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A Theory of Career Mobility

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A THEORY OF CAREER MOBILITY

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A THEORY OF CAREER MOBILITY

ABSTRACT

This paper analyzes the role as well as the significance of the phenomenon of occupational mobility in the labor market focusing on individuals' careers. The study provides an additional dimension to the existing analysis of prominent labor market phenomena including investment in human capital, wage profiles differences across individuals and inter-firm mobility.

The introduction of the concept of occupations and occupational mobility into the study of investment in human capital and labor mobility captures explicitly heterogeneity in human capital (i.e. skills are to a large extent occupational specific and their transferability across jobs is limited). Constraints are therefore added to the process of investment in human capital and to the movement across several activities over the life cycle.

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A THEORY OF CAREER MOBILITY

I. INTRODUCTION

Occupational mobility is an outstanding characteristic of the American labor market; very few workers perform the same tasks throughout their working lives¹.

The economic literature pertaining to the role of occupations in the labor market has, for the most part, focused on occupational choice. Studies of occupational mobility have been conducted within a Job-matching framework where occupational mobility is assumed to be the outcome of changes in the information set, market conditions or workers' characteristics². With the notable exception of Rosen (1972), the fact that job mobility is an integral part of workers' careers, however, has been virtually neglected³.

This paper analyzes theoretically and empirically the role as well as the significance of the phenomenon of occupational mobility in the labor market focusing on individuals' careers⁴. The study provides an additional dimension to the existing analysis of prominent labor market phenomena including investment in human capital, wage profiles differences across

¹See for example Sehgal (1984), and other publications of the Office of Employment and Unemployment Statistics, Bureau of Labor Statistics.

² see Miller (1984) for example.

³In his model jobs/occupations differ by the amount of on-the-job training they provide. The realization of an optimal path of investment in human capital, over the life cycle, might involve jobs/occupational mobility.

⁴Spilerman (1977) defines "career line" or "job trajectory" as "a work history that is common to a portion of the labor force". Following Slocum (1974) he uses the term "career" to refer to an individual's job history, and the terms "career line" and "job trajectory" "...to denote an empirical regularity in the labor force. Sommers and Eck (1977) use the term "career ladder" which they define as: "A series of occupations forming a path of advancement, usually through gaining skills and experience, to a higher status occupation".

individuals and inter-firm mobility.

The introduction of the concept of occupations and occupational mobility into the study of investment in human capital and labor mobility explicitly captures heterogeneity in human capital (i.e. skills are to a large extent occupational specific and their transferability across jobs is limited). Constraints are therefore added to the process of investment in human capital and to the movement across several activities over the life cycle. The implications of these constraints on the optimal time path of investment in human capital and on workers' mobility across firms are examined.

An econometric model of career mobility is presented and several implications of the theory are tested. The relations between occupational mobility, returns to schooling and firm separation are analyzed. The effects of different characteristics on the probability of career mobility are estimated and the differences between workers who move along their career path within the firm and those who do so by moving across firms are examined.

II. A THEORY OF CAREER MOBILITY

The objective of this section is to construct a theoretical model of optimal career choice, firm separation, and occupational mobility. The model is characterized by a limited set of occupations, related by the transferability of skills that are available for individuals within as well as across firms. In the presence of differences in ability and therefore schooling, across individuals, the sequence of occupations that forms the individuals' optimal career path may differ.

Individuals' optimal career path may involve intra-firm mobility as well as inter-firm mobility. Intra-firm career mobility ("promotion") is subject to the employer's decision whereas inter-firm mobility and its optimal timing are determined by the individuals who choose the optimal quitting time so as to maximize their expected lifetime earnings. Intra-firm career mobility is uncertain. The probability of promotion is a function of schooling, ability and job experience. The optimal investment in human capital as well as the optimal quitting time maximizes the individual's expected life time income.

Since the focus of the discussion is the transferability of skills across occupations, we ignore the effect of on-the-job training on the wage in the occupation, and consider only the effect of accumulated human capital on the probability of promotion and the wages in other occupations. Thus, it is assumed that wages are constant while working in the same occupation, and wage growth occurs solely through occupational mobility⁵.

1. THE MODEL

Consider an economy in which individuals wish to allocate their finite life time, T , between education and various feasible occupations so as to maximize their expected life time income, EY .

$$EY = \int_0^T e^{-rt} E(w_t) dt, \quad (1)$$

where r is the rate of interest on borrowing and lending in the existing perfect capital market. The rate of interest is constant over time.

⁵While wages are constant for any individual within a given occupation, the actual wage received will vary across individuals due to differences in education and experience in other occupations.

At time 0 individuals face the choice of either acquiring education through enrollment in the schooling system, or joining the labor force at an occupation appropriate for uneducated inexperienced workers.

1.1 Education

Education provides individuals with a certain level of human capital which subsequently raises their future earnings through two channels: directly, via the potential returns to schooling in certain occupations, and indirectly, through the improvement in their career path. The cost of education is, solely, the forgone earnings.

Individuals who attend the education system for a period of t_s years acquire a level of Human Capital H_s .⁶

$$H_s = \int_0^{t_s} \beta a dt = \beta a t_s \quad ; \quad a > 0 \quad , \quad \beta > 0 \quad , \quad 0 \leq t_s < T \quad . \quad (2)$$

H_s is, therefore, a function of individuals' natural ability, "a". Holding years of schooling constant, higher ability individuals obtain a higher level of human capital.

1.2 Occupations

Individuals face three possible occupations.

Occupation 1:

Pays a constant wage rate, w_1 , regardless of ability, schooling, or market experience. Individuals may join this occupation at any point in time

⁶Clearly, direct cost of education could be incorporated into the analysis, and an alternative assumption where it is not possible to generate education without completing school (no partial credit) could have been employed. These alterations will have no effect on the qualitative results.

irrespective of their ability, education, or experience.

Occupation 2:

Pays a constant wage rate, w_2 , independent of ability, education, or market experience. $w_2 > w_1$. Occupation 2 can be obtained, solely, through a promotion from occupation 1. The promotion decision is made after the individual has spent a constant time interval, α , in occupation 1. Although formal education is not a necessary requirement for promotion, the probability of promotion, P , is positively related to the level of human capital acquired by the individual at school, H_S , as well as the level of human capital acquired in occupation 1, H . H_S and H are, in turn, positively related to the time interval spent in school and the level of ability.

$$P = P(t_S; a) = P[H_S(t_S; a), H(H_S; a, \alpha)] ; \quad \partial H / \partial a > 0 \quad \text{and} \quad \partial H / \partial H_S > 0. \quad (3)$$

P is twice continuously differentiable in t_S .

Occupation 3:

Pays a constant wage rate, w_3 , which is an increasing function of the level of human capital obtained at school, H_S , the aggregate human capital obtained in occupations 1 and 2, H , and the level of ability, "a".⁷

$$w_3 = w[H_S(t_S; a), H(H_S, \tau - t_S; a); a] ; \quad \partial w_3 / \partial \tau > 0 \quad \text{and} \quad \partial^2 w_3 / \partial \tau^2 < 0, \quad (4)$$

where τ is the time in which the individual quits from either occupation 1 or 2 in order to join occupation 3. $t_S \leq \tau \leq T$. w_3 is twice continuously differentiable in t_S and τ .

⁷The level of human capital obtained on the job is assumed for simplicity to be a function of the time spent in previous occupations regardless of the division of the time between the two occupations.

1.3 Feasible Career Paths

Individuals face four possible career paths:

- (a) Starting their working career directly in occupation 3, and remaining there over their entire working life time.
- (b) Starting their working career in occupation 1, and quitting in favor of occupation 3 before the promotion decision.
- (c) Starting their working life in occupation 1, and waiting for the promotion decision, and quitting for occupation 3 some time after the decision is made.
- (d) Starting their working career in occupation 1 and not quitting in favor of occupation 3 regardless of the realization of the promotion decision.

2. THE OPTIMAL CAREER PATH

Individuals wish to choose the level of schooling and a feasible career path so as to maximize the present value of their expected life time earnings. The optimal values are derived using the method of backward solution.

2.1. Quitting After the Promotion Decision.

Consider individuals who spend their initial t_s years in the education system and then join occupation 1 and remain there until the promotion decision is realized.

2.1.1. Promotion is approved

Individuals who are promoted at the promotion decision date $t_s + \alpha$, wish to choose the optimal quitting time, τ_p , so as to maximize the present value of their future earnings, $V_p(\tau_p; t_s, a)$.

The individual's maximization problem is therefore:

$$\text{Max}_{\tau_p} V_p(\tau_p; t_s, a) = \int_{t_s+\alpha}^{\tau_p} e^{-r(t-t_s-\alpha)} w_2 dt + \int_{\tau_p}^T e^{-r(t-t_s-\alpha)} w_3(\tau_p; t_s, a) dt \quad (5)$$

subject to:

$$t_s+\alpha \leq \tau_p \leq T .$$

$V_p(\tau_p; t_s, a)$ is twice continuously differentiable in τ_p . Furthermore, it is assumed to be strictly concave in τ_p .

τ_p^* is optimal if the necessary and sufficient conditions for the maximization of V_p are satisfied:⁸

$$\frac{\partial V_p^*}{\partial \tau_p} \leq 0 \quad ; \quad (\tau_p^* - t_s - \alpha) \left(\frac{\partial V_p^*}{\partial \tau_p} \right) = 0 \quad ; \quad \tau_p^* - t_s - \alpha \geq 0$$

or

$$\frac{\partial V_p^*}{\partial \tau_p} \geq 0 \quad ; \quad (T - \tau_p^*) \left(\frac{\partial V_p^*}{\partial \tau_p} \right) = 0 \quad ; \quad T - \tau_p^* \geq 0 \quad , \quad (6)$$

where $V_p^* = V_p(\tau_p^*, t_s, a)$, and

$$\frac{\partial V_p}{\partial \tau_p} = e^{-r(t_s+\alpha)} \left\{ e^{-r\tau_p} (w_2 - w_3) + \left[\frac{e^{-r\tau_p} - e^{-rT}}{r} \right] \frac{\partial w_3}{\partial \tau_p} \right\} . \quad (7)$$

Thus, for $t_s+\alpha < \tau_p^* < T$, a necessary and sufficient condition for the maximization problem (5) is:

$$e^{-r\tau_p^*} (w_3^* - w_2) = \left[\frac{e^{-r\tau_p^*} - e^{-rT}}{r} \right] \frac{\partial w_3^*}{\partial \tau_p} , \quad (8)$$

where $w_3^* = w_3(\tau_p^*, t_s, a)$.

⁸Sufficiency follows from the strict concavity of V_p with respect to τ_p .

The optimal quitting time is characterized, therefore, by the equalization of the present value of the direct loss of income resulting from the delay in joining occupation 3 (i.e. the present value of the difference between the wages in occupation 3 and 2) and the present value of the additional stream of income in occupation 3 due to the lengthening of the experience in occupations 2.

2.1.2. Promotion is disapproved.

Individuals who are not promoted at the promotion decision date wish to choose the optimal quitting time, τ_{np} , so as to maximize the present value (at time $t_s + \alpha$) of their future earnings, $V_{np}(\tau_{np}; t_s, a)$.

The individual's maximization problem is thus:

$$\text{Max}_{\tau_{np}} V_{np}(\tau_{np}; t_s, a) = \int_{t_s + \alpha}^{\tau_{np}} e^{-r(t - t_s - \alpha)} w_1 dt + \int_{\tau_{np}}^T e^{-r(t - t_s - \alpha)} w_3(\tau_{np}; t_s, a) dt \quad (9)$$

subject to:

$$t_s + \alpha \leq \tau_{np} \leq T .$$

$V_{np}(\tau_{np}; t_s, a)$, which is twice continuously differentiable in τ_{np} , is assumed to be strictly concave in τ_{np} .

τ_{np}^* is optimal if the necessary and sufficient conditions for the maximization of V_{np} are satisfied:⁹

$$\partial V_{np}^* / \partial \tau_{np} \leq 0; \quad (\tau_{np}^* - t_s - \alpha)(\partial V_{np}^* / \partial \tau_{np}) = 0; \quad \tau_{np}^* - t_s - \alpha \geq 0$$

or

$$\partial V_{np}^* / \partial \tau_{np} \geq 0; \quad (T - \tau_{np}^*)(\partial V_{np}^* / \partial \tau_{np}) = 0; \quad T - \tau_{np}^* \geq 0, \quad (10)$$

⁹Sufficiency follows from the strict concavity of V_{np} with respect to τ_{np} .

where $V_{np}^* = V_p(r_{np}^*, t_s, a)$, and

$$\frac{\partial V_{np}}{\partial r_{np}} = e^{r(t_s+\alpha)} \left\{ e^{-rr_{np}(w_1 - w_3)} + \left[\frac{e^{-rr_{np}} - e^{-rT}}{r} \right] \frac{\partial w_3}{\partial r_{np}} \right\}. \quad (11)$$

Thus, for $t_s+\alpha < r_{np}^* < T$, a necessary and sufficient condition for the maximization problem (9) is:

$$e^{-rr_{np}^*(w_3^* - w_1)} = \left[\frac{e^{-rr_{np}^*} - e^{-rT}}{r} \right] \frac{\partial w_3^*}{\partial r_{np}}, \quad (12)$$

where $w_3^* = w_3(r_{np}^*, t_s, a)$.

Thus, at the optimal quitting point, the present value of the marginal loss of income resulting from spending additional time in occupation 1 (rather than moving to occupation 3) equals to the present value of the additional stream of income that will be earned in occupation 3, due to the effect of the lengthening of experience in occupation 1 on the wage in occupation 3.

2.1.3. Optimal Schooling.

Individuals who quit after the promotion decision is realized, determine the optimal level of schooling, t_s , so as to maximize the present value of their expected lifetime earnings, $M(t_s; r_p^*, r_{np}^*, a)$.

$$\begin{aligned} \text{Max}_{t_s} M(t_s, r_p^*, r_{np}^*, a) = & \int_{t_s}^{t_s+\alpha} e^{-rt} w_1 dt + e^{-r(t_s+\alpha)} \left\{ P(t_s, a) V_p(r_p^*, t_s, a) \right. \\ & \left. + [1 - P(t_s, a)] V_{np}(r_{np}^*, t_s, a) \right\} \end{aligned} \quad (13)$$

subject to:

$$t_s \geq 0.$$

$M(t_s, r_p^*, r_{np}^*, a)$, which is twice continuously differentiable in t_s , is assumed to be strictly concave in t_s .

t_s^* is the optimal level of schooling (for the case in which quitting occurs after the promotion decision) if the necessary and sufficient conditions for the maximization of (13) are satisfied:

$$\partial M^*/\partial t_s \leq 0; \quad t_s^*(\partial M^*/\partial t_s) = 0; \quad t_s^* \geq 0, \quad (14)$$

where $M^* = M(t_s^*, r_p^*, r_{np}^*, a)$, and

$$\begin{aligned} \frac{\partial M}{\partial t_s} = e^{-r(t_s+\alpha)} \left\{ (V_p^* - V_{np}^*) \frac{\partial P}{\partial t_s} + P(t_s; a) \frac{\partial V_p^*}{\partial t_s} + [1 - P(t_s; a)] \frac{\partial V_{np}^*}{\partial t_s} \right\} + \\ w_1 \left[e^{-r(t_s+\alpha)} - e^{-rt_s} \right] - \frac{e^{-r(t_s+\alpha)}}{r} \left\{ P(t_s; a) V_p^* + [1 - P(t_s; a)] V_{np}^* \right\}. \end{aligned} \quad (15)$$

Consider an internal solution for the optimal schooling level. If quitting occurs after the promotion decision, a marginal increase in the optimal schooling time results in the equalization of the gains and losses in the present values of expected future earnings. The gains are due to the improvement in the probability of promotion and the increase in the wage rate in occupation 3, whereas the losses are due to the delay in the beginning of the working periods in the various occupations.

2.2. Quitting before the promotion decision.

Consider individuals who spend their initial t_s years in the education system and then either join occupation 1 and quit before the promotion decision, or join directly occupation 3.

Individuals wish to choose the level of schooling, t_s , and the quitting

time from occupation 1, τ , so as to maximize the present value of their expected life time earnings, $V(\tau, t_s; a)$.¹⁰

The individual's maximization problem is therefore:

$$\text{Max}_{\tau, t_s} V(\tau, t_s; a) = \int_{t_s}^{\tau} e^{-rt} w_1 dt + \int_{\tau}^T e^{-rt} w_3(\tau, t_s; a) dt \quad (16)$$

subject to:

$$0 \leq t_s \leq \tau \leq T .$$

$V(\tau, t_s; a)$, which is twice continuously differentiable in t_s and τ , is assumed to be strictly concave.

(\tilde{t}_s^*, τ^*) is an optimal pair for the case in which quitting occurs before the promotion decision, if the necessary and sufficient conditions for the maximization of V are satisfied:

$$\partial V^* / \partial t_s \leq 0 ; \quad \tilde{t}_s^* (\partial V^* / \partial t_s) = 0 ; \quad \tilde{t}_s^* \geq 0 \quad (17)$$

and either

$$\partial V^* / \partial \tau \leq 0 ; \quad (\tau^* - \tilde{t}_s^*) (\partial V^* / \partial \tau) = 0 ; \quad \tau^* - \tilde{t}_s^* \geq 0 \quad (18)$$

or

$$\partial V^* / \partial \tau \geq 0 ; \quad (\tau^* - \tilde{t}_s^* - \alpha) (\partial V^* / \partial \tau) = 0 ; \quad \tilde{t}_s^* + \alpha - \tau^* \geq 0 ,$$

where $V^* = V(\tau^*, \tilde{t}_s^*; a)$, and

$$\frac{\partial V}{\partial t_s} = -e^{-rt_s} w_1 + \left[\frac{e^{-r\tau} - e^{-rT}}{r} \right] \frac{\partial w_3}{\partial t_s} ; \quad (19)$$

$$\frac{\partial V}{\partial \tau} = e^{-r\tau} (w_1 - w_3) + \left[\frac{e^{-r\tau} - e^{-rT}}{r} \right] \frac{\partial w_3}{\partial \tau} . \quad (20)$$

¹⁰If $\tau^* = \tilde{t}_s^*$, then individuals join directly occupation 3.

Thus, if the optimal quitting time takes place before the promotion decision and if $t_s^* < \tau^* < t_s + \alpha$,

$$e^{-r\tau^*}(w_3^* - w_1) = \left[\frac{e^{-r\tau^*} - e^{-rT}}{r} \right] \frac{\partial w_3^*}{\partial \tau}; \quad (21)$$

where $w_3^* = w_3(\tau^*, t_s^*, a)$.

At the optimal quitting point, the present value of the marginal loss of income resulting from spending additional time in occupation 1 (rather than moving to occupation 3) equals to the present value of the additional stream of income that will be earned in occupation 3, due to the effect of the lengthening of experience in occupation 1 on the wage in occupation 3.

2.3. Analysis.

Proposition 1:

Individuals quit prior to the promotion decision if and only if

$$V(\tau^*, \tilde{t}_s^*; a) > M(\tau_p^*, \tau_{np}^*, t_s^*; a);$$

Individuals quit after the promotion decision if and only if

$$V(\tau^*, \tilde{t}_s^*; a) < M(\tau_p^*, \tau_{np}^*, t_s^*; a).$$

Proof:

Follows from the definitions of V^* and M^* . ■

Corollary 1:

The higher the probability of promotion the greater the possibility for the occurrence of quitting after the promotion decision.

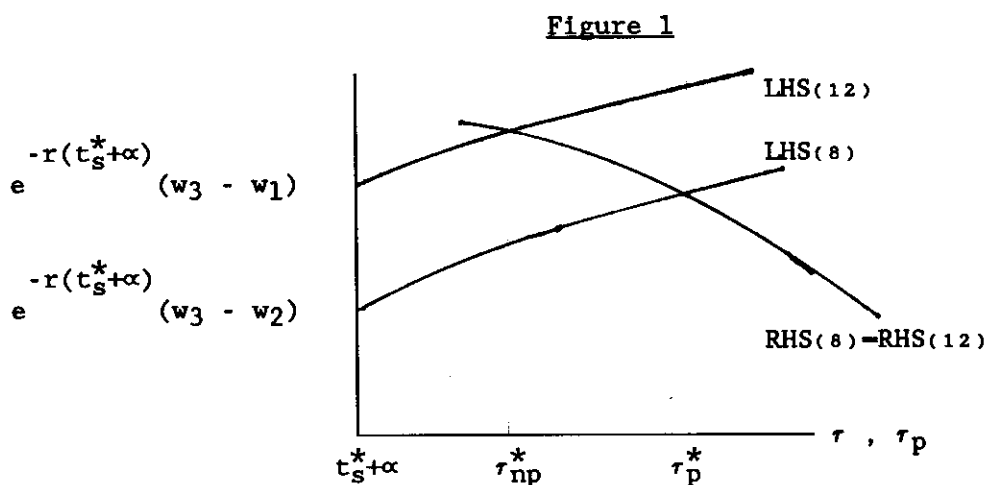
Proposition 2:

The optimal quitting time for individuals who are not promoted occurs

earlier than that for individuals who are promoted (i.e. $\tau_p^* > \tau_{np}^*$).

Proof:

Consider figure 1 where the left hand side (LHS) and the RHS of (8) and (12) are drawn as a function of τ_p and τ_{np} , respectively. Given the assumptions made in this paper, the graph of the RHS of these two equations is identical and downward sloping. The LHS of these two equations may be a decreasing or an increasing function of time. However, for every equal values of τ_p and τ_{np} the LHS of (8) is larger. Thus, as can be seen in the diagram $\tau_p^* > \tau_{np}^*$. ■



Let $\tilde{\tau}$ be the expected optimal quitting time,

$$\tilde{\tau} = P(t_s^*; a)\tau_p^* + [1 - P(t_s^*; a)]\tau_{np}^* . \quad (22)$$

Then, the corollary follows from proposition 2.

Corollary 2:

If promotion is approved, individuals quit later than their expected optimal quitting time (i.e. $\tau_p^ > \tilde{\tau}$). The higher is the expected probability of promotion the smaller is the gap between the expected and the actual quitting time.*

If promotion is disapproved, individuals quit earlier than their expected optimal quitting time (i.e. $\tau_{np}^ < \tilde{\tau}$). The higher is the expected probability of promotion the larger is the gap between the expected and the actual quitting time.*

3. EMPIRICAL IMPLICATIONS

The theory of career mobility suggests several specific predictions concerning the effects of schooling on wages and firm mobility. While in some occupations (occupation 3 in the model) the returns to schooling are in a form of higher wages, in other occupations (occupations 1 and 2 in the model) the returns are in terms of higher probabilities of advancing to occupations with higher wages. This hypothesis can explain the observed differences in return to schooling across occupations. The model suggests that if the returns to schooling are lower while working in a specific occupation, the effect of schooling on the probability of being promoted from this occupation (within or across firms) will be higher. Similarly, it will be rational for some individuals to spend a portion of their working career in occupations which require a lower level schooling than they have acquired. This observation can serve as a partial explanation for the phenomenon of "over-education" and is discussed in Sicherman (1987(b)).

The theoretical model provides an ambiguous prediction concerning the

unconditional effect of schooling on career mobility. On the one hand, highly educated individuals are able to start their working career in a higher level occupation (higher step on the ladder). Their careers, therefore, involve fewer occupations. On the other hand, highly educated individuals face greater opportunities (longer ladders). In terms of the theory, if they start in occupation 1, they are more likely to move to occupations 2 and/or 3. The model suggests, therefore, that given an occupation of origin, more educated individuals are more likely to move to a higher level occupation.

At any point in time, individuals face different probabilities of promotion within the firm, based on personal characteristics and occupation. The model predicts that among individuals who were not promoted, those with a higher probability of promotion are more likely to quit the firm. The higher the probability of promotion, the earlier they quit.

Specific human capital and job matching theories predict a negative effect of tenure on mobility. The presented theory of career mobility, conversely, predicts that in the absence of firm specific human capital there exists a positive effect of tenure (in occupation) on mobility; individuals acquire skills and experience in one occupation in order to be able to move to another occupation. An empirical test for the presence of a positive duration effect on career mobility has to be conducted controlling for firm specific investment. Thus, only intra-firm mobility is expected to have a positive duration effect.

In the next section these empirical predictions are tested. An econometric model of career mobility is constructed and estimated using a large panel data set of males aged 18-60.

III. AN ECONOMETRIC MODEL OF CAREER MOBILITY

THE DATA AND DEFINITIONS

The data set used for the empirical analysis is the Panel Study of Income Dynamics (PSID). It consists of male heads of households, aged 18-60. Individuals are observed annually during the period 1976-1981. Individuals report their occupation at the time of the survey, or if unemployed, the last occupation held. Occupational change is defined to occur when the 2 digit occupational category reported by the worker in two successive surveys is different¹¹. The implicit assumption is that, using those categories, an occupational change will be observed when there is an apparent change in the tasks performed by the worker. Since each category is a combination of a number of detailed occupational titles, it is possible that some individuals move between relatively different occupations in the same category with no change observed, while others move between relatively similar occupations which fall into different categories, and a change will be observed. We assume that on average, workers who move across categories, experience a bigger change in tasks than those who move across occupations within a category.

Occupational mobility which is due to career mobility is considered as a mobility to a higher level occupation¹². The vertical distance between

¹¹See appendix 1 for the list of the 25 categories using this classification. Due to measurement errors the measured rate of transitions is expected to be much higher than the real rate. It is expected that such errors will weaken but not bias the estimation results.

¹²We use this criteria in order to distinguish career mobility from other types of occupational mobility, although it is possible that a mobility to a lower level occupation (based on our ranking) will be part of the worker's career mobility.

occupations is measured as the difference in the mean levels of human capital needed to work in the occupations, after required training is completed. These levels are constructed by summing the weighted means of the levels of schooling, market experience prior to entering the occupation, and the amounts of training required in order to be qualified to work in the different occupations. The weights are the estimated coefficients of these variables in a wage regression. For a formal derivation See Appendix 2.

1. THE MODEL.

In this section, an econometric model of career mobility is presented and the effects of different characteristics on the probability of mobility are estimated. The distinction between inter- and intra-firm mobility made in the paper enhance the understanding of the interaction between firm and occupational mobility as elements of career development.

Three models are estimated: One is a model of "(Total) Career Mobility", in which there is no distinction between inter and intra firm transitions. This total mobility is then decomposed into transitions that occur within the firm ("Promotion")¹³, and others that occur "across firms".

Observed occupational transition can result in a movement to a higher level occupation, or a lower one. Since the scaling of occupations is continuous (see appendix 2) horizontal mobility does not occur. Therefore, the three dependent variables in the three models estimated, are defined as follow:

¹³"Promotion" is usually defined as "moving through grade levels within the firm" (see Wise (1975) for example). Here we take a different approach mainly because our interest is in occupational mobility, namely, the tasks performed in the two positions are different enough to fall under different occupational categories.

"Career Mobility"	[<p>- 1 if the worker moved to a higher level occupation between two surveys.</p> <p>- 0 otherwise.</p>
"Promotion"	[<p>- 1 if the worker moved to a higher level occupation and stayed in the firm.</p> <p>- 0 otherwise.</p>
"Across Firms"	[<p>- 1 if the worker moved to a higher level occupation and changed firm.</p> <p>- 0 otherwise.</p>

Mobility ($y=1$) occurs when the latent variable $Y_{ijt}^* > 0$, where

$$Y_{ijt}^* = X_{it}\beta + \tau ED_i + \delta_j + \epsilon_{ijt} = Z_{it}\Gamma + \epsilon \quad (1)$$

where

i = individual index,

j = occupation index,

t = time (the initial period).

X_{it} is a vector of individual characteristics which may vary across time, and ED_i is the level of schooling.

Parameter δ_j is an occupation fixed effect. It is assumed to be constant across time and across individuals.

Since Y_{ijt}^* is unobserved, so the probability of a transition is

$$\text{Prob}(y=1) = 1 - F(-Z\Gamma), \quad (2)$$

where $F(\cdot)$ is the CDF of ϵ . In practice, we assume that ϵ is logistically

distributed, and estimate the parameters by maximum likelihood.

Table 1(a) presents the estimation results of the three models (the pure occupation effects are not reported). Table 1(b) reports the results without a control for tenure with employer.

TABLE 1(a)
 MAXIMUM LIKELIHOOD LOGIT MODELS OF CAREER MOBILITY
 WITHIN AND ACROSS FIRMS

Dep. Var.:	CAREER MOBILITY		PROMOTION		ACROSS FIRMS		SAMPLE MEANS (S.D.)
Mean of Dep' Var':	.148		.102		.046		
# of obs.:	13384						
	(a)	(b)*	(c)	(d)*	(e)	(f)*	(g)
INTERCEPT	-4.2119 (16.9)	-.53203	-4.4155 (15.8)	-.40571	-4.9463 (10.9)	-.21684	
SCHOOLING	0.0972 (7.63)	.01228	0.0831 (5.82)	.00764	0.0871 (3.98)	.00382	12.197 (2.95)
EXPERIENCE	-0.0298 (2.82)	-.00376	-0.0388 (3.22)	-.00357	0.0033 (0.18)	.00015	16.049 (10.9)
EXPERIENCE ²	0.0003 (1.08)	.00004	0.0005 (1.81)	.00005	-0.0006 (1.18)	-.00002	
TENURE	-0.0111 (0.94)	-.00140	0.0426 (3.31)	.00391	-0.2516 (9.48)	-.01103	6.914 (8.0)
TENURE ²	0.0007 (1.74)	.00009	-0.0007 (1.58)	-.00006	0.0059 (5.26)	.00026	
QUIT	0.7309 (9.34)	.09232					.0941
LAI D OFF	0.4824 (5.57)	.06093					.0811
UNION	-0.2381 (3.77)	-.03007	-0.1048 (1.52)	-.00964	-0.6137 (5.17)	-.02690	.2687
SMSA (Metropolitan)	0.0035 (0.06)	.00045	-0.0320 (0.49)	-.00294	0.0962 (0.99)	.00422	.6760
MARRIED	0.1781 (2.51)	.02249	0.3598 (4.22)	.03306	-0.2231 (2.16)	-.00978	.8314
DISABLED	-0.0338 (0.38)	-.00427	0.1010 (1.03)	.00927	-0.4531 (2.97)	-.01986	.1018
RACE (1=BLACK)	-0.3118 (5.00)	-.03938	-0.2038 (2.91)	-.01872	-0.4481 (4.40)	-.01964	.2944
Log Likelihood	-4883.5		-4083.6		-2031		

Absolute t statistics in parentheses.

* Columns (b), (d), and (f) report the estimated derivatives for the probabilities.

The regressions also include dummy variables for 1 digit occupational category.

The dependent variables are measured between t-1 and t. All level variables are measured in (t-1).

TABLE 1(b)
 MAXIMUM LIKELIHOOD LOGIT MODELS OF CAREER MOBILITY
 WITHIN AND ACROSS FIRMS
 (No control for tenure with employer)

Dep. Var.:	CAREER	MOBILITY	PROMOTION	ACROSS	FIRMS	
	(a)	(b)*	(c)	(d)*	(e)	(f)*
INTERCEPT	-4.2105 (16.9)	-.53185	-4.3755 (15.8)	-.40203	-5.1452 (11.3)	-.22556
SCHOOLING	0.0973 (7.64)	.01229	0.0834 (5.87)	.00766	0.0818 (3.75)	.00359
EXPERIENCE	-0.0335 (3.43)	-.00424	-0.0228 (2.07)	-.00209	-0.0540 (3.14)	-.00237
EXPERIENCE ²	0.0004 (1.88)	.00006	0.0004 (1.45)	.00004	0.0002 (0.36)	.00001
QUIT	0.7318 (9.50)	.09243				
LAI D OFF	0.4840 (5.71)	.06113				
UNION	-0.2324 (3.74)	-.02936	-0.0411 (0.61)	-.00378	-0.8649 (7.42)	-.03792
SMSA (Metropolitan)	0.0080 (0.14)	.00102	-0.0311 (0.48)	-.00286	0.1325 (1.38)	.00581
MARRIED	0.1745 (2.46)	.02204	0.3741 (4.40)	.03437	-0.3036 (2.96)	-.01331
DISABLED	-0.0336 (0.38)	-.00425	0.0359 (0.37)	.00330	-0.1639 (1.10)	-.00719
RACE (1-BLACK)	-0.3131 (5.03)	-.03956	-0.2008 (2.88)	-.01845	-0.4468 (4.43)	-.01959
Log Likelihood	-4886.2		-4095.6		-2106	

Absolute t statistics in parentheses.

* Columns (b), (d), and (f) report the estimated derivatives for the probabilities.

The regressions also include dummy variables for 1 digit occupational category.

The dependent variables are measured between t-1 and t. All level variables are measured in (t-1).

2.1. Experience and Tenure

Specific human capital and job matching theories predict a negative effect of tenure on mobility. The presented theory of career mobility conversely predicts that in the absence of firm specific human capital there exists a positive effect of tenure (in occupation) on mobility; individuals acquire skills and experience in one occupation in order to be able to move to another occupation. An empirical test for the presence of a positive duration effect on career mobility has to be conducted controlling for firm specific investment. Thus, only intra-firm mobility is expected to have a positive duration effect.

Consider Table 1(a). The rate of career mobility decreases with time in the labor market¹⁴. In the absence of a control for tenure (Table 1(b)) the negative experience effect on vertical mobility is stronger on mobility across firms than on mobility within the firm. Introducing tenure into the analysis (Table 1(a)) reduces the experience effect in all models. In the "across firms" model the experience effect becomes practically zero.

In the promotion model the tenure effect is positive and decreasing. When "across firms mobility" is the dependent variable, the tenure effect is negative, and levels off around 20 years of tenure. This result explains the differences in the experience effect when tenure is included and when it is not. Thus, the tenure effect on the probability of moving to a higher level occupation is on average insignificant; a result of two effects that operate in opposite directions.

It is obvious that the strong negative partial correlation between

¹⁴"Experience" is defined as the number of years in the labor force, while "Tenure" is defined as the number of years with the employer.

tenure and firm separation is a major reason for the negative effect of tenure on inter-firm mobility¹⁵. Our objective is to understand the implications of this observation in the context of career mobility.

One interpretation is that there could exist a trade off between career mobility and investment in firm specific human capital. When an individual's career is within the organization, both general and firm specific human capital increase productivity, and thus promotion rates. On the other hand, the same worker, when considering moving to another firm, has to take into account the loss of earnings due to the loss of firm specific human capital, which increases with tenure in the firm¹⁶. Therefore, even if the optimal path for an individual involve a change in occupation by changing firm, such an act might become undesirable if, for different reasons, the worker stayed in the firm a longer period than initially expected.

2.2. Union Membership

The effect of union membership on the probability of career mobility is negative. The effect is stronger for "across firm" mobility and is the result of two effects: Union workers have lower tendency to change employers (see Table 3). In addition, given separation, union members are less likely to move up (see Table 4). This observation is explained in part by the fact

¹⁵For the effect of tenure (and other variables) on the probability of firm separation (quits and lay-offs), see Table 3. In Table 4 we estimate the probability of moving to a higher level occupation given firm separation. There it is shown that given separation, nor experience nor tenure affect the probability of an upward mobility.

¹⁶Although it has been suggested that due to "heterogeneity bias" in the analysis of wage equations, the tenure effect is over estimated, its magnitude after controlling for individuals' heterogeneity is subject to controversy. Altonji and Shakotko (1987), and Abraham and Farber (1987), find it to be minor, while Mincer and Jovanovic (1981), find it to be significant (although smaller than that obtained in a cross section). Topel (1988) finds this effect to be stronger than suggested by previous studies.

that given separation, union members are more likely to be laid-off than to quit.

The negative effect of union membership on intra-firm mobility is due to the career structure of union members. Typical careers of union members involve occupations in which advancement is by changing grade levels within the same occupation or by moving to a very similar occupation within the same category. Even when union members change category, they move a shorter distance (vertically and horizontally) than non union members (see Sicherman 1987).

2.3. Marital Status

Married workers have higher rates of career mobility than not married workers, other things equal. The effect is negative when inter-firm mobility is the dependent variable. Again, we know that married workers have lower separation rates, thus explaining the lower rates of inter-firm career mobility. Since the positive effect (of being married) on promotion is much stronger (in absolute terms), than its negative effect on "across firm" mobility, the total effect of being married on career mobility is positive.

Another interesting observation is that, given separation, married workers are more likely to quit than to be laid-off. This explains why they are more likely to move up (given separation).

The conclusion that might be made is that married workers will prefer to realize their career path within the firm rather than across firms. This by itself might provide an incentive to both the worker and the firm to invest more in firm specific training, than if the worker was unmarried.

2.4. Race

Black workers have lower rates of career mobility than white workers.

Again, this is after controlling for observed personal characteristics, and the occupation of origin. Without a control for occupation of origin, blacks have **higher** rates of career mobility (not shown here).

Other things equal, black workers have lower firm separation rates than whites, but much lower quits to lay offs ratio. When a firm separation is observed, it is more likely to be a lay-off. Therefore, given separation, black workers have much lower probabilities to move up (see Table 4). The opposite effects, of lower separation rates and higher incidence of lay-offs given separation, seem to cancel each other. The final result as observed in Table 1 is that the coefficients of the race dummy are similar for inter- and intra-firm career mobility.

2.5. Schooling and Career Mobility

As discussed earlier, the theory of career mobility predicts two opposite effects of schooling on career mobility. Since more educated workers can start their working career in a higher level occupation their careers might involve a fewer number of distinct occupations than less educated workers. In addition, high skill careers might involve fewer changes in tasks over time which will cause more educated workers to have less transitions. On the other hand, as predicted by the model, given the occupation of origin, more educated workers are more likely to move to a higher level occupation (within or across firms).

Without a control for occupation of origin (this result is not reported), schooling has a negative effect on career mobility. This result indicates that careers of more educated workers are more likely to be combined of a smaller number of distinct occupations. In the estimation results reported in table 1 a control for 1 digit occupation of origin is

performed. There it is shown that schooling has a positive effect on career mobility. This effect is much stronger in the promotion model than in the career mobility across firms model.

Given firm separation, more educated workers are more likely to quit than to be laid-off, and also are more likely to move up vertically (see Table 4).

The schooling effect on the probability of career mobility will vary, depending on the type of career and the occupation in which the worker is in. In the next section we analyze the differences in the returns to schooling across occupations.

2.7. THE EFFECT OF SCHOOLING ON WAGE AND ON THE PROBABILITY OF PROMOTION.

As suggested by the theoretical analysis, at some stages of a working career we might observe that workers with different levels of human capital have the same wages within a specific occupation. In other words, the estimated short run returns to schooling, when observing workers while at that stage, will be relatively low.

Human capital theory is a life cycle theory, and returns to schooling should be estimated accordingly. Therefore, we suggest that a possible explanation for the observed differences in returns to schooling across occupations may be due to the differences in promotion probabilities across occupations.

In the following, we test the hypothesis that if the return to human capital (schooling) is lower while working in a specific occupation, the effect of schooling on the probability of being promoted from that occupation will be higher.

Consider the following fixed effect models:

$$Y_{ijt}^* = X_{ijt}\beta_1 + \tau_j ED_i + \delta_j + \epsilon_{ijt} \quad (3)$$

$$\ln(W_{ijt}) = X_{ijt}\beta_2 + \alpha_j ED_i + \mu_j + \epsilon'_{ijt} \quad (3-1)$$

Equation (3) is a career mobility equation where the schooling effect (τ_j) is occupation specific. Equation (3-1) is a standard wage regression.

Here again we assume occupational fixed effects, estimated by using dummy variables (δ_i and μ_i). It is assumed that the effect of schooling on wage is occupational specific (α_j).

The following is implied by our hypothesis and will be tested empirically:

$$\text{Corr}(\alpha_j, \tau_j) < 0 \quad (4)$$

Estimates of α_j and δ_j are presented in table 2.

The estimated correlation between the effect of schooling on wage in the occupation and its effect on the probability of moving to a higher level occupation is $-.56$ (with .95 level of confidence)¹⁷.

¹⁷Since each of the coefficients is measured with a different level of error (see the standard errors in the regressions), it can be shown that the measured correlation given above is underestimated.

TABLE 2
 THE SCHOOLING EFFECT ON CAREER MOBILITY AND WAGE
 The interaction between schooling and occupational dummies
 in the Career Mobility (Logit) and the wage regressions.

OCCUPATIONAL CATEGORY	CAREER MOBILITY MODEL*		WAGE MODEL
	Coeff.	Prob.	
	(a)	(b)	(c)
10 PHYSICIANS, DENTISTS	-.354324 (0.756)	-.0447	0.092096 (7.8764)
11 OTHER MEDICAL AND PARAMEDICAL	.0578823 (0.945)	.0073	0.059134 (2.2734)
12 ACCOUNTANTS AND AUDITORS	-.061389 (0.824)	-.0077	0.077502 (3.4171)
13 TEACHERS, PRIMARY AND SECONDARY SCHOOLS	.0265294 (0.447)	.0033	-0.003364 (0.1779)
14 TEACHER(COLL.),SOC. SCI.,LIBRARIAN,ARCH.	-0.06751 (0.836)	-.0085	0.067732 (2.5479)
15 ARCHITECT,CHEMIST,ENGINEER,PHY.&BIO.SCI.	-.146355 (1.726)	-.0184	0.075679 (7.9143)
16 TECHNICIANS	0.1175 (1.842)	.0148	0.050122 (6.3384)
17 PUBLIC ADVISORS	.0576772 (0.932)	.0072	0.060651 (5.2189)
18 JUDGES, LAWYERS	-.335769 (0.978)	-.0424	0.347471 (3.2359)
19 PROF",TECHNICAL & KINDRED, NOT ABOVE	0.1565 (2.687)	.0197	0.024038 (1.2215)
20 MAN.,OFFIC.&PROPR.(NONFARM)EXC. SELF-EM.	0.3885 (5.150)	.0490	0.074033 (19.634)
31 LIKE 20, SELF EMPLOYED (UNINCORP.BUS.)	0.2153 (3.264)	.0271	0.068493 (6.8170)
40 SECRETARIES, STENOGRAPHERS, TYPISTS	0.1134 (2.189)	.0143	-0.062524 (1.3994)
41 OTHER CLERICAL WORKERS	0.1424 (3.478)	.0179	0.031038 (5.1211)
45 SALES WORKERS	.0747631 (1.974)	.0094	0.106548 (12.500)
50 FOREMEN, N.E.C.	0.2165 (6.086)	.0273	0.037331 (4.3035)
51 OTHER CRAFTSMEN & KINDRED WORKER	0.1954 (5.856)	.0246	0.037385 (12.759)
52 GOVT(FIRE,POLICE,MARSH.&CONSTABLES)	0.1177 (2.717)	.0148	0.042988 (3.1086)
55 MEMBERS OF THE ARMED FORCES	.0673445 (0.434)	.0085	0.082950 (6.0601)
61 TRANSPORT EQUIPMENT OPERATIVES	0.056313 (2.296)	.0071	0.033794 (7.2564)
62 OPERATIVES, EXCEPT TRANSPORT	0.1193 (5.070)	.0150	0.043912 (13.342)
70 UNSKILLED LABORERS (NONFARM)	0.1116 (5.240)	.0141	0.038422 (9.3666)
71 FARM LABORERS AND FOREMEN	.0905733 (3.171)	.0114	0.044839 (4.9204)
75 OTHER SERVICE WORKERS	.0455192 (2.220)	.0057	0.031283 (6.1657)
80 FARMERS (OWNER & TENANT) & MANAGERS	.0626079 (0.305)	.0079	0.067441 (2.8314)

* The Logit parameter estimations are in (a), and the derivatives for the probabilities are reported in (b) (calculated as $\beta[p(1-p)]$).

The other independent variables are Experience, Tenure, Union, Race, SMSA, Married, and Disability. See Appendix 1 for full occupational titles.

Absolute t statistics in parenthesis.

TABLE 3
FIRM SEPARATION, QUIT AND LAY-OFF
MAXIMUM LIKELIHOOD LOGIT ESTIMATION

Dep. Var.:	FIRM MOBILITY		QUIT		LAY-OFF		SAMPLE MEANS (S.D.)
Mean of Dep' Var':	.18		.093		.082		
# of obs.:	13384						
	(a)	(b)*	(c)	(d)*	(e)	(f)*	(g)
INTERCEPT	0.8777 (6.19)	.12950	-0.4948 (2.75)	-.04158	-0.1974 (1.05)	-.01493	
SCHOOLING	-0.0704 (7.65)	-.01039	-0.0387 (3.29)	-.00325	-0.0812 (6.50)	-.00614	12.155 (2.95)
EXPERIENCE	-0.0326 (3.77)	-.00481	-0.0417 (3.73)	-.00350	-0.0093 (0.81)	-.00070	15.966 (10.9)
EXPERIENCE ²	0.0003 (1.11)	.00004	0.0004 (1.49)	.00004	-0.0001 (0.25)	-.00001	
TENURE	-0.2837 (24.6)	-.04188	-0.2177 (14.8)	-.01829	-0.3058 (17.8)	-.02314	6.714 (8.0)
TENURE ²	0.0070 (16.9)	.00103	0.0053 (9.96)	.00045	0.0073 (11.8)	.00056	
UNION	-0.3647 (6.38)	-.05384	-0.5860 (7.37)	-.04924	-0.0132 (0.17)	-.00100	.2681
SMSA (Metropolitan)	0.0956 (1.93)	.01411	0.1652 (2.60)	.01388	-0.0117 (0.17)	-.00089	.6777
MARRIED	-0.3303 (6.02)	-.04875	-0.1123 (1.58)	-.00943	-0.4265 (6.02)	-.03227	.8306
DISABLED	-0.4255 (5.67)	-.06281	-0.3646 (3.66)	-.03064	-0.3813 (3.86)	-.02885	.1104
RACE (1=BLACK)	-0.0778 (1.50)	-.01148	-0.4053 (5.84)	-.03405	0.2876 (4.27)	.02175	.2967
Log Likelihood	-6314.1		-4364.1		-3898.2		

Absolute t statistics in parentheses.

* Columns (b), (d), and (f) report the estimated derivatives for the probabilities.

The dependent variables are measured between t-1 and t. All level variables are measured in (t-1).

Table 4
 CAREER MOBILITY OF WORKERS WHO CHANGED FIRM
 Maximum Likelihood (Logit) Estimation

The event: -1 IF THE WORKER MOVED TO A HIGHER OCCUPATION
 -0 OTHERWISE

Mean Frequency: .25

	Coefficients	Probability
INTERCEPT	-4.8301 (9.16)	-.91853
SCHOOLING	0.1332 (5.01)	.02533
EXPERIENCE	0.0238 (1.15)	.00453
(EXPERIENCE) ²	-0.0007 (1.33)	-.00014
TENURE	0.0375 (1.10)	.00714
(TENURE) ²	-0.0019 (1.18)	-.00036
UNION	-0.1971 (1.37)	-.03748
SMSA	-0.0089 (0.07)	-.00169
MARRIED	0.0655 (0.52)	.01246
DISABILITY	-0.2334 (1.32)	-.04438
RACE	-0.5391 (4.32)	-.10253
QUIT	0.2175 (2.00)	.04135
<u>Occupational Dummy (Omitted category: Professionals):</u>		
MANAGERS, NOT S.E.	0.3585 (1.00)	.06818
SELF EMP. BUSINESSMEN	1.7773 (4.26)	.33800
CLERICAL AND SALES	1.8354 (5.94)	.34900
CRAFTSMEN/FOREMEN	1.0069 (3.25)	.19150
OPERATIVES	2.5192 (8.33)	.47910
LABORERS & SERVICE	3.7872 (11.9)	.72020
FARMERS & FARM MANAGERS	0.8701 (0.79)	.16550
ARMY	1.0161 (1.83)	.19320

Log Likelihood: -1142.6

No. of observations: 2412

2.9. QUITTING AND CAREER MOBILITY

Economic theory suggests that a worker will quit his job if the expected present value of his future earnings, if he stays in the firm, is lower than if he leaves the firm. Most of the work that we are aware of relates quitting decisions to changes in the economy or imperfect information. Quitting as a result of a bad match, or finding out the existence of a better job in another firm, are examples of imperfect information (or the arrival of new information) concerning opportunities and the nature of the firm. Changes in the economy might make the worker re-evaluate his position and cause him to quit.

The theory of career mobility presented here suggests an additional reason for mobility (in the spirit of Rosen (1972)): Quitting is a device by which workers realize an optimal path of a chosen career. When a career that a worker considers his best choice cannot be realized in one firm (and the loss of firm specific human capital is taken into account), quitting will be part of the worker's optimal (ex-ante) career path. What is unique to this type of quitting is that it may be planned in advance by the worker.

Some stages of the career are uncertain. We presented this uncertainty as the probability of being promoted inside the organization. The actual quitting time, conditioned on the promotion decision, will differ from the initial expected quitting time. The theoretical result that this section tests empirically, is the effect of the promotion decision on the worker's decision to quit. Our hypothesis is that the higher the expected probability of promotion a worker has, the larger the effect of not being promoted on the decision to quit.

There are many reasons why workers who have high expected probabilities

of promotion are not promoted. One reason is that there are not enough vacancies for the higher position. Another reason is that there may be individual characteristics which have a negative effect on the probability of promotion and which are unknown to the worker and/or the employer until some working period (in the work-place or the position) is experienced.

The realization of those characteristics will result in a good or a bad match between the worker and the employer/position. If the worker has a good reason to believe that the bad match is firm specific, he might quit and look for a job elsewhere. On the other hand, a realization that the reasons for not promoting him will hold also in other firms might induce him to stay (if he is not laid-off before) in the same occupation/position within the firm¹⁸.

We call those workers who have high expected probability of being promoted but are not promoted "The Disappointed Workers". The higher the level of expected probability of promotion, given no promotion, the higher the level of disappointment.

Our prediction is that the higher the level of disappointment, the earlier the worker will quit. In section II we show that workers, based on their promotion expectations, decide if and when to quit the firm, and move to a higher level occupation in a new firm. We also show, that if they are not promoted, they will quit earlier than expected¹⁹. The higher is the expected probability of promotion, the larger will be the gap between the

¹⁸This observation led Laurence Peter to his pessimistic statement (observation?) known as "The Peter Principle": "In a hierarchy every employee tends to rise to his level of incompetence" (Peter 1972).

¹⁹Of course, among those who, ex-ante, planned not to quit at all, some might revise their decision and decide to quit. Other might still find that the ex-post optimal solution is not to quit.

expected and the actual quitting time. In the following we test this hypothesis empirically:

For each worker at each period, we estimate the probability of promotion, based on the promotion model estimated earlier. We then see whether he is promoted or not. For those workers who are not promoted (the disappointed) we "look into the future", and see if and when they quit. We continue to follow those workers as long as they stay in the firm and are not promoted. Our assumption is that the higher the level of disappointment (defined earlier) the more likely we are to observe an early quit. It should be noted that the structure of the data set (one observation each year) does not allow us to observe those workers who quit very early. The reason is that we estimate the probability of promotion for the year interval and define "no promotion" only if the worker stayed in the firm until the next survey. Therefore, workers who expect, with high probability in the beginning of the period, to be promoted and are not, might quit during the period, and for those workers we cannot say that they were not promoted.

In the following we present a nonparametric measure to test our model.

Let:

$$Y_{it} \begin{cases} -1 & \text{if individual } i \text{ is promoted between } t-1 \text{ and } t. \\ -0 & \text{otherwise.} \end{cases}$$

$\hat{P}_{it} = \text{Prob}(Y_{it}=1)$, is the expected probability that the worker will be promoted, based on observed characteristics at $t-1$.

$$Q_{i,t+j} \begin{cases} -1 & \text{if } i \text{ quit between } t+j-1 \text{ and } t+j. \\ -0 & \text{if not.} \end{cases}$$

$D_{it} = (\hat{P}_{it} | Y_{it}=0)$ is defined as the level of "disappointment".

Our hypothesis is that the rank correlation between D_{it} and $Q_{i,t+j}$ is positive and will decrease as j is increasing. In other words:

$$\text{Corr}(D_{it}, Q_{i,t+1}) > \text{Corr}(D_{it}, Q_{i,t+2}) > \text{Corr}(D_{it}, Q_{i,t+3})$$

The number of surveys we have in the data set allow us to observe a maximum of 3 periods to the future.

The estimation results using Spearman Correlation are reported in the following table.

SPEARMAN CORRELATION COEFFICIENTS			
	$Q_{i,t+1}$	$Q_{i,t+2}$	$Q_{i,t+3}$
D_{it}	.0289 (.011)	.0064 (.637)	-.0088 (.678)
# of obs.	7671	5482	2238

The numbers in parenthesis are the probabilities that the true correlation is zero. These probabilities values are obtained by treating $(n-2)^{1/2}p/(1-p)^{1/2}$ as coming from t distribution with $n-2$ degrees of freedom, where p is the appropriate correlation. In our case these values should be taken with a lot of caution.

The above results support our hypothesis.

IV. SUMMARY

This paper analyzes the role as well as the significance of the phenomenon of occupational mobility in the labor market focusing on individuals' careers. The study provides an additional dimension to the existing analysis of prominent labor market phenomena including investment in human capital, differences in wage profiles across individuals and inter-firm mobility. Occupational mobility, defined as a change in tasks performed on the job, is analyzed as an integral part of the worker's career path.

It is shown that more educated individuals have careers which involve a

fewer number of distinct occupations, and therefore are less likely to change occupations (and firms). Within a given occupation, however, more educated individuals are more likely to move to a higher level occupation, within or across firms. This observation explains the variations in the returns to schooling across occupations. In those occupations where the returns to schooling (in terms of wages) are lower, the effect of schooling on career mobility is larger.

The rate of career mobility decreases with time in the labor market. With higher levels of experience career mobility is more likely to occur within the firm (promotion) than across firms. Within the firm, tenure has a positive effect on career mobility. This observation confirms the proposition that skills and experience accumulated in one occupation are transferable to other occupations along the worker's career, and therefore increase the probability of promotion.

As was demonstrated in the theory presented in this paper, individuals' optimal career path may involve intra-firm mobility as well as inter-firm mobility. Intra-firm career mobility ("promotion") is subject to the employer's decision whereas inter-firm mobility and its optimal timing are determined by the individuals who choose the optimal quitting time so as to maximize their expected lifetime earnings. Intra-firm career mobility is uncertain. The probability of promotion is a function of schooling, ability and job experience. The optimal investment in human capital as well as the optimal quitting time maximizes the individual's expected life time income. The optimal quitting time for individuals who were not promoted occurs earlier than that for individuals who were promoted. It is shown empirically that among workers who were not promoted, those with a higher

probability of promotion are more likely to quit the firm. The higher the probability of a promotion, the earlier they quit.

Appendix 1

**OCCUPATIONAL CLASSIFICATION
(Used in the PSID)**

2 digit classification

- 10 Physicians (Medical and Osteopathic), Dentists.
- 11 Other Medical and Paramedical.
- 12 Accountants and Auditors.
- 13 Teachers, Primary and Secondary Schools.
- 14 Teachers, college ; Social Scientists; Librarian; Archivists.
- 15 Architects; Chemists; Engineers; Physical & Biological Scientists.
- 16 Technicians.
- 17 Public Advisors.
- 18 Judges, Lawyers.
- 19 Professional, Technical and kindred workers, not listed above.
- 20 Managers, Officials and Proprietors (except farm), not self-employed.
- 31 Like 20, Self Employed (unincorporated businesses).
- 40 Secretaries, Stenographers, Typists.
- 41 Other Clerical Workers.
- 45 Sales Workers.
- 50 Foremen, n.e.c.
- 51 Other Craftsmen and Kindred Workers.
- 52 Government Protective Service Workers (Fire, Police, Marshals and Constables).
- 55 Members of the Armed Forces.
- 61 Transport Equipment Operatives.
- 62 Operatives, except transport.
- 70 Unskilled Laborers (nonfarm).
- 71 Farm Laborers and Foremen.
- 73 Private Household Workers.
- 75 Other Service Workers.
- 80 Farmers (Owners and Tenants) and Managers.

1 digit classification

- 10-19 PROFESSIONAL/TECHNICAL & KINDRED WORKERS
- 20 MANAGERS, OFFICIALS OR PROPRIETORS
- 30-31 SELF EMPLOYED BUSINESSMEN
- 40-49 CLERICAL AND SALES WORKERS
- 50-52 CRAFTSMEN/FOREMEN/KINDRED WORKERS
- 61-62 OPERATIVES AND KINDRED WORKERS
- 70-75 LABORERS AND SERVICE WORKERS
- 80 FARMERS AND FARM MANAGERS

Appendix 2
The vertical Ranking of Occupations

Consider the following wage regression:

$$\ln(W_{ijt}) = X_{it}\beta + \alpha E_i + \tau \text{PEXP}_{ijt} + \delta \text{TEN}_{ijt} + \mu \text{RQT}_{ijt} + \epsilon_i \quad (1)$$

where:

X = a vector of observed characteristics.

E = the worker's level of schooling.

PEXP = market experience prior to entry the present occupation.

TEN = tenure in the occupation.

RQT = the amount of training the worker received in order to be fully qualified to work in the present occupation.

i = individual's index.

j = occupation index.

t = time index.

Define the level of human capital the worker needed in order to be qualified for working in the occupation as:

$$\text{HC}_{ij} = \alpha E_i + \tau \text{PEXP}_{ijt} + \mu \text{RQT}_{ijt} \quad (2)$$

Then, the mean level of human capital needed to be fully qualified to work in occupation j is given by:

$$\text{HC}_j = \frac{\sum_i \text{HC}_{ij}}{N_j} \quad (3)$$

and the vertical distance between occupations k and l is given by:

$$\text{DV}_{kl} = \text{HC}_k - \text{HC}_l \quad (4)$$

Since tenure in occupation is not reported in the PSID, it was replaced by "tenure in position". The sensitivity of the vertical ranking to different functional forms and its correlation with other measures are discussed in Sicherman (1987).