OCCUPATIONAL SELF-SELECTION: A HUMAN CAPITAL APPROACH TO SEX DIFFERENCES IN OCCUPATIONAL STRUCTURE

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I. Introduction

A RICH and diverse literature exists concerning the distribution of labor incomes.[1] One approach, namely that of human capital, concentrates on lifetime accumulation paths of "earnings capacity units" (human capital).[2] Individual variations in human capital imply differences in earnings power, thereby yielding strong implications concerning earnings distribution within a population.

Despite its explanatory power, the human capital model has been widely criticized. One criticism centers on its inability to obtain inferences concerning occupational distribution.[3] The purpose of this paper is to alleviate at least some such criticism by applying the hedonic price approach so as to embed occupational choice into the human capital framework. The significance is that neoclassical economic theory can be used to obtain implications concerning the determinants of occupational structure.

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[1] For example, see Lydall (1968), Metcalf (1972), and Blinder (1974).

[2] See Mincer (1970, 1974) for cogent descriptions of the human capital approach.

[3] For a description of some of these criticisms see Blaug (1976) or Cain (1976). Other criticisms of human capital are not considered because this paper concentrates solely on occupational structure.

II. Theoretical Framework

A. *A Critique of the Traditional Human Capital Approach*

Current human capital theorists assume that individual decisions regarding earnings power are made early in one's life. At that time the individual faces the problem of choosing investments in schooling and on-the-job training so as to maximize the present value of earnings given a finite and certain lifetime. It has been shown that if life cycle labor force participation is relatively continuous, optimal on-the-job training declines monotonically over one's lifetime so as to yield characteristically concave earnings profiles (see Ben-Porath, 1967). On the other hand, for those whose life cycle labor force participation is discontinuous, investment and hence earnings profiles are lower and flatter. In addition, they need not be monotonic (see Polachek, 1975a).

These implications are derived from life cycle models where the sole control variable is amount of time devoted to enhancing future human capital stock. It is argued here that these and even the more recent models that embed the problem into one of utility maximization (see Blinder and Weiss, 1976, or Heckman, 1976), neglect a crucial and important aspect of the life cycle process. *In particular, each of these models assumes human capital to be homogeneous.* As such, *all* variation in wages can be attributed *only* to differences in *amounts* of human capital. *No implications exist concerning kinds of human capital.* Yet, as has been documented at least for the case of women (see Fuchs, 1971), variations in kinds of human capital may be as important as variations in amount. Thus, incorporating individual differences in kind of human capital would lead to a fuller explanation of earnings distribution.

To rectify such a situation this paper proposes incorporating *kind* of investment as an additional control variable. Equating type of investment with occupation yields implications concerning occupational choice, and hence differences in occupational patterns across demographic groups. Because occupational distribution is important in explaining sex wage differentials, this paper concentrates on occupational segregation by sex.

B. A Generalization of the Human Capital Model: Introduction of Occupational Choice

For the sake of exposition the simplest possible model is chosen. Therefore, although not necessary, this paper deals with the lifetime as a unit, and abstracts from the detail of life cycle accumulation paths. Within this context, interperiod occupational mobility can be neglected.[4]

Consistent with previous human capital literature, a goal of earnings maximization is assumed. The point of departure in this paper is the incorporation of notions from the hedonic price literature.[5] As such, earnings are related *not only to amounts* of human capital, but also to the varying rental rates associated with different *kinds* of human capital. Because kind of human capital, taken as synonymous with occupation is finite and polytomous, a hedonic index ($\boldsymbol{\delta}$) of occupational characteristics is created and assumed to uniquely describe occupation. However, unlike occupation, the index $\boldsymbol{\delta}$ is a vector of *continuous variables*, and hence can serve as a control variable within the maximization process.[6]

Assume an individual has a lifetime of T years. Of these T years, S are spent in school and H are spent at home out of the labor force.[7] Working life (years spent at work) then equals $(T - S - H)$. Lifetime income in turn is given as the product of years at work $(T - H - S)$, the rental rate on type $\boldsymbol{\delta}$ human capital $W(\boldsymbol{\delta}, \mathbf{I})$,[8] and one's lifetime quantity of human capital stock $K(S, \boldsymbol{\delta})$.[9] The individual is assumed to choose an investment in human capital (S) and a kind of human capital depicted by (occupational) characteristics ($\boldsymbol{\delta}$) so as to maximize lifetime income. Thus an individual chooses S and $\boldsymbol{\delta}$ to

$$\max_{S,\boldsymbol{\delta}} \ (T - H - S)\ W(\boldsymbol{\delta}, \mathbf{I})\ K(S, \boldsymbol{\delta}) \tag{1}$$

where

$T \equiv$ age of retirement minus five.
$H \equiv$ number of years out of the labor force, for example, to bear and raise children (assumed to be exogenous),
$S \equiv$ lifetime investment measured as the number of years spent in school,
$\boldsymbol{\delta} \equiv$ a vector of characteristics describing type of human capital K and hence occupation,
$\mathbf{I} \equiv$ a vector of individual characteristics,

[4] As will be explained, such an assumption is not necessary but is made to reduce drastically the amount of mathematics. In the empirical work to follow account is taken explicitly of such life cycle occupational mobility.

[5] It is not our purpose to survey the hedonic price approach. However, the interested reader should note that this literature has its roots in Court (1939) and Court (1941), but is more explicitly described in Houthakker (1951–2), Tinbergen (1951) and even more recently in Rosen (1974), and Sattinger (1975, 1977). Unlike Rosen and Sattinger, we do not concern ourselves with the complete supply, demand, and equilibrium price system of characteristics. Instead we deal only with estimation of individual characteristics (e.g., labor force intermittency) on the *derived demand* for occupational characteristics (atrophy) *given* that the rental rate function $W(\delta)$ has already been determined in the market.

[6] The vector $\boldsymbol{\delta}$ is composed of the many characteristics describing a particular occupation. Working conditions, specific training requirements, maintenance of skills are all examples. As shall be seen later, this paper concentrates on one particular component of $\boldsymbol{\delta}$, namely atrophy. Implicit in the occupational choice decision is that once $\boldsymbol{\delta}$ is optimally determined, then it can be mapped uniquely into the occupation it represents.

[7] Since it takes five years to go to school, five must be subtracted from T for all individuals. It is assumed that T is fixed and exogenous for all, that home-time (H) is exogenous, and that S is endogenous.

[8] One should note that the $W(\boldsymbol{\delta}, \mathbf{I})$ function incorporates both supply and demand forces and is determined by overall labor market equilibrium conditions. This function is comparable to the envelope of curves generating market equilibrium depicted in figure 2 of Thaler-Rosen (1975, p. 279); or that equilibrium wage equation generated by Sattinger (1977, p. 499.)

[9] The maximization is specified in a static framework. Thus it is implicitly assumed that decisions are relevant to the *whole* lifetime, and not each period separately. Implications can be obtained about *each* time period. However, such an approach requires the use of control theory to

$$\max_{S_t, \delta_t} \int_0^T (1 - H_t - S_t) W(\delta_t, \mathbf{I}) K_t e^{-rt} dt$$

where H_t and S_t now refer to the proportion of each time period devoted to leisure and investment subject to

$$\dot{K} = K(S_t, \delta_t, K_t).$$

However, this formulation does not yield differing results. Thus we concentrate on the whole lifetime and neglect the separate analysis of each time period. For an analysis of this problem, see Polachek (1975b, 1979).

$W(\boldsymbol{\delta}, \mathbf{I}) \equiv$ the rental rate per unit of type $\boldsymbol{\delta}$ human capital for an individual of characteristics, **I**, and

$K(S, \boldsymbol{\delta}) \equiv$ lifetime amount of human capital.

As will be shown, maximization of (1) yields optimal amounts of investment (S) as well as characteristics of the optimal kind of human capital ($\boldsymbol{\delta}$). Implications concerning occupational choice are obtained by assuming that $\boldsymbol{\delta}$ characterizes occupations.

C. An Application: Occupational Segregation by Sex

Imposition of a structure on the abstract model described in (1) enables the desired concentration on sex differences in occupational structure. First for the sake of simplicity, the original notion of occupational characteristics is narrowed to deal with only one component of the $\boldsymbol{\delta}$ vector denoted as atrophy (δ). Atrophy is assumed to uniquely describe an occupation. It is defined as the loss in earnings potential when skills are not continuously used. The logic is as follows: Wages on-the-job rise continuously over the life cycle as experience mounts. Dropping out of the labor force through intermittent participation has adverse effects on earnings potential. Aside from the obvious period of zero earnings, reentry earnings levels are lower than what they would have been if one worked continuously. Atrophy is thus defined as the loss of earnings potential that can be attributed to periods of work intermittency. Those occupations in which losses are smallest have the lowest atrophy rates.

Second, the rental rate for different occupations are specified. It is postulated that

$$\text{(a)}\ \frac{\partial W}{\partial \delta} > 0,$$

$$\text{(b)}\ \frac{\partial^2 W}{\partial \delta^2} < 0,$$

$$\text{(c)}\ \frac{\partial W}{\partial \mathbf{I}} \neq 0,$$

and

$$\text{(d)}\ \frac{\partial^2 W}{\partial \delta \partial \mathbf{I}} \neq 0. \qquad (2)$$

Assumptions (a) and (b) are necessary to obtain non-trivial solutions for optimal δ. However, economic justification exists as well. If it is true that losses of human capital stock yield lower earnings, then the market would compensate the rental rates (wages) of occupations for which the price of such intermittency is high. Those with expectations of full participation have a non-zero probability of dropping out of the labor force, even if only for health reasons. Thus to compensate for the non-zero probability of atrophy, it is assumed that $\partial W/\partial \delta > 0$.[10]

Individual characteristics (**I**) are introduced to explain why individuals with full lifetime participation have differing occupations. For the application to sex differences in occupational structure, it is assumed that, on the average, males and females have identical characteristics (**I**), but differ only in average lifetime labor force participation (H). Thus since this paper concentrates not on occupational structure *per se,* but instead only on sex differences in occupation, one can attribute observed occupational differences to differences in H.[11]

Third, the K function governing the technology to create human capital is defined. Little research exists on the exact functional form. For this reason a specification is based on the criterion of being simple, yet adhering to general human capital investment properties. Thus K is constructed so that time spent investing (S) has at least some positive impact on creating human capital; and that for less than full lifetime labor force participation, higher rates of atrophy tend to decrease lifetime human capital stock. Hence (without vector notation because $\boldsymbol{\delta}$ is redefined as the scalar atrophy (δ))

$$K(S, \delta) = (1 - \delta)^H \kappa(S) \qquad (3)$$

where each term has already been defined, and $\partial\kappa(S)/\partial S > 0$. This specification implies a constant percentage depreciation of human capital compounded for *each* year out of the labor force, but not at such a high rate that human capital

[10] This assumption derives from the *market* wage equilibrium and is comparable to the condition that "more satisfying jobs pay less" used by Sattinger (1977) to prove that more productive individuals choose more satisfying jobs (p. 498).

[11] Obviously if sex differences in (**I**) exist then some differences in occupational structure could be attributed to differences in **I**. In the empirical work to follow, adjustment is made for **I** differences. The point is that even if males and females are identical in *all* characteristics, differences in H imply differences in the occupational structure in the same direction that is empirically observed.

stock completely depreciates, even if one never works. Traditional human capital investment properties hold. Capital stock varies directly with investment (S), but inversely with time out of the labor force (H). Also, $\partial K(S, \delta)/\partial\delta < 0$. When full lifetime labor force participation occurs ($H = 0$), the $(1 - \delta)^H$ term equals one, and the model reverts to the classic depiction of human capital in terms of schooling alone. Further, as is to be expected, investment enhances human capital stock $\partial K(S, \delta)/\partial S > 0$.

D. *Optimality Conditions*

Maximization of lifetime income given the restrictions posed by (2) and (3) constitute the means to determine optimal amounts and kind of investment. Thus substituting (3) into (1) yields[12]

$$\max_{S,\delta} Y = (T - H - S)\ W(\delta, I)(1 - \delta)^H\ \kappa(S). \tag{4}$$

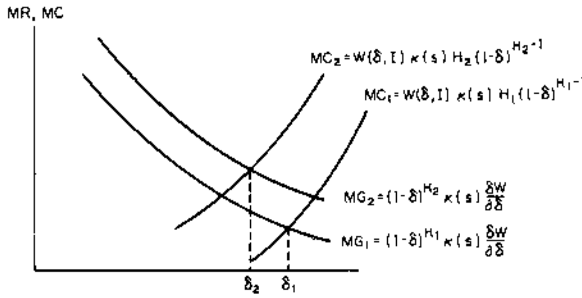
First-order conditions are obtained by setting the appropriate partial derivatives of (4) equal to zero:

$$Y_s = -W(\delta, I)\ K(S, \delta) + (T - H - S)\ W(\delta, I)\frac{\partial\kappa}{\partial S} = 0 \tag{5a}$$

$$Y_\delta = (1 - \delta)^H\ \kappa(s)\frac{\partial W}{\partial\delta} - W(\delta, I)\ \kappa(S)\ H(1 - \delta)^{H-1} = 0. \tag{5b}$$

Both (5a) and (5b) can be interpreted in terms of standard marginality conditions. Equation (5a) implies a time investment (S) up to the point that marginal cost—composed of forgone wages, $W(\delta, I)K(S, \delta)$ per time unit of investment—equals the marginal gain of lifetime earnings: $(T - H - S)W(\delta, I)\ [\partial\kappa(S, \delta)/\partial S]$. Equation (5b) implies that one chooses an occupation with an atrophy rate such that the monetary value of marginal depreciation associated with a higher atrophy $\{W(\delta, I)\kappa(S)H(1 - \delta)^{H-1}\}$ is exactly balanced by the marginal gain in lifetime earnings $\{(1 - \delta)^H\kappa(S)\ (\partial W/\partial\delta)\}$. Condition (5b) is illustrated graphically by points δ_1 and δ_2 (figure 1) for two different lifetime work patterns. In the

FIGURE 1.—DETERMINATION OF OCCUPATION ($H_2 > H_1$)



case of full labor force participation H equals 0. The marginal cost of a higher δ is zero $\{\partial K(S, \delta)/\partial\delta = H(1 - \delta)^{H-1}\kappa(S) = 0\}$ in (5b) so that occupation is determined solely on the basis of individual characteristics (I), i.e., the equilibrium occupation is determined by $\partial W(\delta,I)/\partial I = 0$.

When the model is simplified to neglect the existence of δ, then (4) reduces to models portrayed in the standard human capital literature that only determine optimal amounts of investment (S).[13] *Thus the model described by equations (4) and (5) represents a generalization of standard human capital analysis that encompasses an individual's decisions concerning both optimal amount (S) and kind (δ) of human capital investment.* With the interpretation of δ as representing an occupation, implications are obtained concerning optimal lifetime occupational choice.

E. *The Effect of Labor Force Intermittency (H) on Occupational Choice*

Equation (5) sets out the conditions upon which an individual determines his optimal occupational choice. The crucial question now to be considered is how optimal occupation differs with exogenous changes in lifetime labor force intermittency (H). The solution to this problem yields expected differences in occupational choice for two individuals who differ only insofar as their lifetime labor force behavior is concerned. From these results unambiguous implications are obtained concerning sex differences in occupation.

Perturbation of the optimal solution generated by (5) yields measures of the impact of differing

[12] A solution is guaranteed by (2) and (3). It is interior if the appropriate Inada conditions hold.

[13] Such a solution would be similar to that of Becker (1967).

labor force participation. Totally differentiating equation system (5) yields[14]

$$\frac{d\delta}{dH} = \frac{Y_{\delta s}\, Y_{sH} - Y_{\delta H}\, Y_{ss}}{Y_{\delta\delta}\, Y_{ss} - Y_{\delta s}\, Y_{s\delta}} < 0. \qquad (6)$$

Thus we see that δ decreases as labor force intermittency increases (figure 1).[15]

Equation (6) implies an unambiguous relationship between life cycle labor force participation and occupational choice.[16] Hence when individual tastes and abilities (I) are held constant, occupation is determined in part by labor market variables. In particular if lifetime labor force participation differs across individuals, then occupational variations in the cost of labor force intermittency will cause an individual to choose that occupation that imposes the smallest penalty given his desired lifetime participation, *ceteris paribus*. According to this generalized human capital model, if this cost of intermittency is measured by the amount of depreciation attributed to less than full time use of human capital (atrophy), then the effect of differences in life cycle labor force participation on entering a particular occupation would be greater the greater is that occupation's atrophy rate.

III. Empirical Analysis

Much of the theoretical model has been devoted to predicting the existence of a relation between patterns of life cycle labor force participation and occupational choice. It is hypothesized (1) that *ceteris paribus* intermittent labor force participation affects occupational choice, and (2) that the impact of lifetime labor force participation on the probability of entering a given occupation varies with that occupation's atrophy rate. This section establishes the empirical plausibility of these contentions by examining the relationship between lifetime labor force participation, occupation, and atrophy both in an ordinary and simultaneous equations setting.

A. *The Data*

The data are obtained from the National Longitudinal Survey of Women 30–44 years of age (NLS), already well documented in the literature.[17] This sample was chosen because extensive lifetime work history information is given. By examining the impact of differences in work histories *only* of women, the problem of implicitly picking up the impact of sex discrimination is avoided. The calculated effect of intermittent participation on occupational choice *cannot* be measuring sex discrimination if *only* females are being considered.

B. *The Relationship between Occupation and Lifetime Labor Force Participation*

Equation (6) predicts a negative relation between home-time and occupational choice. Implicit in the parameterization of the problem is that occupational choice is a one-time decision. Occupational mobility is postulated not to exist.[18] Since such an assumption may be unduly

[14] Second order conditions imply

$$Y_{ss} < 0,$$
$$Y_{\delta\delta} < 0,$$

as well as

$$Y_{ss}\, Y_{\delta\delta} > Y_{\delta s}\, Y_{s\delta}.$$

In addition, for the given specification,

$$Y_{sH} = -w(\delta, \mathrm{I})\,\frac{\partial \kappa(S)}{\partial S} < 0$$

$$Y_{s\delta} = Y_{\delta s} = 0,$$

and

$$Y_{\delta H} = W(\delta, \mathrm{I})(1 - \delta)^{H-1} < 0.$$

[15] It can easily be seen that the MC curve shifts up more than the MG. Define "excess marginal net gain" (NG) to be $MG - MC$ which in equilibrium equals 0. Thus,

$$NG \equiv (1 - \delta)^{H}\kappa(S)\,\frac{\partial W}{\partial \delta} - W(\delta, \mathrm{I})\,\kappa(S)H(1 - \delta)^{H-1} = 0$$

or

$$NG = \kappa(S)(1 - \delta)^{H-1}\left\{(1 - \delta)\,\frac{\partial W}{\partial \delta} - W(\delta, \mathrm{I})\,H\right\} = 0,$$

and

$$\frac{d\delta}{dH} < 0.$$

[16] This implication neglects the timing of labor force intermittency within the life cycle. Implications regarding the timing of labor force intermittency are obtainable only within a dynamic framework. See Polachek (1975a, p. 455).

[17] See Parnes (1970) for a description of the data. The most recently released data were used so as to alleviate recent problems with miscoded life cycle labor force participation data.

[18] As mentioned earlier this assumption can be relaxed by posing the problem within a dynamic control theory framework. However, even within such a framework the same conclusions hold for occupations chosen at a given stage of the life cycle (e.g., first job). Thus in the empirical work, broad occupations are chosen because little mobility between

strong an empirical attempt is made for its alleviation. First, only eight broad occupational categories are used so as to minimize the chances of occupational mobility. Second, exogenous variables are introduced to account for life cycle variations when measuring the correlation between lifetime participation and occupation.

1. Measuring the Relationship Directly: Occupation Polytomous: Occupation is presented categorically as a discrete non-ordered variable. Such a representation implies that any a priori ranking of the set of occupations can only be arbitrary. Given the polytomous non-ordered nature of the dependent variable, traditional approaches do not yield efficient estimates of the impact of causal factors.[19]

Instead, since occupational groupings can be broken into mutually exclusive categories, the logistic approach can be applied to estimate the impact of independent variables on being in a particular occupation relative to another. Thus,

$$\ln \frac{P_{jt}}{P_{1t}} = H_t \gamma_j + X_t \beta_j \qquad t = 1, \ldots, T; \quad j = 2, \ldots, M \qquad (7)$$

where $j \equiv$ index of occupation, $t \equiv$ index of number of observations, $H \equiv$ the number of years out of the labor force (home-time), $\gamma \equiv$ the impact of home-time on the odds ratio of being in occupation j, $X \equiv$ vector of individual characteristics that standardize for life cycle stage, and $\beta \equiv$ coefficients measuring the effect of X on the logit. Since each individual chooses one and only one occupation at a given time, a linear dependency arises such that the occupational determination depicted in equation system (7) consists of $(M - 1)$ independent equations.[20]

them exists. In addition, life cycle adjustments are made by adding exogenous control variables.

[19] See Theil (1969) as well as Nerlove and Press (1973) for a more detailed explanation of the shortcomings of ordinary least squares (OLS) estimates.

[20] The likelihood function is

$$L = \prod_{t \in \Omega_1} P_{t1} \prod_{t \in \Omega_2} P_{t2} \cdots \prod_{t \in \Omega_M} P_{tM}$$

where the P's are defined as

$$P_{1t} = \left[1 + \sum_{j=2}^{M} \exp\,(\gamma_j H_t + X_t \beta_j)\right]^{-1}$$

$$P_{it} = \frac{\exp(X_t \beta_i)}{1 + \sum_{j=2}^{M} \exp(\gamma_j H_t + X_t \beta_j)} \qquad i = 2, \ldots, M$$

and Ω_i represents each possible occupation. The program used was developed by Schmidt and Strauss (1974). It is comparable except for the normalization to the technique of Nerlove and Press (1973).

These results (table 1) illustrate a strong relationship between lifetime labor force participation and occupational choice. The home-time coefficients measure the effect of greater labor force intermittency upon the odds of being in occupation i relative to being a professional. As can be seen, more home-time increases the probability of being in all except managerial occupations. The relative magnitudes of the coefficients indicate that more home-time increases the odds of being either a household or sales worker relative to an operative or non-household service worker, and that those with greatest home-time are least likely to enter managerial and professional occupations. Thus, as is predicted, even after adjusting for marital status, age, and education *differences in lifetime labor force participation are associated with the probability of being in a given occupation.*[21] Yet as indicated, the relationship differs among occupations. Is a pattern discernible?

2. Measuring the Relationship Indirectly: Occupation Continuously Represented by Atrophy: According to the theory outlined it is claimed that attached to each occupation is a unique rate of atrophy. Further, those individuals with expectations of higher home-time would find relatively larger losses associated with occupations having higher atrophy rates.[22] For this reason home-time should act as a deterrent to choosing an occupation with high atrophy.

No data exist measuring atrophy rates. Thus in order to test this aspect of the theory crude atrophy measures had to be estimated, and should be thought of as serving only to test the plausibility of our hypothesis. The technique used was developed in a recent paper (Mincer and Polachek, 1978). It does not rely on retrospective cross-sectional data as in past research

[21] Again it should be emphasized that the sample is *only* of white females. Thus the home-time coefficient is not measuring sex discrimination.

[22] Obviously the relationship could be the reverse. That is, those who by chance enter high atrophy occupations would tend to work a greater extent because labor force intermittency would be costly. This question of causality is explored in the next section with simultaneous equations models. However, note that occupation is treated *both* polytomously and continuously in this section, so that it is encouraging that the results are as predicted in *both* cases.

TABLE 1.—MULTIPLE LOGIT MODEL OF OCCUPATIONAL CHOICE
(asymptotic t-ratios in parentheses)
$N = 518$[a]

Dependent Variable	C	M	S	E	H
$\ln \frac{P(OC_2)}{P(OC_1)}$	6.027 (2.28)	0.845 (1.053)	−0.593 (−3.481)	−0.028 (−0.421)	−1.217 (−1.407)
$\ln \frac{P(OC_3)}{P(OC_1)}$	1.612 (1.25)	0.356 (0.91)	−0.210 (−2.80)	0.093 (3.07)	0.647 (1.41)
$\ln \frac{P(OC_4)}{P(OC_1)}$	0.203 (0.10)	−0.462 (−0.74)	−0.375 (−3.10)	0.154 (3.28)	2.375 (3.00)
$\ln \frac{P(OC_5)}{P(OC_1)}$	1.499 (0.35)	−0.437 (−0.33)	−0.451 (1.61)	0.066 (0.63)	1.095 (0.63)
$\ln \frac{P(OC_6)}{P(OC_1)}$	7.147 (4.36)	−0.156 (−0.19)	−0.813 (−7.78)	0.107 (2.65)	1.299 (2.07)
$\ln \frac{P(OC_7)}{P(OC_1)}$	4.155 (1.16)	−0.237 (−0.19)	−0.845 (−4.11)	0.110 (1.12)	2.461 (1.53)
$\ln \frac{P(OC_8)}{P(OC_1)}$	4.667 (2.80)	−0.018 (−0.04)	−0.577 (−5.47)	0.084 (2.11)	1.558 (2.46)

Note: Variable definitions:
OC_1 ≡ professional; OC_2 ≡ managerial; OC_3 ≡ clerical; OC_4 ≡ sales; OC_5 ≡ craft; OC_6 ≡ operative; OC_7 ≡ household worker; OC_8 ≡ services (excluding household)
C ≡ constant
M ≡ marital status (1 if married)
S ≡ years of schooling
E ≡ exposure (A − S − 6)
H ≡ home-time (years out of labor force).
[a] Random sample from NLS data.

(Mincer-Polachek, 1974); nor does it use male cross-sectional profile slopes as proxies (Landes, 1977). Instead panel data are used. This has the advantage of relying on actual work history and wage information, and uses the measure of years out of the labor force (H) defined in the theory section of this paper.

The estimates are obtained from regressions of first differences in wages on length of work interruption (as well as other standardizing variables) for each broad occupational category during the years 1967–1972:

$$\Delta W = \alpha_0 + \alpha_1 S - \alpha_2 H + \alpha_3 \mathbf{X} + \epsilon \qquad (8)$$

where

ΔW = $\text{wage}_{1972} - \text{wage}_{1967}$
S = years of schooling
H = years of work interruptions, and
$\mathbf{X}$ = a vector of standardizing exogenous variables.

The coefficient α_2 estimates the extent to which wages fall (fail to rise) given work interruptions (H). In table 2 (as well as the subsequent computations), a positive value of α_2 connotes those occupations with large wage losses to be the ones with high atrophy. For example, a coefficient of 45.21 implies that earnings growth between 1967

TABLE 2.—ESTIMATED ATROPHY RATES BY OCCUPATION
(excluding farming)
(NLS data)

	Coefficient Times (−1)	t-value	Number Observed	Average Percentage Home-time
Professional	45.21	−3.1	156	33
Managers	30.35	−2.0	42	37
Clerical	21.64	−5.7	400	39
Sales	12.61	−1.9	47	53
Craft	44.68	−1.4	10	50
Operative	8.17	−2.2	217	46
Household work	5.91	−0.5	9	58
Service	14.87	−1.9	127	56

Note: See text for variable definitions.

and 1972 was 45.21 cents lower for each year out of the labor force. Each atrophy rate is significant except for household work, which is not significantly different from zero. Moreover, the professional, managerial, and craft occupations have the highest atrophy, followed by clerical workers, and finally the unskilled. While not perfect, these estimates certainly seem plausible. They are similar in rank order to cross-sectional estimates, and thus should prove sufficient to illustrate the model. Certainly more precision can be obtained, but this will be left to future research when data with more observations are available.

According to table 1, home-time affects the odds of being in each occupation differently. For example, home-time most greatly decreases the probability of being in professional and managerial type occupations. If the model presented is correct, then these occupations should exhibit the highest levels of atrophy. Put differently, a negative correlation should be exhibited between the home-time coefficients and the atrophy coefficients of table 2. Indeed the correlation is −0.56.

If it is valid to characterize an occupation by its atrophy rate, then an alternative specification to the logit exists. This alternative entails using atrophy as a dependent variable in a regression on home-time. Such a regression run across individuals also yields a negative relation between atrophy and home-time:

$$\delta = \underset{(-5.1)}{-10.72} + \underset{(1.8)}{1.38M} + \underset{(24.8)}{2.74S} + \underset{(0.1)}{0.01E} - \underset{(-2.8)}{0.11H} \quad (9)$$

$$R^2 = .34 \quad (t\text{-values in parentheses}).$$

These results hold constant potential labor market experience (E), schooling (S), and marital status (M) so that life cycle changes in occupation can be held constant.

C. *A Simultaneous Equations Approach*

In the analysis so far, little attention has been given to the question of causality between home-time and occupational choice. Obviously causality could run in both directions. Expectations of greater amounts of home-time could result in the choice of an occupation with a lesser amount of atrophy. Still, at the same time, being in an occupation with low atrophy could cause one to spend less time in the labor force. Dropping out would be less costly than in high atrophy occupations. Adherents of the dual labor market theory (e.g., Bergmann, 1971) would postulate this reverse causality, though clearly both hypotheses reinforce each other.

It is not the purpose of this paper to disentangle each direction of causality, though the answer to this question is obviously important for policy purposes. Instead, we seek only to test whether the negative impact of home-time remains even when home-time is treated as endogenously determined. The characterization of occupation by atrophy enables standard two-stage least-squares (2SLS) estimation:

$$\delta = \underset{(4.5)}{-10.08} + \underset{(2.0)}{2.05M} + \underset{(18.5)}{2.64S} + \underset{(1.0)}{.18E} - \underset{(-1.6)}{.45\hat{H}}. \quad (10)$$

with the instrumental H equation being

$$\hat{H} = \underset{(1.7)}{3.44} - \underset{(-3.2)}{.22S} + \underset{(15.3)}{.56E} + \underset{(4.3)}{1.96M} + \underset{(2.4)}{1.96C} - \underset{(-1.0)}{.35U} - \underset{(-2.6)}{1.24HL} - \underset{(-1.5)}{.05Ac} - \underset{(-2.3)}{.10D},$$

$$R^2 = .22 \quad (11)$$

where the new exogenous identification variables are potential labor market experience (E) defined as years since school graduation, number of children less than 18 (C), an urban area dummy (U) defined as in central city, a good or excellent health dummy (HL), the age of the youngest child (Ac), and an index of labor market demand (D). As can be seen, the negative relation between home-time and occupation pervades despite an adjustment for simultaneity.

IV. Conclusion: An Application to Occupational Segregation

The model outlined in this paper is in part designed to shed light on the question of why within most societies women are by and large relegated to different occupations than men. It is hypothesized that, at least for females, duration of time in and out of the labor force is related to occupation. This implication stems from a model that utilizes a hedonic approach to embed the occupational choice decision into the human capital framework. Empirically this hypothesis is tested by measuring the effect of home-time on occupational choice.

To answer the remaining question of how important intermittent labor force behavior really is in explaining occupational segregation, male-female occupational dissimilarity can be compared before and after adjustments are made for differences in lifetime labor force participation. An occupational probability density function is obtained for each woman by using the (table 1) logit coefficient estimates with the assumption that $H = 0$. Aggregation of all individual probabilities yields a projected population-wide occupational distribution. From this comparison (table 3), it can be seen that differences in labor force commitment *alone* account for much of the difference in professional and menial employment. If women were to have a full commitment to the labor force, the number of women professionals would increase by 35%, the number of women in managerial professions would more than double, and women in menial occupations would decrease by more than 25%.

Obviously these projections ignore the economy's ability to absorb more employees in professional-managerial type occupations. Because macroeconomic factors are not considered, it is best to view these projections as a measure of potential change in female job aspirations as opposed to actual occupational distribution.

While large sex differences still exist in clerical, operative, and craft occupations, the changes in the other occupations are in the predicted direction. Such results illustrate that life cycle labor force participation patterns are related to career choices *even* on as aggregated a level as the eight occupations chosen. Because jobs can be viewed as investment opportunities[23] with switching being easier between narrow opportunity differences than between broader ones, the estimates presented here of the importance of life cycle behavior are probably lower bound. Thus one may be confident that if efficient computer algorithms were available to perform computations on a detailed occupational basis, a greater proportion of occupational segregation would be explained.

Evidence is presented indicating that the question of causality (i.e., the extent to which home-time and occupational choice reinforce each other) cannot be neglected. By the use of simultaneous equations models it was found that the results hold even after adjusting for the possible endogeneity of home-time. Obviously more experimentation is needed regarding identification. One can hope that future work will move in such directions.

[23] See Rosen (1972) for a description of how jobs can be viewed in terms of investment opportunities.

TABLE 3.—OCCUPATIONAL DISTRIBUTIONS BY SEX UNADJUSTED AND ADJUSTED FOR HOME-TIME

	Actual Female	Adjusted Female[a]	Male[b]
Professional	14	19	17
Managerial	3	7	17
Clerical	46	49	7
Sales	7	3	6
Craft	0.9	0.8	26
Operative	15	13	22
Household	1	0.5	—
Service	13	9	5
	99.9	101.3	100.0

[a] Occupational distribution of females assuming zero home-time.
[b] Occupational distribution of males (30–44) taken from 1965 Survey of Economic Opportunity data tape.

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