance of a population that is composed of two groups (employed and not employed) consists of the sum of the variance within the groups (σ_w^2) and the variance between their means (σ_b^2).

The first term in (6) represents σ_w^2 and the second σ_b^2 . To derive (7) recall that $\mu_2 = P\mu_{2e}$.

Furthermore, changes in participation may be accompanied by changes in wage differentials, dispersion of hours of working women and the correlation between wives' and husbands' earnings.

Thus, in response to the question how do women's earnings affect income inequality, one has to revert to the economist's favorite answer "It depends. . .".

C. EARNING AND PARTICIPATION PATTERNS - THE ISRAELI EXPERIENCE

The previous section described the conflicting factors affecting family earnings inequality. It has been shown that the effect of the wives' earnings depends on the exact configuration of these factors, and hence may differ in different environments. This section analyzes two of the main protagonists, the earnings and participation functions, how they interact and how they affect other parameters, such as the correlation between husband's and wife's earnings.

Our testing ground is Israel. Israel has witnessed substantial changes in the composition of its labor force over the last decades. Labor force participation of men has dropped over the period 1955-78 from 80 to 65 percent, while the rate for women has increased from 28 to 37 percent, and that for non-single women has increased from 23 to 37 percent (the share of men in the labor force dropping over the period from 75 to 65 percent). A prime cause for the increase in women's (and specifically, married women's) participation is the continuous improvement in schooling levels of both men and women in Israel. The effect of schooling on participation and earnings and, consequently, on the wife-husband earnings ratio is one of the main themes of this section. The other theme is ethnic differences in participation and earnings. Asian-African born wives have lower earnings and a lower participation rate than their European-American and Israeli counterparts. Part of this difference can be explained by the schooling differential (Asian-African born wives have on the average 6.8 years of schooling, as compared with 11.0 for the others), but given the high social sensitivity of this issue it is worth examining whether ethnic origin has an independent effect of its own.^{10/}

^{10/} Amir reports significant differences between the hourly earnings of males of Asian-African origin and those of European-American origin, even if one controls for schooling and experience. Weiss, Fishelson and Artzi report similar differentials exist in the case of females. In a previous study (Gronau 1978) I could not detect any significant difference in wives' earnings but there was a significant difference in the participation function of the two groups (other things equal, Asian African born tended to participate less in the labor force). In some of these studies the Asian-African group includes Israeli born of Asian-African origin. In this study, Israeli born wives are included in the European-American group.

The data used in this study are derived from the 1975-76 Family Expenditure Survey and relate to married Jewish families.^{11/} A major feature of the earnings data is the wage differential between wives and husbands, and the differentials among wives of different schooling and ethnic background. Wives' earnings are on the average less than half those of their husbands (where both partners are employed). This disparity is generated by, both, an annual hours differential and a wage gap. Annual working hours of wives are about two thirds those of their husbands, while the hourly earnings ratio is about 3:4. Asian-African born wives have hourly earnings which are less than 80 percent of those of the European-American or Israeli born, and wives with less than 9 years of schooling have hourly earnings which are less than 70 percent of those with more than 12 years of schooling. What may account for these differentials?

To answer these questions, I estimated semi-log hourly earnings functions for husbands and wives. The explanatory variables, besides the person's schooling and ethnic origin, include his potential experience in the labor force (measured as age minus schooling minus 6), the number of years in Israel, the^{12/} number of young children (less than 2 years old) and the spouse's education.^{12/} The results are reported in Table 1.

A year in school increases wife's earnings by about 7 percent, but the effect may not be linear and may depend on the level and kind of schooling (e.g., vocational vs. non-vocational).^{13/} Earnings increase with potential experience (i.e., years since last school) but at an ever decreasing rate (hourly earnings of people with different schooling levels may converge over time).

^{11/}The original sample collected over the period June 1975 - May 1976 included about 2250 urban households. After removing the non-married and the non-Jews the sample thins down to 1780 observations (some of the major characteristics of the sample are described in Table A1 of the appendix). For technical reasons, we used in some of the computations a random subsample of 1492 observations.

^{12/}The Family Expenditure Survey does not include any direct information on hourly earnings. Hourly earnings are defined, therefore, as the ratio of annual earnings divided by annual hours. Annual hours are defined, in turn, as weeks worked in the previous year times normal number of hours per week. Self employed were not asked about their weekly hours so the hourly earnings data refers only to wage and salary workers. Potential experience was used in the absence of direct information on actual experience.

^{13/}A functional form that incorporates the type of the last school attended as a set of dummy variables (regression (2)) does marginally better than the function that incorporates schooling as a continuous variable. The effect of schooling is computed at the mean value of 19.12 years of experience.

TABLE 1: HOURLY EARNINGS FUNCTIONS: WIVES
(Dependent Variable: ln Hourly Earnings)

	(1)		(2)		(3)	
	b	t	b	t	b	t
Intercept	0.7609	3.69	1.943	18.23	0.675	2.75
Husband's Schooling (yrs)	0.018	2.89	0.022	3.98	0.017	2.34
Wife's Schooling (yrs)	0.101	6.99			0.109	6.51
Wife's Schooling 1(D.V)			-0.328	4.97		
" 2(D.V)			-0.119	1.80		
" 3(D.V)			0.265	3.75		
" 4(D.V)			0.153	1.97		
" 5(D.V)			0.344	5.15		
" 6(D.V)			-0.033	0.29		
Experience	0.037	3.35	0.012	1.82	0.020	1.63
(Experience) ²	-0.0004	2.52	-0.0003	2.12	-0.002	-1.21
Experience x Schooling	-0.0017	3.54			-0.0014	2.57
Years in Israel	0.075	4.45	0.076	4.43	0.081	4.43
Children age 0-1 (Mills Ratio) ⁻¹	0.176	3.23	0.151	2.80	0.246	2.18
R ²	0.315		0.337		0.314	
Sample Size	510		510		416	

Comments: Years in Israel are measured in units of 10 years. The schooling dummy variables are: 1-elementary school, 2-vocational highschool, 3-teacher's college, 4-other non-academic post-highschool education, 5-college and university, 6-other. The base group is highschool.

TABLE 1 (Cont'd): HOURLY EARNINGS FUNCTION: HUSBANDS
 (Dependent Variable: ln Hourly Earnings)

	(4)		(5)		(6)	
	b	t	b	t	b	t
Intercept	1.917	23.37	1.853	22.55	1.980	16.16
Husband's Schooling (yrs)	0.070	7.54	0.047	4.56	0.037	6.39
(Years of School) ²	-0.0016	4.41	-0.0011	3.02		
Wife's Schooling (yrs)			0.022	4.88		
Experience	0.020	4.76	0.022	5.37	0.037	5.60
(Experience) ²	-0.0004	5.39	-0.0004	5.87	-0.0007	5.54
Years in Israel	0.049	4.10	0.050	4.26	0.036	2.10
Israeli of EuAm origin	0.190	4.14	0.174	3.82	0.217	3.60
(Mills Ratio) ⁻¹					-0.129	2.00
R ²	0.218		0.235		0.223	
Sample Size	1032		1032		416	

Comments: Years in Israel are measured in units of 10 years.

The effect of experience is augmented by the length of stay in Israel, every year increasing hourly earnings by about 3/4 of a percent. Wife's hourly earnings are affected by her family environment, increasing with her husband's education and the number of young children. The first of these effects may be attributed to selective mating - the more able women marrying the more educated men. The second effect may reflect a selectivity bias - only women with high hourly earnings participate in the labor force when they have young children (Gronau 1974). Surprisingly absent from the regression are the variables relating to ethnic origin. A detailed examination indicates that none of these variables is significant, though Asian-African born wives' earnings may be more sensitive to formal education than their European-American and Israeli counterparts' (the interaction term is barely significant at a level of significance of 10 percent).

Years in school are also a major determinant of hourly earnings in the case of the husbands. The effect of schooling on husband's earnings is almost identical to that of the wife's (regression 4). However this estimate declines considerably once we allow for the effect of the wife's education on her husband's earnings (regression (5)). The last effect can, again, be attributed to selective mating, or, as has been sometimes claimed, (Benham), to the beneficial effect wives have on their husbands' productivity, an effect that seems to increase with education. The hourly earnings-experience profile is concave as expected, the effect of potential experience having a stronger effect in the case of the husband than in the case of the wife (reflecting the higher ratio of actual to potential years of experience for the first group). Years of residency in Israel have a positive effect and the number of children have no significant effect on their father's hourly earnings. Of the ethnic groups, only one stands out - Israeli husbands whose fathers were born in Europe or America. Other things being equal, members of this group enjoy hourly earnings which are almost 20 percent higher than those of members of other ethnic groups. It is notable, however, that there exists no significant difference between the hourly earnings of Asian-African born and European-American born married men.^{14/}

The estimates of the hourly earnings function may be affected by selectivity bias since only a fraction of the wives' population is represented in the labor force. Since this fraction is self-selected it is not clear that the sample we observe is random (specifically, it is not clear that the random component in the earnings function is not correlated with the explanatory variables through the selection process).^{15/} To correct for this potential bias we introduced in the wage functions the inverse of the Mills ratio (Heckman). This change did not improve the explanatory power of the hourly earnings functions. However, certain variables which previously seemed to have a significant effect turn out to be insignificant. Of special interest is the effect of young children on their mothers' hourly earnings, which vanishes in the new formulation (regression (3)), confirming the suspicion that this effect reflects merely

^{14/} These results are consistent with results reported by Fishelson, Weiss, Mark.

^{15/} See the appendix for a more detailed analysis of the implications of the selectivity bias.

a selectivity bias. Similarly, the wife's effect on her husband's earnings weakens considerably (it is significant but only at a level of significance of 10 percent).^{16/} This result is consistent with the assumption of selective mating, i.e., the random components in the two earnings functions are positively correlated.

Schooling turns out to be the major (actually, the sole) explanation for the hourly earnings differential between Asian-African born wives and those born in Europe or America. Can schooling (or any combination of observed characteristics) explain the sex-related hourly earnings differentials? An examination of the husbands' and wives' characteristics in the sample where both partners are employed (Table 2), suggests that there exist only minor differences in the observed characteristics, much too small to explain the wide wage gap.^{17/} This impression is supported by Table 3, where I try to account for differences in characteristics by comparing the wife's actual hourly earnings with the hourly rate her husband would have received had he possessed his wife's characteristics (method I), or alternatively comparing the husband's actual hourly earnings with that of the wife's had she had her husband's characteristics (method II).^{18/}

Wives are making on the average about 75 percent of the hourly earnings of husbands with the same observed characteristics. Hence, there is very little in socio-economic variables that can explain the observed hourly earnings gap. This gap however, is not constant and narrows down as education increases. It is about 40 percent of the husband's rate for wives with less than 9 years of schooling and only about 10 percent for wives with more than 12 years of schooling, reflecting the higher rate of return to

^{16/}Two other changes worth mentioning are: a) the weakening of the effect of experience in the wife's hourly earnings function (the effect becomes entirely insignificant when schooling is represented by dummy variables, as in column (2), and b) (schooling)² becomes insignificant in the hourly earnings function of husbands. The coefficients indicating a selectivity bias are both significant. The coefficient for wives is positive implying that a unit increase in the wife's market productivity is associated with an increase of less than a unit in productivity at home. The coefficient in the husband's function is negative implying that the husband's productivity in the market is affected more by his wife's productivity at home than by her productivity in the market. Note, also, that these results are not strictly comparable with earlier results because of the composition of the sample. The censoring effect is measured in a subsample of families where both husband and wife are employed.

^{17/}Given the self-selected nature of this sample and the nature of the participation function, the differences between husband and wife characteristics are even smaller than in the sample as a whole.

^{18/}The predicted hourly earnings were derived using regressions 2 (corrected for selectivity bias) and 6 in Table 1. Similar results are obtained using less restricted samples (e.g., the sample of employed wives and the sample of employed husbands.)

TABLE 2: WIVES' AND HUSBANDS' CHARACTERISTICS
 (Sample Averages for Families with both Husband and Wife Employed)

	Total		Wife's Land of Birth				Wife's Years of Schooling					
			AsAF		EuAm Israel		0-8		9-12		13+	
	W	H	W	H	W	H	W	H	W	H	W	H
Age	36.2	40.3	34.6	39.3	36.6	40.5	40.2	44.8	34.9	38.8	35.9	39.8
Years of Schooling	11.8	12.4	9.2	9.6	12.4	13.0	6.2	8.6	11.1	11.8	14.9	14.6
Years in Israel	23.3	24.2	21.2	23.9	23.9	24.3	22.1	22.7	24.2	25.1	23.0	23.9
Land of Birth:												
AsAF	0.19	0.22	1.00	0.71	-	0.10	0.41	0.42	0.21	0.21	0.08	0.13
EuAm	0.45	0.49	-	0.11	0.56	0.58	0.44	0.46	0.39	0.43	0.52	0.56
Israel	0.36	0.29	-	0.18	0.44	0.32	0.15	0.12	0.40	0.36	0.40	0.31
Number of children:												
age 0-1	0.20	0.20	0.22	0.19	0.19	0.06	0.23	0.22				
age 2-5	0.37	0.37	0.58	0.31	0.31	0.28	0.38	0.39				
age 6-13	0.57	0.57	0.78	0.52	0.52	0.72	0.46	0.62				
age 14+	0.21	0.21	0.28	0.19	0.19	0.40	0.18	0.16				
No. of observations	492	95	397	86	210	196						

TABLE 3: STANDARDIZED VS. ACTUAL HOURLY EARNINGS OF HUSBANDS AND WIVES

	Total		Wife's Land of Birth				Wife's Years of Schooling					
	I	II	Asaf		Eudam Israel		0-8		9-12		13+	
			I	II	I	II	I	II	I	II		
Wives	2.5298	2.4956	2.3368	2.3045	2.5760	2.5414	2.0476	2.1585	2.4518	2.4492	2.8249	2.6934
Hus- bands	2.8012	2.8312	2.6412	2.6805	2.8395	2.8672	2.5629	2.5759	2.7644	2.7983	2.9452	2.9783
Diffe- rence	-0.2714	-0.3356	-0.3044	-0.3760	-0.2635	-0.3258	-0.5153	-0.4174	-0.3126	-0.3491	-0.1203	-0.2849
Ratio	0.76	0.71	0.74	0.69	0.77	0.72	0.60	0.66	0.73	0.71	0.89	0.75
Non Stand. Diffe- rence												
Non Stand. Ratio												
			-0.3014	-0.3437	-0.2912		-0.5283	-0.3465	-0.1534			
	0.74		0.71		0.75		0.59	0.71		0.86		

Sample: Families where husband and wife are employed.

wives' schooling as compared with males'.^{19/} The smaller wage gap for better educated women results in a smaller wage gap for European-American born as compared with Asian-African wives.

Schooling is also the prime actor when it comes to the participation decision, where it plays more than one role. It affects the pecuniary rewards the woman can expect in the market, the nonpecuniary rewards, and her productivity at home. In order to separate these effects, one has to impute the wife's wage, since earnings are known only for employed women. Applying the hourly earnings function reported in Table 1 (regression 2 corrected for selectivity bias), I estimated the labor force participation function of Israeli married women. Given the dichotomous nature of the dependent variable I used the logit method (applying a logistic curve to the participation data). The explanatory variables are the wife's schooling, her age, land of birth, length of stay in Israel, her imputed hourly earnings, the family's income (wife's earnings excluded) and the number and age of children.

Table 4 reports the coefficients of the logit function, their corresponding standard errors, and the marginal effect of the explanatory variables [$= bP(1-P)$]. Reflecting, either a life-cycle effect or merely a cohort effect, participation tends to decline with age (except for the young ages). Length of stay in Israel which has figured in earlier studies as an important variable explaining participation (Gronau 1978), seemed to lose its importance in the 70's and was not included in the final versions of the regression. Children maintain their strong deterrent effect on participation, in particular those in the preschool ages (a child in this age group reduces his mother's probability of participation by almost 20 percentage points). Other things equal, Asian-African born have been observed in the past to participate less than their European-American born counterparts. This disparity has vanished, and the only group standing out in terms of participation is the Israeli born. The wife's hourly earnings and family income have the expected opposite effects: a ten percent increase in wages increases participation by 2.4 percentage points. On the other hand, a ten percent increase in family income reduces participation by 0.7 percentage points. Controlling for hourly earnings, schooling has an independent positive effect on participation, reflecting the effect of non-pecuniary rewards of work in the market. Each additional year of schooling increases participation by almost 3 percent.

Our earlier findings indicate that an additional year of schooling contributes about 7 percent to hourly earnings. Combining the wage effect and the schooling effect, a year of schooling increases participation by 4.6 percentage points ($= 1.7 + 2.9$). This effect more than offsets the negative effect of income (a year of school is associated with an increase of income of 3.6 percent, and a reduction of participation of 0.25 percentage points). The positive correlation between the husband's and the wife's

^{19/} These sex-related hourly earnings differentials are more sensitive to level of schooling when one uses standardization - method I than when one uses method II.

TABLE 4: WIVES' LABOR FORCE PARTICIPATION FUNCTION
(Logit Functions)

	I			II			
	b	S _b	bP(1-P)**	b	S _b	bP(1-P)**	
						AsAf	Eu Am, Israel
Intercept	-2.011	1.104		-1.612	1.127		
Age	0.115	0.040	0.027	0.122	0.041	0.024	0.030
(Age) ²	-0.002	0.0005	-0.0005	-0.002	0.0005	-0.0004	-0.0005
Years of Schooling	0.121	0.026	0.029	0.201	0.045	0.014	0.050
School x AsAf				-0.126	0.050		
Israel	0.385	0.153	0.092	0.382	0.176		0.095
Children:							
Age 0-1	-0.797	0.175	-0.191	-0.772	0.176	-0.150	-0.192
Age 2-5	-0.790	0.121	-0.189	-0.743	0.122	-0.145	-0.184
Age 6-13	-0.290	0.071	-0.069	-0.275	0.072	-0.054	-0.068
ln(Hourly Earnings)	1.010	0.324	0.242	0.423	0.407		
ln(Hourly Earnings) x AsAf				0.463	0.222	0.1725	0.105
ln(Income)	-0.298	0.115	0.071	-0.297	0.116	-0.058	-0.074

*Computed at the sample mean.

**Computed at the group-means.

schooling and the strong association between schooling, participation, and earnings give rise to a positive correlation between the husband's and the wife's earnings.

The rate of participation of Asian-African born wives is almost 20 percentage points lower than that of European American and Israeli born. This difference is explained almost entirely by the difference in schooling levels, ethnic origin having no independent effect on the level of participation. It has been observed, however, in an earlier study (Gronau 1978) that wives with different ethnic origins react differently to pecuniary and non-pecuniary market rewards. These findings are supported by our sample. While Asian-African born wives are attracted to the labor force primarily by pecuniary motives, the European-American born place a higher value on the non-pecuniary element in the rewards (Table 4, regression II). In either case the positive effect of schooling by far outweighs the negative effect of income, leading to positive correlation between the earnings of husband and wives.

Finally, examining the effect of the explanatory variables on the number of annual working hours (in a sample of working wives) indicates that neither wages, nor income, schooling and ethnic origin have any effect, the only variables of importance being the wife's age and the number and age of her children (Table 5).

TABLE 5: THE DETERMINANTS OF ANNUAL HOURS
(Sample: Working Wives)

	<u>b</u>	<u>t</u>
Intercept	710.81	1.40
Age	63.71	2.75
(Age) ²	-0.74	2.65
Years of Schooling	17.68	1.21
Wife land of birth: AsAf	19.61	0.22
Israel	-64.75	0.83
Children: age 0-1	-331.06	4.11
age 2-5	-128.03	2.29
age 6-13	-101.63	2.63
age 14+	-147.63	2.16
ln(Hourly Earnings)	-204.80	1.23
ln(Income)	6.82	0.17
R ²	0.119	

D. FAMILY INCOME INEQUALITY - DO WIVES' EARNINGS MATTER?

Past studies in the U.S. and the U.K. (Mincer, Layard and Zabalza, Smith) have shown that wives' earnings tend to reduce the inequality of family incomes, although their distribution has a much greater (relative) variation than that of husband's earnings. Does Israel exhibit the same pattern?

Our initial investigation focuses exclusively on wife's and husband's earnings, ignoring all other sources of income,^{20/} and the answer suggested by Table 6 seems to be unequivocal - wives' earnings reduce family earnings inequality (the coefficient of variation declines by over 5 percent from 0.78 to 0.73). The decline is, however, far from uniform. While there is hardly a noticeable change in the measure of inequality in the lowest schooling group and among Asian-African born families, there is almost a 10 percent decline among European-American born, and over 15 percent decline in the highest schooling group. Moreover, the decline in the within-group variation (a decline from 0.78 to 0.72 for the ethnic groups and from 0.76 to 0.68 in the school groups) is associated with an increase in the between-groups variation. Thus, the gap between the mean earnings of the ethnic groups and the earnings differential between the highest and the lowest school group increase by over 60 percent (the between-groups coefficients of variation increase from 0.09 to 0.12, and from 0.21 to 0.29, respectively).

The changes in inequality can be directly traced to the positive association between schooling and participation on the one hand, and the narrowing of the wife-husband hourly earnings ratio as schooling increases on the other. Both factors result in an increase in the wife's share in total earnings. This share is only 7 percent for wives with less than 9 years of schooling and 26 percent for those with more than 12 years of schooling; it is 12 percent for Asian-African born wives, and 18 percent for European-American born. The increased participation drastically changes the wife-husband relative earnings variation (θ). The value of θ falls from 3.4 to 1.6 for the schooling groups, and from 3.3 to 1.9 for the ethnic groups.

The different contribution of wives to family earnings are the source of the increasing inequality between groups, while the reduction in the wives' relative variability (θ) can be accredited for the decline in the total and within-group variability. As has been shown in section B, given the low correlation between husbands' and wives' earnings, a reduction in θ reduces inequality. At a theoretical level, this effect may have been counterbalanced by the increase in the wives' shares ($1-\alpha$), but surprisingly, in spite of the drastic changes in this share, it hardly affected the final outcome (i.e., maintaining θ at its mean value and changing α hardly affects E).

^{20/} Earnings include income from self-employment.

TABLE 6: THE DETERMINANTS OF FAMILY EARNINGS INEQUALITY BY LAND OF BIRTH

	Total			Wife's Land of Birth					
				AsAf			EuAm and Israel		
	μ	σ	C	μ	σ	C	μ	σ	C
<u>Total Sample:</u>									
Sample Size	1768			547			1221		
Family									
Monthly Earnings	3806	2790	0.73	3104	2036	0.66	4120	3016	0.73
Monthly Earnings:									
Wives	619	1032	1.67	350	770	2.20	740	1109	1.50
Husbands	3186	2492	0.78	2755	1814	0.66	3380	2720	0.80
Ratio	0.19	0.41	2.14	0.13	0.42	3.33	0.22	0.41	1.88
Correlation	0.10			0.09			0.08		
Participation Rate:									
Wives	0.40			0.27			0.46		
Husbands	0.88			0.88			0.87		
Ratio	0.45			0.31			0.53		
<u>Employed Wives and Husbands:</u>									
Sample Size	631			128			503		
Monthly Earnings:									
Wives	1656	1068	0.64	1401	963	0.69	1721	1085	0.63
Husbands	3605	1926	0.53	3161	1286	0.41	3718	2043	0.55
Ratio	0.46	0.55	1.21	0.44	0.75	1.68	0.46	0.53	1.15
Correlation	0.14			0.20			0.12		
Hourly Earnings:									
Wives	14.65	11.24	0.77	11.91	6.61	0.55	15.33	12.03	0.79
Husbands	19.11	9.72	0.51	16.15	7.71	0.48	19.84	10.02	0.51
Ratio	0.77	1.16	1.51	0.74	0.86	1.15	0.77	1.20	1.55
Correlation	0.21			0.28			0.19		
Annual Hours:									
Wives	1491	702	0.47	1451	688	0.47	1501	706	0.47
Husbands	2324	583	0.25	2359	619	0.26	2316	574	0.24
Ratio	0.64	1.20	1.88	0.62	1.11	1.81	0.65	1.23	1.96
Correlation	0.05			0.04			0.06		

TABLE 6 (Cont'd): THE DETERMINANTS OF FAMILY EARNINGS INEQUALITY BY YEARS OF SCHOOLING

	Wife's Years of Schooling								
	0-8			9-12			13+		
	μ	σ	C	μ	σ	C	μ	σ	C
<u>Total Sample:</u>									
Sample Size	676			719			373		
Family									
Monthly Earnings	2591	1918	0.74	4095	2924	0.71	5450	2870	0.58
<u>Monthly Earnings:</u>									
Wives	197	507	2.57	606	949	1.57	1408	1380	0.98
Husbands	2393	1822	0.76	3489	2788	0.80	4041	2534	0.63
Ratio	0.08	0.28	3.38	0.17	0.34	1.96	0.35	0.54	1.56
Correlation	0.06			-0.02			-0.01		
<u>Participation Rate:</u>									
Wives	0.22			0.41			0.69		
Husbands	0.81			0.92			0.92		
Ratio	0.27			0.45			0.75		
<u>Employed Wives and Husbands:</u>									
Sample Size	121			269			241		
<u>Monthly Earnings:</u>									
Wives	1007	718	0.71	1561	900	0.58	2089	1192	0.57
Husbands	2860	1419	0.50	3559	1995	0.56	4029	1955	0.49
Ratio	0.35	0.51	1.42	0.44	0.45	1.04	0.52	0.61	1.16
Correlation	0.08			-0.03			0.15		
<u>Hourly Earnings:</u>									
Wives	8.69	4.98	0.57	13.10	7.07	0.54	19.17	14.84	0.77
Husbands	15.11	8.07	0.53	18.41	9.66	0.52	21.79	9.75	0.45
Ratio	0.58	0.62	1.08	0.71	0.73	1.04	0.88	1.52	1.71
Correlation	0.28			0.24			0.10		
<u>Annual Hours:</u>									
Wives	1411	721	0.51	1550	724	0.47	1462	666	0.46
Husbands	2282	638	0.28	2383	599	0.25	2281	532	0.23
Ratio	0.62	1.13	1.82	0.65	1.21	1.88	0.64	1.25	2.00
Correlation	0.24			-0.10			0.15		

The effects on overall earnings inequality of the wife's earnings share and her earnings variability can be demonstrated with the help of Figure 1. The figure describes the value of E for various rates of participation P and wife-husband earnings ratios β , assuming ρ , C_1 , and γ are given at their sample mean levels ($\rho = 0.1$, $C_1 = 0.78$, $C_{2e} = 0.64$). An increase in β , for given value of P , increases the wife's share, without affecting the relative variation θ . On the other hand, changes in P which are accompanied by offsetting changes in β (i.e., a movement along a rectangular hyperbola $\beta P = \text{constant}$), trace the net effect of changes in variability θ . Given the mean rate of participation $P = 0.4$, changes in β in the range $0.3 \leq \beta \leq 0.7$ hardly affect E . On the other hand, increasing P in this range reduces E sharply.

The figure shows that the mitigating effect of wife's earnings on inequality should in no way be regarded as a universal rule. For our sample means of ρ , C_1 and γ , inequality could have increased had the participation rate been sufficiently small ($P < 0.4$) and the wife-husband earnings ratio sufficiently high. Given the parametric values of ρ , C_1 , and γ , an increase in participation increases earnings inequality for very low values of P (remember when $P = 0$ $E = 1$), but for $P > 0.1$ inequality always declines. Changes in the wife-husband earnings ratio have the opposite effect. Increases in β are initially accompanied by a decline in inequality but eventually the trend turns around and inequality increases.^{21/}

One of the most striking features of the observed wives' earnings structure is the presence of the significant unexplained male-female wage differential. Part of this gap is often attributed to sex discrimination, and much effort has gone to isolate this part. Yet little has been done to clarify the distributional effect of the wage disparity. A pertinent question is, therefore, how the closing of this gap would affect the income distribution. In answering, one should distinguish between primary and secondary effects. The primary effect is an increase in wives' wages and, consequently, in their shares of family income. Given the different initial gaps in hourly earnings for the various schooling groups, wage equalization requires non-uniform wage increases - the wage increasing most for the least educated. The secondary effects are associated with a wage induced increase in participation. The increase in labor supply has in turn a direct impact on inequality, as well as indirect effects through possible changes in the variability of hours worked and in the correlation between wife's and husband's earnings.

Can one measure the effect of sex-related wage discrimination on inequality? The answers are necessarily going to be very crude. Wage discrimination is only one of the possible causes of differential worker retribution, others being the type of professional skills acquired in school, the intensity of on-the-job training, and the fraction pecuniary rewards constitute in total market compensation. There is no way to separate these factors and, thus, one can provide only an upper limit to the effect

^{21/}

The turning point is specified by equation (4).

The Effect of Labor Force Participation (P) and the Wife-Husband
Earning Ratio (β) on the Inequality of Family Income (E)

$$E = f(P, \beta; \rho = 0.1, C_1 = 0.782, C_{2e} = 0.645)$$

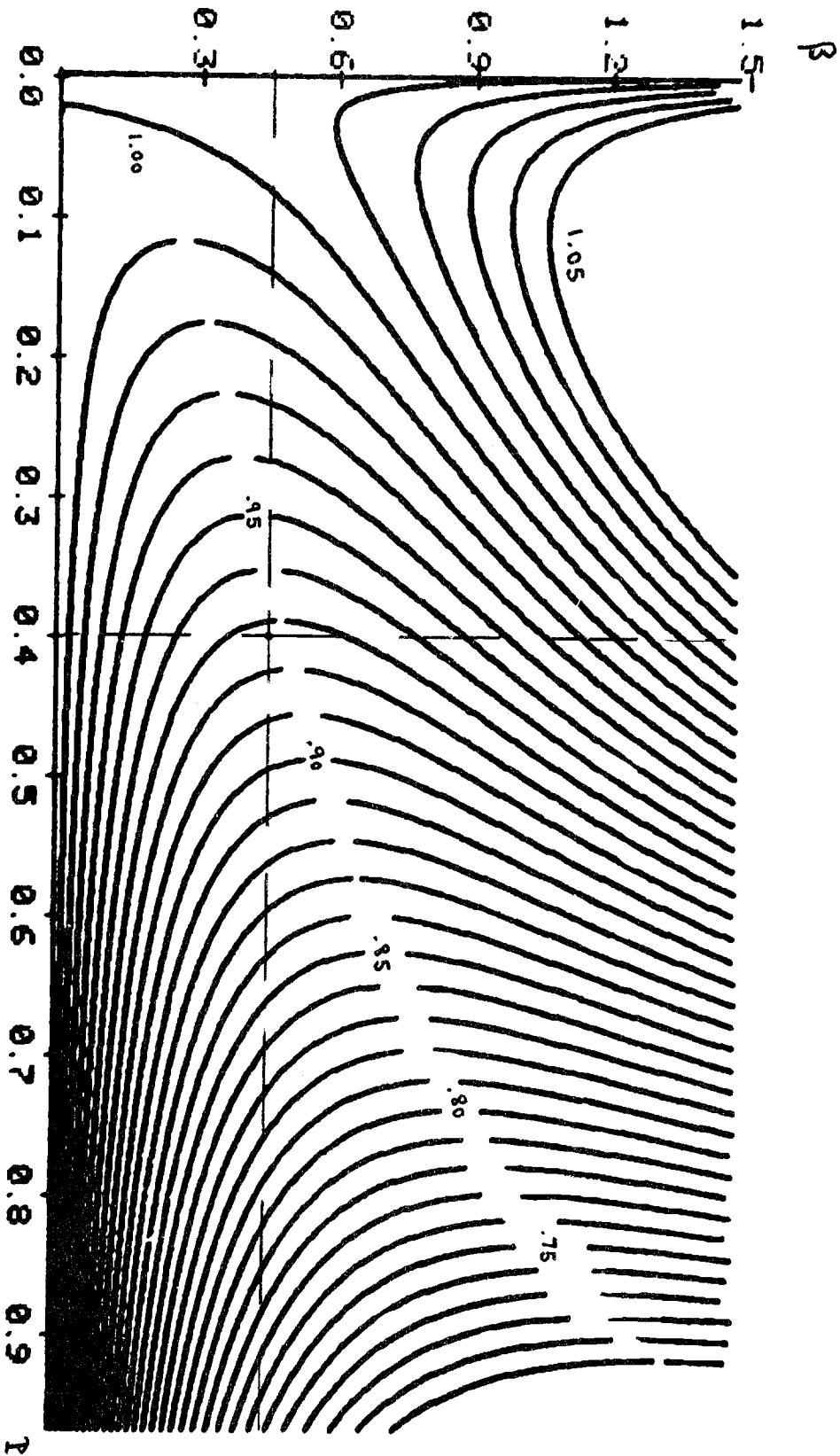


Figure 1

of discrimination, assuming that the whole wage gap is imputable to it. Similarly, it will be difficult to estimate the effect of the elimination of wage differentials on wives' labor supply. The closing of the wage gap may affect the patterns of specialization in the household, fertility, and the long term commitment of wives to market careers. Again one has to do with partial answers: estimating the short run effect of the wage increase using the labor force participation function.

Full wage equality would leave differences in hours worked as the sole source of earnings differentials, and would increase β from the observed 0.46 to 0.64 for all schooling groups. This large change in earnings (over 30 percent on average) would have by itself almost no effect on inequality - E is almost completely insensitive to changes in β in this range. The indirect effect (through changes in the participation rate) would also be only modest. As said earlier, wage equalization would require differential wage increases and hence induce differential changes in the participation rate across the various education groups. Wives' hourly earnings should increase by 72, 41, and 13 percent, respectively, and the induced changes in participation would be 10, 8 and 3 percentage points. The increase in participation, for the sample as a whole, would be 8 percent (from 0.40 to 0.48). This increase would reduce E from 0.93 to 0.91.^{22/}

The high incidence of part-time work among women (working wives report an average of 34 hours per week as compared with an average of 47 hours for their husbands) is associated with a larger variability (both in relative and in absolute terms) in their annual working hours. Would a reduction in this variability affect family earning inequality? Eliminating this difference in variability, given full wage equality, would make the wives' monthly earnings dispersion equal that of husbands'. This reduction in C_{2e} from the observed 0.64 to 0.53 little affects our results - the values of E for the initial values $P = 0.40$ and $\beta = 0.46$ fall from 0.93 to 0.92, and for $P = 0.48$ and $\beta = 0.64$ from 0.91 to 0.81.

Finally, the increased participation of wives may strengthen the correlation between wives' and husbands' earnings. We used as an upper limit the correlation between the hourly earnings of wives and husbands when both are employed ($\rho = 0.2$).^{23/} The increase in the correlation coefficient, other

^{22/} The differential changes in participation and hourly earnings have also only a surprisingly small effect on between-group variation. The elimination of discrimination increases the earnings of an average wife with less than 8 years of schooling by 150 percent, and those of a wife with more than 12 years of schooling by less than 20 percent. However, given the initial differentials in earnings and in the shares in family income, the earnings differentials between the two groups hardly change.

^{23/} The estimate of the correlation coefficient between husband's and wife's earnings may suffer from a selectivity bias (see the appendix). Smith suggests a correction of the variances and the covariance of husband's and wife's hourly earnings accounting for possible censoring bias. This correction did little to alter our results.

things being equal, reduces the egalitarian impact of wives' earnings (for $P = 0.40$ and $\beta = 0.46$ $E = 0.96$ and when P and β increase to 0.48 and 0.64 $E = 0.94$).

In order to fully assess the distributional effect of women's earnings, it is necessary to examine the contribution to inequality of other sources of family income. Table 7 describes the mean incomes and coefficients of variation for the population as a whole and for the various ethnic and schooling groups given alternative definitions of gross income. Using as basis of comparison the family earnings, wife's earnings excluded, it is observed (comparing the third and fourth row) that in the aggregate the egalitarian effect of wife's earnings is almost as strong as that of transfer income.^{24/} There exist, however, fundamental differences. While wives' earnings have an equalizing effect mainly for the European-American and the higher schooling groups (i.e., years of schooling greater than 8), the impact of transfers is concentrated almost exclusively in the Asian-African and lower education groups. Consequently, whereas wives' earnings have been noticed to sharpen the intergroup differences, these are hardly affected by non-labor income.^{25/}

Finally, the analysis up to now ignored the effect of taxes. The introduction of taxes does not affect any of our previous findings concerning labor supply and the earnings structure. It calls, however, for some modification of the conclusions on the impact of wives' earnings on inequality.

Wives and husbands file in Israel separate income tax returns. Consequently, their marginal tax rates are independent. Having imputed the taxes paid by husbands and wives I computed the after tax income from the various sources (Table 8).^{26/} The comparison of gross earnings and net earnings in

^{24/}The base includes earnings of other members of the household besides the husband and his wife. The comparison of Tables 6 and 7 indicates that these earnings by themselves have an equalizing effect, being in particular important in the low schooling and Asian-African group. Non-labor income includes capital income (rent, interest, dividends), social security and welfare receipts and other private and public transfers. Reported capital income, which constitutes about 40 percent of the non-labor income hardly affects our indices of inequality in the aggregate and for the individual groups (the only exception being the schooling group 13+). The changes in the index of inequality reported in Table 7 are, therefore, due primarily to the transfer payments.

^{25/}The transfers reduce between-group variability but this effect is offset by the effect of capital income.

^{26/}Using the tax data in the sample of estimated separate tax functions for husbands and wives: $T_1 = -230.00 + 22.188 \text{ HEARN} + 0.147 (\text{HEARN})^2$ $R^2 = 0.74$
(5.97) (13.52) (9.85)

$T_2 = -41.57 + 12.300 \text{ WEARN} + 0.252 (\text{WEARN})^2 - 24.034 \text{ children}$ $R^2 = 0.80$
(2.41) (10.39) (12.98) (5.48)

where monthly earnings (EARN) are measured in 100 of Israeli pounds (IL). The imputed taxes have a small upward bias but this does not affect the relative variability of net earnings in the sample.

TABLE 7: THE EFFECT OF WIVES' EARNINGS ON FAMILY INCOME INEQUALITY
WITH ALTERNATIVE DEFINITIONS OF INCOME (BEFORE TAXES)

	Wife's Earn- ings	Total		Wife's Land of Birth						
		μ	C	E	AsAf			EuAm and Israel		
					μ	C	E	μ	C	E
Wife's earnings		619	1.67		350	2.20		740	1.50	
Labor Income*	excl.	3374	0.76	1.00	3099	0.63	1.00	3497	0.80	1.00
	incl.	3994	0.71	0.93	3449	0.63	0.98	4237	0.72	0.91
Gross Income**	excl.	3840	0.69	0.90	3506	0.54	0.85	3990	0.72	0.91
	incl.	4460	0.64	0.84	3856	0.53	0.84	4730	0.66	0.83
Total Income***	excl.	4659	0.63	0.83	4110	0.51	0.80	4904	0.66	0.82
	incl.	5279	0.61	0.80	4460	0.52	0.81	5644	0.61	0.77

	Wife's Earn- ings	Wife's Years of Schooling								
		0-8			9-12			13+		
		μ	C	E	μ	C	E	μ	C	E
Wife's earnings		197	2.57		606	1.57		1402	0.98	
Labor Income*	excl.	2756	0.74	1.00	3582	0.79	1.00	4088	0.65	1.00
	incl.	2954	0.72	0.97	4188	0.70	0.89	5490	0.54	0.83
Gross Income**	excl.	3273	0.60	0.81	4003	0.73	0.93	4548	0.63	0.97
	incl.	3471	0.59	0.79	4610	0.66	0.84	5950	0.52	0.80
Total Income***	excl.	3857	0.57	0.76	4848	0.65	0.83	5736	0.57	0.88
	incl.	4055	0.56	0.76	5455	0.60	0.76	7138	0.49	0.76

*Labor income includes earnings of all household members as well as self-employment income.

**Gross income includes labor and non-labor income (capital income and transfers).

***Total income consists of gross income and imputed income for housing and car services.

Tables 7 and 8 is illuminating. The lower effective marginal tax rate for wives reduces the progressivity of the tax structure. The inequality in the distribution of wives' earnings is much less affected by taxes than the inequality of other earnings. Thus, whereas taxes reduce the coefficient of variation of other labor income from 0.76 to 0.62 (the second row in both tables) the coefficient for wives declines only from 1.67 to 1.60. In this fashion, the tax structure neutralizes to a large extent the equalizing effect of wives' earnings on family income. Their effect on inequality of labor income is cut by half and their effect on inequality of net income becomes almost negligible. Wives' earnings maintain their equalizing effect (though this effect is somewhat mitigated) for the higher schooling and European-American group, but they have a perverse effect on inequality in the low education and Asian-African group. The tax structure, thus, enhances the divisive effect of the wives' earnings, increasing income inequality between the social groups.^{27/}

^{27/} The following table describes the between-group coefficients of variation for earnings before and after taxes with wives earnings included and excluded.

		<u>Between schooling groups</u>		<u>Between ethnic groups</u>	
		<u>Before</u>	<u>After</u>	<u>Before</u>	<u>After</u>
		<u>taxes</u>	<u>taxes</u>	<u>taxes</u>	<u>taxes</u>
Wives' earnings	excluded	0.155	0.135	0.054	0.039
	included	0.238	0.227	0.091	0.079

The lower effective marginal taxes on wives' earnings tend to erode the little effect taxes have on closing intergroup disparities.

TABLE 8: THE EFFECT OF WIVES' EARNINGS ON FAMILY INCOME INEQUALITY
WITH ALTERNATIVE DEFINITIONS OF INCOME (AFTER TAXES)

	Wife's Earn- ings	Wife's Land of Birth								
		Total			AsAf			EuAm and Israel		
		μ	C	E	μ	C	E	μ	C	E
Wife's earnings		533	1.60		309	2.12		633	1.44	
Labor Income*	excl.	2578	0.62	1.00	2421	0.55	1.00	2648	0.65	1.00
	incl.	3111	0.61	0.97	2729	0.56	1.02	3281	0.61	0.94
Net Income*	excl.	2909	0.53	0.85	2721	0.45	0.81	2993	0.55	0.86
	incl.	3442	0.52	0.84	3029	0.46	0.84	3626	0.53	0.82
Total Income*	excl.	3728	0.51	0.81	3324	0.44	0.80	3908	0.52	0.81
	incl.	4260	0.51	0.81	3633	0.46	0.83	4540	0.51	0.78

	Wife's Earn- ings	Wife's Years of Schooling								
		0-8			9-12			13+		
		μ	C	E	μ	C	E	μ	C	E
Wife's earnings		179	2.47		525	1.52		1181	0.93	
Labor Income*	excl.	2162	0.67	1.00	2725	0.61	1.00	3045	0.54	1.00
	incl.	2341	0.66	0.99	3250	0.54	0.92	4226	0.46	0.86
Net Income*	excl.	2556	0.51	0.76	3014	0.54	0.89	3343	0.49	0.92
	incl.	2735	0.51	0.76	3539	0.50	0.82	4524	0.42	0.79
Total Income*	excl.	3140	0.49	0.74	3859	0.49	0.81	4531	0.47	0.87
	incl.	3319	0.49	0.74	4384	0.46	0.76	5712	0.42	0.77

*See definition in Table 7.

E. SOME CONCLUDING COMMENTS

It has been shown in the last section that wives' earnings have an egalitarian effect on family income inequality, and that this is particularly pronounced where the wife is European-American or Israeli born and when she has a higher education. The effect of sex-related discrimination is somewhat ambiguous. Its primary effect is regressive, since it undermines a reduction in inequality due to a wage induced increase in wives' labor force participation. However, this effect may be overshadowed by secondary effects (for example, a strengthening of the correlation between wives' and husbands' earnings) which work in the opposite direction. In either case, the first round effects of discrimination on family inequality are relatively small, though the long run effects, through changes in fertility patterns, differentiation of roles in the household, and the wives' commitment to a market career (effects not investigated in this paper) may be considerable. The filing of separate income tax returns erodes the progressive effect of wives' earnings, and though it narrows the after tax wage differential between wives and husbands, it widens the earning gap between social groups (be they identified by education or ethnic origin).

To what extent are these results sensitive to the specific choice of the income inequality measure? The analysis focused on the coefficient of variation, but our conclusions would have been unaffected had we used the variance of the logarithm of income.^{28/} Furthermore, any summary measure, such as the one used in the paper, is incapable of capturing all the dimensions of the problem. For example, it ignores altogether an important aspect of wives' earnings, serving as a vehicle for social mobility. In fact, even when the summary measure is hardly affected by the inclusion of the wives' earnings (for example when one uses the coefficients of variation of total income including imputed income in table 7) an examination of the relative ranking of families in terms of their incomes is very sensitive to the size of the wives' earnings. This is exemplified by table 9, which ranks the families according to their total income and their income minus the wives' earnings.

^{28/}

Let Y_F denote family earnings, then

$$\ln Y_F = \ln(Y_1 + Y_2) = \ln Y_1 + \ln[1 + (Y_2/Y_1)]$$

Hence

$$\text{VAR}[\ln Y_F] = \text{VAR}[\ln Y_1] + \text{VAR}[\ln(1 + (Y_2/Y_1))] + 2\rho [\text{VAR}[\ln Y_1] \text{VAR}[\ln(1 + (Y_2/Y_1))]]^{1/2}$$

where

$$\ln[1 + (Y_2/Y_1)] = \begin{cases} \ln(1+\beta) & \text{when the wife participates (P = 1)} \\ 0 & \text{when the wife does not participate (P = 0)} \end{cases}$$

The analysis in terms of $\text{VAR}(\ln Y_F)$ should not vary much from the analysis of this paper even at the analytical level.

TABLE 9: THE EFFECT OF WIVES' EARNINGS ON THE DECILE DISTRIBUTION OF TOTAL INCOME -- INTER-DECILE TRANSITION MATRIX *

Total income, wife's earnings included (decile)	1	2	3	4	5	6	7	8	9	10	Total
Total income, wife's earnings excluded (decile)											
1	0.83	0.09	0.05	0.01	0.02	0	0	0	0	0	1.00
2	0.17	0.63	0.07	0.05	0.05	0.01	0.02	0	0	0	1.00
3	0	0.27	0.42	0.10	0.08	0.06	0.06	0.01	0.00	0	1.00
4	0	0	0.46	0.25	0.09	0.10	0.07	0.03	0.00	0	1.00
5	0	0	0	0.60	0.10	0.08	0.11	0.10	0.01	0	1.00
6	0	0	0	0	0.62	0.09	0.12	0.13	0.04	0	1.00
7	0	0	0	0	0.03	0.63	0.11	0.10	0.11	0.02	1.00
8	0	0	0	0	0	0.03	0.52	0.19	0.20	0.06	1.00
9	0	0	0	0	0	0	0	0.44	0.37	0.19	1.00
10	0	0	0	0	0	0	0	0	0.26	0.74	1.00

*Total income consists of gross income plus imputations.

The analysis focuses on the inequality in family earnings, ignoring single people. It may very well be that by this choice we inadvertently overlook the case where wives have the greatest impact on overall inequality by widening the income gap between multiperson and single person units. Moreover, by ignoring the differential effect wives' earnings have in families of different sizes (because of the negative correlation between the wife's earnings and the number and age of her children), we do not consider another important aspect - the effect on per capita (or adult equivalent) income inequality.

The analysis does not take account of the opportunity of the wife's work in the market. I have shown elsewhere (Gronau, 1976) that the increase in the labor supply to the market comes, to a large extent, at the expense of work at home. In 1970 employed Israeli women spent on average 6.6 hours daily in work in the market and 2.9 hours in work at home, while non-employed spent 6.7 hours daily in work at home (housework, shopping, and children). It is difficult to attach a monetary figure to the value of home production lost as a result of this reallocation of working time. But a crude measure based on U.S. data (Gronau 1980) indicates that this loss is over one third of wives' earnings, and reaches 85 percent when the family has young children (children under 6). ^{29/}

Finally, our findings are crucially dependent on the Israeli parameters, and cannot be used as a basis for generalizations. The Israeli experience should be regarded as unique, as should any other example. Given the Israeli parameters ($P = 0.4$, $\beta = 0.46$, and $\rho = 0.1$) wives' earnings have been shown to have an important egalitarian effect. However, had the correlation between husband's and wife's earnings been 0.4 (rather than 0.1), the effect would have been in the opposite direction, wives' earnings exerting a regressive influence on inequality. Similarly, the finding that the wife-husband wage gap bears only a relatively small cost in terms of family income inequality is true only for the circumstances prevailing in the Israeli labor market in the mid-70's. Had the wives' participation rate been $P = 0.6$ rather than $P = 0.4$ the effect of discrimination would have doubled.^{30/} The sensitivity of family income inequality to changes in the parameters increases the higher the participation rate and the wife-husband earnings ratio. A lesson to be learned from this paper, therefore, is that there are no easy generalizations. This is a very discouraging conclusion given the ever increasing importance of women's earnings from both a social and economic viewpoint. Hopefully, however, this paper provides a framework for the evaluation of their effect on inequality in each historical instance.

^{29/}

According to these U.S. data the foregone home production increased both in absolute and in relative terms with education.

^{30/}

When $P = 0.6$ and $\beta = 0.46$, $E = 0.88$. An increase in participation of 8 percentage points to $P = 0.68$ and an increase in the wife-husband earnings ratio to $\beta = 0.64$ due to the elimination of the wage gap would have reduced E to $E = 0.84$.

APPENDIX: THE ESTIMATION OF THE CENSORING BIAS*

Let W_i denote the individual's wage rate and R_i his reservation wage, where 1 denotes husbands and 2 wives. Let

$$W_1 = AX + u_1$$

$$W_2 = BY + u_2$$

$$R_2 = CZ + u_3 .$$

The wife participates in the labor force if $W_2 > R_2$, i.e., if $I = BY - CZ > u_3 - u_2 = v$. The expected wages of the partners in a sample where the wife is employed are:

$$E(W_1 | I > v) = AX + E(u_1 | I > v) \quad \text{for husbands}$$

$$E(W_2 | I > v) = BY + E(u_2 | I > v) \quad \text{for wives.}$$

These are biased estimates of AX and BY if the conditional expectations of u_1 and u_2 do not equal zero. If u_2 and u_3 have a bivariate normal distribution

$$E(W_1 | I > v) = AX + \frac{\sigma_{12} - \sigma_{13}}{\sigma_v} \lambda = AX + \delta_1 \lambda$$

$$E(W_2 | I > v) = BY + \frac{\sigma_{22} - \sigma_{23}}{\sigma_v} \lambda = BY + \delta_2 \lambda$$

where λ is the inverse of the Mills ratio corresponding to I/σ_v , i.e.,

$\lambda = f(I/\sigma_v)/F(I/\sigma_v)$, where f and F denote the density and the cumulative density of the standardized normal distribution. The direction of the bias depends on the regression coefficients among the residuals (b_{ij}). The husband's wage has an upward bias if $b_{21} > b_{31}$ (i.e., if the husband's market productivity has a greater effect on his wife's market productivity than it has on her home productivity). The wife's wage is upward biased if $b_{12} < 1$ (i.e., if a unit increase in market productivity is associated with a smaller increase in home productivity).

Finally, residual variances and covariances may be biased estimators of the true variance-covariance matrix because:

$$\text{cov}(u_i, u_j | I > v) = \sigma_{ij} - \delta_i \delta_j (\lambda^2 + I\lambda) .$$

*The appendix is based on Heckman and Smith.

A1: HUSBAND'S AND WIFE'S CHARACTERISTICS (Total Sample Averages)

	Wife's Land of Birth												Wife's Years of Schooling					
	Total						EuAm						0-8		9-12		13+	
	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H		
Age	41.8	46.3	40.0	45.4	42.6	46.8	46.4	51.6	39.7	43.9	37.6	41.5						
Years of Schooling	9.7	10.7	6.8	8.3	11.0	11.8	5.5	7.7	10.9	11.5	14.9	14.6						
Years in Israel	24.5	25.8	21.4	23.2	25.9	26.9	24.0	24.9	25.4	26.8	23.8	25.4						
Land of Birth:																		
AsAf	0.31	0.32	1.00	0.82	-	0.10	0.53	0.52	0.22	0.24	0.09	0.12						
EuAm	0.44	0.48	-	0.08	0.64	0.75	0.37	0.40	0.47	0.51	0.52	0.55						
Israel	0.25	0.20	-	0.10	0.36	0.25	0.10	0.08	0.31	0.25	0.39	0.33						
Number of Children:																		
Age 0-1	0.19		0.21		0.18		0.14		0.21		0.24							
Age 2-5	0.39		0.53		0.32		0.31		0.42		0.45							
Age 6-13	0.63		1.07		0.44		0.78		0.52		0.58							
Age 14	0.24		0.44		0.15		0.39		0.15		0.14							
No. of Observations	1773		547		1226		677		723		373							

REFERENCES

- Amir, S. (1976). "Income from Employment of First-Generation Israelis," Jerusalem: The Maurice Falk Institute for Economic Research, (in Hebrew).
- Benham, L. (1974). "Benefits of Women's Education Within Marriage," Journal of Political Economy, Vol. 82, No. 2, Part 2 (March/April), pp. S57-S71.
- Fishelson, G., Weiss, Y., and Mark, N. (1980). "Ethnic Origin and Income Differentials Among Israeli Males, 1969-1976," in Israel - A Developing Society, Tel Aviv: Tel Aviv University.
- Gronau, R. (1974). "Wage Comparisons - A Selectivity Bias," Journal of Political Economy, Vol. 82, No. 6 (November/December), pp. 1119-1143.
- Gronau, R. (1976). "The Allocation of Time of Israeli Women," Journal of Political Economy, Vol. 84, No. 4, Part 2 (August), pp. S136-S263.
- Gronau, R. (1978). Wives' Participation in the Labor Force and their Earning Structure, Jerusalem: The Maurice Falk Institute for Economic Research, (in Hebrew).
- Gronau, R. (1980). "Home Production - A Forgotten Industry," The Review of Economics and Statistics, Vol. 62, No. 3 (August), pp. 408-415.
- Heckman, J. (1979). "Sample Selection Bias as a Specification Error," in Female Labor Supply: Theory and Estimation, edited by J.P. Smith, Princeton: Princeton University Press.
- Layard, R. and Zabalza, A. (1979). "Family Income Distribution: Explanation and Policy Evaluation," Journal of Political Economy, Vol. 87, No. 5, Part 2 (October), pp. S163-S192.
- Mincer, J. (1974). Schooling, Experience and Earnings, (National Bureau of Economic Research: Human Behavior and Social Institutions, No. 2), New York and London: Columbia University Press.
- Smith, J.P. (1979). "The Distribution of Family Earnings," Journal of Political Economy, Vol. 87, No. 5, Part 2 (October), pp. S163-S192.
- Weiss, Y., Fishelson, G., and Artzi, Y. (1980). "Income Differentials Among Wage and Salary Employed Women in Israel," The Pinhas Sapir Center for Development, Tel Aviv, Tel Aviv University Discussion Paper 8-80 (May) (in Hebrew).