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Cohort Size and Relative Earnings : A Survey on Approaches and Empirical Result

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Ⅰ. Introduction

It has been argued that the aggregate earnings profiles may be twisted over time when the age composition of the labor force changes, and workers of different ages are imperfectly substitutable in production. Under the assumption of imperfect substitutability between new entrants and more experienced workers, the entry of the relatively large cohorts (i.e. postwar baby-boom birth cohort) into the labor force should increase the ratio and reduce the relative earnings of larger to smaller cohort workers. Even though it has been established that large cohorts have generally suffered depressed earnings relative to smaller cohorts at the entry level, there is a disagreement regarding the steepness of the earnings profile of these large cohorts.

Theories and approaches which hinge on the supply of labor have been advanced and empirically examined by Freeman (1979) and Welch (1979), and modified and broadened by scholars such as Berger (1983, 1984, 1985) for the U.S., Mosk and Nakata (1985) for Japan, Lin and Chu (1985) for Taiwan, and Shin (1987) for Korea. Previous researches used different methodologies with the different results for each country.

The objective of this study is to review lots of the literatures on this research and summarize them by approaches and empirical results of different countries. In addition, I will indicate the advantages and disadvantages of different methodologies for estimating cohort size effect on earnings. I hope this survey will be helpful to understand the dynamics of the earnings profiles over time by considering the cohort size effects on earnings, which might be decomposed into experience, period and cohort components.

Ⅱ. Production Function Approach

1. CES Approach

The constant elasticity of substitution (CES) production function has only one elasticity of substitution, which is defined as $S_{ij}=\partial \ln(X_i/X_j)/\partial \ln(W_j/W_i)$. It is reasonably simple to estimate, considering only two factor inputs (i and j) and provides direct information on the impact of relative quantities on relative earnings, by using the following relative wage determination equations :

$$(2.1)\ \ln(W_i/W_j) = -(1/S_{ij}) * \ln(X_i/X_j) + \\ +\text{error},$$

where S_{ij}=elasticity of substitution,
(W_i / W_j)=wage ratio between age group i and j,
(X_i / X_j)=relative number of workers between i and j,
Z=vector of other variables, for example, an indicator of cycle.

The possibility of changes in relative wages being due largely to cyclical rather than demographic changes can be readily examined with the above equation by addition of variables measuring the business cycle. But it can not be used to test the possibility that in a consistent production function framework changes in other factors, such as, capital, may be influencing the relative demand for labor of different ages.

Freeman (1979) used this approach for the U. S., and Martin (1982) and Mosk and Nakata (1985) for Japan. Freeman (1979) finds that the estimated effects of demographic, cyclical, and time trend factors using relative wage equations suggest that the observed twist in age-earnings profiles against young men can be attributed in large part to the changed age structure of the work force. Also, he finds that the increased number of young male workers relative to the number of old male workers have an especially large impact on college graduates' profiles compared to only a modest impact on high school graduates' profiles.

Martin (1982) finds that cohort size significantly affects the relative wages of age groups and that wages are also affected by general economic conditions in the case of Japan. Mosk and Nakata (1985) emphasize the dualistic structure of the Japanese labor market segmented into two sectors - a primary market of large firms and a secondary market comprised principally of small firms, by estimating the relative wage equations separately for each firm. They also emphasize the importance of structural shift on the demand side, especially that associated with the slowing down of output growth as Japan caught up with Western economies, by estimating the equations for each period before and after the Oil Crisis of 1973. In their analysis, it is found that demographic changes, specifically the aging of the labor force in Japan, had a profound impact on the relative wages of senior to junior workers.

2. TL Approach

The Transcendental logarithmic (TL) system provides estimates of elasticities of complementarity (C_{ij}) for more than two inputs in a consistent production function framework which assumes exogenous factor quantities. It is better suited for the analysis of relative earnings changes than the TL cost function, which assumes exogenous factor prices. For older workers, factor quantities are more properly viewed as exogenous than are factor prices. This approach has two disadvantages : First, specification and measurement errors in the equation for a factor of only marginal concern, such as for capital in the case at hand, can greatly affect estimates of the demand equations for other factors. Second, the TL model is an equilibrium model that can not be readily modified to allow for the effect of cyclical factors on relative demands.

The formal specification of the TL production function is

(2.2) $\ln Q = \ln a_0 + \Sigma_i a_i \ln X_i + 1/2 \Sigma_i \Sigma_j r_{ij} \ln X_i \ln X_j$,

where the X_i are the inputs and Q is output.

The standard first-order conditions for profit maximization, with the assumption that markets are competitive, are

(2.3) $\partial Q / \partial X_i = P_i$,

where P_i is the price of the ith factor and the price of output is unity. These can be stated in logarithmic form as

(2.4) $\partial \ln Q / \partial \ln X_i = P_i X_i / Q = S_i = a_i + \Sigma_j r_{ij} \ln X_j$, where S_i is the share of output accruing to the ith factor.

After imposing the assumption of homogeneity ($\Sigma_i a_i=1$, $\Sigma_i r_{ij}=0$, $\Sigma_j r_{ij}=0$, $\Sigma_i \Sigma_j r_{ij}=0$) and symmetry ($r_{ij}=r_{ji}$), the system of share equations can be rewritten after dropping the kth equation :

(2.5) $S_i=a_i+\Sigma_{j\neq k} r_{ij}(\ln X_j-\ln X_k)$.

This system of equations is estimated using a restricted version of the Zellner's(1962) seemingly unrelated regression method.

The estimated parameter from (2.5) can be readily transformed to obtain estimates of the inverse of the Hicks' (1970) partial elasticities of complementarity (C_{ij}) :

(2.6) $C_{ij}=r_{ij}/S_iS_j+1$,
$C_{ii}=(1/S^2_i)(r_{ii}+S^2_i-S_i)$.

Any pairs of factors are : q-complements if $C_{ij}>0$,
q-substitutes if $C_{ij}<0$
and the estimated own elasticities of complementarity (C_{ii}) are negative for well-behaved production function.

Sato and Koizumi (1973) show that the factor price elasticity, or the percent change in price of factor i given a change in the quantity of factor j or i used in production is :

(2.7) $e_{ij}=\partial\ln P_i/\partial\ln X_j=S_jC_{ij}$,
$e_{ii}=\partial\ln P_i/\partial\ln X_i=S_iC_{ii}$.

Given equation (2.7), the following expression for percentage changes in relative factor prices can be derived, assuming all factor quantities are allowed to vary :

$$\text{(2.8) } \partial\ln P_i-\partial\ln P_k=\Sigma_{i\neq j\neq k}S_j(C_{ij}-C_{jk})\partial\ln X_j + S_i(C_{ii}-C_{ik})\partial\ln X_i + S_k(C_{ik}-C_{kk})\partial\ln X_k.$$

This expression can then be used to predict changes in relative earnings and to divide each change into amounts due to differences in the employment of each factor.

Freeman (1979), Grant and Hamermesh (1981), and Berger (1983) employ the TL system in their analyses of relative earnings in the U.S.

Freeman (1979) estimates a TL production function with the number of male workers aged 20-34, the number of male workers aged 35-64, the number of female workers aged 20-64, and the quantity of capital as inputs (see Table 1). He finds that the earnings of men aged 20-34 depend critically on the number of young male workers. The own elasticity of complementarity for the number of young men (C_{ii}) is sizably negative and far in excess of the cross-elasticity between young and older men (C_{ij}). This implies that an increase in the number of young men would reduce their wage relative to the wage of older men. Most importantly, the estimated factor price elasticities indicate that changes in the numbers of male workers of different ages will substantively influence the earnings of younger and older men and are therefore likely to alter male age-earnings profiles.

Grant and Hamermesh (1981) disaggregate factor inputs into five categories : youths aged 14-24, adult blacks, white women, white men, and capital. They find that youth and adult women are close substitutes in production, so that an influx of the latter shifts the demand curve for youth sharply to the left, and cause some displacement in the earnings of youth. Part of the sharp relative decline in earnings of young workers that occurred in the late 1960s and 1970s is thus attributable to the increase in the adult female labor force. The baby boom of the 1950s is not the only reason for the relative decline in earnings of the youth labor force.

Berger (1983) suggested the estimation of TL models of aggregate production with labor inputs

Table 1. Iuput Factors in Translog Production Function

Author(s)	Input Factors Employed	Data Description
Freeman (1979)	Men 20-34, Men 35-64 Women 20-64, Capital	Entire Economy CPS* 1950-1974
Grant and Hamermesh (1981)	Youths 14-24 (Y) Adult Blacks (OB) White Women (OFW) White Men (OMW) Capital (K)	Manufacturing SMSAs, Census of Population, 1970
Berger (1983)	Males, 0-15 years of schooling and 0-14 years of experience (YHS) Males, 16+ years of schooling and 0-14 years of experience (YC) Males, 0-15 years of schooling and 15+ years of experience (OHS) Males, 16+ years of schooling and 15+ years of experience (OC) Females (F) Capital (K)	Entire Economy CPS 1968-1975

Note : * March Current Population Surveys

segmented by labor market experience, schooling, and sex (see Table 1). This, in his view, would also be of help in consideration of the substitution between schooling groups in a production. This segmentation is suggested to consider the previous results that the increased relative supply of college graduates is one of the reasons for the decline in their earnings relative to high school graduates (Freeman, 1975) and that male workers of different ages are imperfectly substitutable in production, possibly due to different activities performed at various stages of the career (Freeman, 1979 ; Welch, 1979). Berger's results indicate that, among males, those in the same experience category but with different amounts of schooling (YHS and YC) are q-substitutes. On the other hand, among college graduates, younger and more experienced workers (YC and OC) are q-Complements. But for those with less than a college degree, younger and older workers (YHS and OHS) appear to be q-substitutes. Members in different schooling and experience categories (YHS and OC, YC and OHS) are also q-substitutes, and females and the male labor force, especially younger, less educated males (F and YHS), are q-substitutes. Thus, the rapid increase in the number of young male college graduates appears to have been the largest contributor to the decline in their earnings relative to less educated young males and older male college graduates. The increase in female participation appears to have contributed significantly to the decline in the earnings of younger workers relative to older workers among those with less than a college degree. In addition, he finds that the negative earnings effects of cohort size persist over the life cycle, but that the observed decline in the earnings of young college graduates relative to other young workers during the

1970s does not signal a permanent decline in value of college, based on the prediction of future relative earnings change.

Ⅲ. Earnings Function Approach

1. General Earnings Function Approach

The dominant theory for explaining age-earnings profiles is the human capital approach of Becker (1962, 1964), Mincer (1958, 1962, 1970, 1974) and Schultz (1961). Investments in schooling, on-the-job training and other forms of human- capital accumulation increase the earnings capacity of individuals. Their distribution over the life cycle determines the particular shape of the age-earnings profile.

The human capital theory predicts that earnings will increase with schooling and in general with age (or experience), but that earnings rise with age at a declining rate. The logarithm of earnings are therefore estimated as a function of education, experience, experience squared, cohort size, and other control factors.[1] During the seventies, researchers began to notice sizable changes in the structure of male earnings, and they found that the composition of the labor force was a major factor in the explanation of the changes. Thus, it is argued that cohort size, indicating the composition of the labor force, is as important as the others in the earnings functions in order to understand the dynamics of the experience-earnings profiles over time.

Johnson (1980) estimates an earnings function to investigate the vintage (or cohort) effects on the earnings of white American men including a variable, RELSIZE, defined as the number of 16-19 year olds relative to the civilian labor force in the year of entry. Vintage effects, here, are defined as the differences in earnings between cohorts that can not be explained by either secular growth or the normal age-experience profile of earnings. Using the panel data taken from the University of Michigan's Panel Study of Income Dynamics, he finds the cohort size effect is significantly negative only for college graduates.

Rosen and Taubman (1982) estimate Tobit earnings functions with dummy variables for each birth cohort and they find that cohorts born after World War Ⅱ show earnings no larger than those born in the 1930s, by using a matched sample of Social Security and March Current Population Survey (CPS). However, when demographic factors, namely, veteran status, are controlled, earnings show no tendency to vary with cohort size.

In order to investigate cohort size effects on the earnings profile, Welch (1979) estimates annual and weekly log earnings equations for white males with March Current Population Survey (CPS) data covering the period from 1967 to 1975. The sample is segmented into four schooling completion groups : 8-11 years, 12 years, 13-15years, and 16+ years. Within each schooling group, the data are cross-classified into 44 experience and 9 year groups yielding 396 total cells. The estimation takes place using this aggregated data with each observation weighted by the square root of the frequency of each group to avoid heteroscedasticity problems inherent in grouped data.

In each earnings equation, the amount of previous labor market activity is controlled for by "full density" measures of experience, experience squared, and an early career spline variable (S). The spline variable takes on the value one at entry and then declines linearly to zero in six to nine

1) Mincer (1974) derived the earnings equation which has the variables such as education, experience, and experience squared, based on the human capital theory. Log of weeks worked (ln WKS) was added in his earnings equation to control for an upward bias in the rate of return to education, because more educated men work more weeks per year.

years. Cohort size is measured within each schooling group as a moving average of individuals in adjacent experience groups relative to the total number of indivduals with that level of schooling.[2)]

Variation in the cohort size effect on earnings over the life cycle is obtained by interacting cohort size with the early career spline variable, which is $S=(1-X/a)*D$,

where X=experience,

a=6,7,8, and 9 years, respectively, for those with 8-11, 12, 13-15, and 16+ years of schooling,

$D=1$ if $X=a$

0 otherwise.

The actual earnings equation specification estimated by Welch is

$$
\begin{aligned}
(3.1)\ \ln W &= b_0+b_1X+b_2X^2+b_3S+b_4\ln C(X) \\
&\quad + b_5S*\ln C(X)+Z+e, \\
&= b_0+b_1X+b_2X^2+b_3D+b_5\ln C(X)*D \\
&\quad + b_4\ln C(X)-(b_3/a)X*D \\
&\quad -(b_5/a)X*\ln C(X)*D+Z+e,
\end{aligned}
$$

where W=real earnings,

$C(X)$=cohort size,

Z=a vector of control variables; unemployment rate, time trend, exclusion rate due to nonwork, and exclusion rate due to income imputation,

e=error term.

Welch (1979) finds strong evidence that large cohorts do depress earnings and that most of the effect comes early in the career. The evidence also suggests that cohort size effects increase with level of schooling.

Lin (1982) used this earnings function approach developed by Welch (1979), and included the development characteristics (Z), such as industrialization, urbanization, and occupational composition. Earnings equations are there estimated using the 1976 cross-section raw data and seven years time-series data from 1964 to 1976 by two years intervals, collected from a published paper. His specification of the earnings function for Taiwan is as follows :

$$
\begin{aligned}
(3.2)\ \ln W &= b_0+b_1X+b_2X^2+b_3\ln C(X) \\
&\quad + b_4S*\ln C(X)+Z+e \\
&= b_0+b_1X+b_2X^2+b_3\ln C(X) \\
&\quad + b_4\ln C(X)*D \\
&\quad -(b_4/a)X*\ln C(X)*D+Z+e,
\end{aligned}
$$

where Z is a vector of development characteristics expressed with dummy variables for industries, job location, and occupations.

Lin, contrary to Welch's model, dropped the early career spline (S) as one of explanatory variables of earnings equations. It means that the intercept (b_0) and the parameter estimate of X (b_1) are restricted to be equal over the life cycle.[3)]

His results are different from findings of previous studies done in the United States. First, the negative cohort size effects on male earnings in Taiwan only prevail for those workers who have not received any college education and still are in the early stage of their careers. Second, the effects of cohort size for those male workers with a college education are not significant at the early stage of their careers. Also, significant and positive cohort size effects are observed for the earnings of those who have passed this very early stage

2) If N_{ij} is the number of individuals in schooling group j with i years of experience, Welch's cohort size measure can be expressed as

$$C(X) = \frac{(1/9N_{i-2,j}+2/9N_{i-1,j}+3/9N_{i,j}+2/9N_{i+1,j}+1/9N_{i+2,j})}{\Sigma_i N_{ij}}$$

The weights are scaled up to sum to one when experience equals one or two.

3) In the case of the Welch's model specified in the equation (2.9), we can see the changes in the intercept and parameter estimate of X over the life cycle, by comparing b_0 and b_3D, and b_1X and $-(b_3/a)X*D$, respectively.

in the male college group. Also, Lin and Chu(1985) supported Lin's empirical results for Taiwan by using the same model specification with different control variables(Z) such as dummies for worker employe industries.

The studies cited above indicate that the cohort size and earnings literature has focused principally on average cohort earnings. Dooley and Gottschalk (1985) study demographic structure in relation to the proportion of low earners in male labor force (an annual and a weekly low earnings threshold are fixed in real terms at $6,280 per year and $120 per week, respectively, in 1975 prices) and assess the extent to which any such relationship is transitory. They used logit function with the same explanatory variables as Welch's to estimate the impact of cohort size on the probability of low earnings conditional on education and experience using the data from March CPS 1968-1979. They find little support for the assertion that the recent rise in the incidence of low earnings was principally a transitory demographic phenomenon not only for the members of the baby-boom cohorts, but also for the male labor force as a whole, because the time trend coefficients in their model are not trivial. This implies that the major portion of the increase in the aggregate proportion of low earners can not be explained on the basis of an increase in the ratio of younger to older workers. They alternatively suggest to investigate changes in female labor supply or the structure of labor demand for the analysis of the cohort size effect on earnings profiles.

2. Relative Earnings Function Approach[4]

In much of the work on age-experience profiles of earnings, it has been assumed that the shape of the profile does not change over time. But it might be useful to decompose the earnings (log of real earnings) of a cohort with a given level of schooling into an experience component, a period component and a cohort component in order to understand the dynamics of the earnings profiles. [5] The experience component could be interpreted as the return on net investments on the job ; the period component would result from investment in the machinery and equipment and from changes in the organization of work, which in turn changes the productivity of all age groups ; and the cohort component could, for instance, depend on the size of the cohort and on the quality of schooling. If the three components are additive, the experience component will explain the general profiles of earnings, rising with experience at a declining rate. The period component will not influence the shape of cross-sectional earnings profile but only induce parallel shifts. Excluding individual investments in on-the-job training, it has been common to regard investments in machinery, buildings and other activities that promote productivity and growth. They affect all age groups equally, and yield cross-sectional profiles that are stable in shape and exhibit parallel shifts depending on the growth of the economy.

The cohort component will contribute to the shape of cross-sectional profiles. According to the theory, an increase in the quality of schooling will result in a relative increase in the earnings of young people and thus give a flatter cross-sectional profile. [6] If this quality increase is persistent, it will eventually include all active cohorts and the whole profile is shifted upward so that the shape it had before the first cohort with higher quality schooling entered the market will be regained. Similarly, if the size of new cohorts increase, their relative earnings will decrease. Suppose all active cohorts have achieved the new size. Then the whole pro-

4) This approach was developed and empirically tested in Shin (1987), and so please see the article for more detail.
5) Identification of the three components has been discussed in detail in e.g. Hanoch (1982) and Heckman (1983).
6) It is assumed that demand for the services produced by new cohorts is elastic.

file would regain its old shape but at a relatively lower level. If the increase in cohort size were a temporary phenomenon, it would first increase the cross-sectional slope and then decrease it. In summary, when there is limited substitution between workers of different experience groups, the cohort component of earnings becomes important. An increased supply of younger labor would lead to a relative decrease in earnings for these cohorts and the slope of the cross-sectional earnings profile would increase. An increase in demand for new graduates would have the opposite effect.

To estimate the above three effects on real earnings, pooled coss-section and time-series data are needed. Thus, the empirical model extends in both years of experience and time dimensions. The model estimated stems from the general model of the natural log of wage rates :

(3.3) $\ln W_{it} = X_i\alpha + Y_{it}\beta + Z_t\gamma + U_{it}$,

where W_{it}=real earnings of those who have i years of experience at time t. Here X_i is a vector of explanatory variables fixed for a cross-section over time ; Y_{it} is a vector of variables fixed that varies over both cross-section and time ; Z_t is a vector of variables fixed for a given time period. Under the assumption of an additive period effect (no allowance for an interaction between period and experience component) on real earnings, which will only induce parallel shifts of the earnings profiles, Z_t can be treated as variables of period component in earnings equations.

The period effect will be eliminated to emphasize the experience and cohort effects on earnings in the model. If there is a misspecification of variables, in other words, omission of some relevant variables of period component of Z_t from the regression equation, it could yield biased and inconsistent parameter estimates of other variables, unless the correlation coefficients between included and omitted variables are zero (see Pindyck and Rubinfeld (1981), pp. 128-129). In reality, we can never be sure that the correlation coefficients are zero, or some variables specified for the period effects are correct and capture the parallel shifts of earnings profiles over time, completely.

To eliminate the period effects on real earnings, the log of real earnings with S years of experience is specified from equation (3.3) as follows :

(3.4) $\ln W_{st} = X_s\alpha + Y_{st}\beta + Z_t\gamma + U_{st}$.

By subtracting (3.4) from (3.3), the earnings equation is that :

(3.5) $\ln(W_{it}/W_{st}) = (X_i - X_s)\alpha + (Y_{it} - Y_{st})\beta + (u_{it} - u_{st})$.

The regressors for the period effects (Z_t) on real earnings are eliminated.

The specific form that equation (3.5) takes for estimating for each of the education groups of workers is :

(3.6) $\ln(W_{it}/W_{st}) = b_1(EXPER_i - EXPER_s)$
$+ b_2(EXPER_i^2 - EXPER_s^2)$
$+ b_3(COHORT_{it} - COHORT_{st})$
$+ b_4(EXPER_i * COHORT_{it}$
$- EXPER_s * COHORT_{st})$
$+ b_5(Z_{it} - Z_{st})$
$+ e_{it}$,

where W_i=labor earnings for those who have i years of experience,
W_s=labor earnings for those who have S years of experience,
EXPER=years of experience,
COHORT=cohort size of workers,
Z=other control variables, and the subscripts of i and t represent years of experience and time respectively.

Based on the results the relative earnings equations with the data from occupational wage surveys of Korea covering the period from 1972 to 1982, it is generally found that while cohort size depresses earnings at entry, these negative effects of cohort size diminish and wages reach "normal" levels as workers age. Moreover, the greater positive effect on earnings growth is found in small-sized firms than large firms, which implies that the technology of small firms are more labor-intensive and the elasticities of substitution between workers are greater, and so workers employed in small firms transit more rapidly from learner to worker status than those in large firms.

Ⅳ. Summary and Discussion

As stated above, the production function approaches have their disadvantages : simplicity in the case of CES considering only two factor inputs, and measurement and specification errors for a factor such as capital in the case of TL. Especially, the specification of age groups in the labor force for either the TL or CES production function is not only difficult but can also easily lead to sharp differences in the estimates of production parameters and elasticities of substitution between age groups, because all workers in a category are assumed to be perfect substitutes for each other. In addition, the TL production function approach can not be readily modified to allow for the effect of cyclical factors (Freeman, 1979;Martin, 1982) and changes in the structure of an economy (Lin, 1982;Mosk and Nakata, 1985), which are expected to be important in determining the relative earnings especially in developing countries.

The earnings function approach is the only one to date which directly addresses the question about the effects of cohort size on earnings and earnings growth by estimating b_3 and b_4 in equation (3.6). Only the effects of cohort size on earnings levels can be estimated in the other approaches. Although this approach has been used by welch (1979) and Lin and Chu(1985), it has the disadvantage of ignoring substitution between schooling classes with the variable C(x) measured separately for each schooling classes' earnings profiles. It is possible to consider the substitution between workers in different schooling classes by measuring the cohort size variable C(X). That is, if both college graduates and high school graduates are included in the denominator of the cohort size measure, then the possibility of substitution between the schooling classes can be recognized.

Berger (1985) points out that welch's(1979) equations model have several restrictions on the estimated parameters, due to the spline variable (S) in equation (3.1). The parameters of X∗D and X∗ln C(X)∗D are restricted to be constant multiples of the parameters of D and ln C(X)∗D, respectively. The parameter estimate of X∗ln C(X) is restricted to equal zero for workers with experience greater than the level of experience (a) at which an individual becomes a fully-vested worker. This level is assumed to be exogenous and given. Also the parameter estimate of X^2 is restricted to be equal over the life cycle. Thus, while the effects of cohort size and experience are allowed to vary over the life cycle, they do so only in a very limited manner. If these restrictions are relaxed, then the analysis of cohort size effects must take place within the separate subsamples of younger and older workers.

Recall that the key identifying assumption is that the only cohort effects on earnings are cohort size effects. The uncontrolled cohort effects would be the effects from shifts of demand side, for example, gradual increases in quality of schooling or capital. The former would increase demand for younger workers and so increase their wages, but the latter for older workers if older labor is relatively more complementary to capital than younger workers. This is less likely to be a problem within the relatively narrow band of birth cohorts covered in the younger worker subsamples. That is, one way to control for cohort effects other than cohort size is to estimate earnings equation (3.6) for relatively narrow bands of entry cohorts.

Thus, it is suggested to estimate earnings equations with cohort size variables by restricting only to relatively younger workers, who are still pursuing training.

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