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The Returns from Classroom Training for Displaced Workers

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Abstract

Administrative data on workers' wages and salaries are merged with administrative data from a community college to estimate the returns from classroom training for displaced workers under the Displaced Workers Educational Training Program. Results indicate that a year of training eventually raises displaced workers' earnings six to seven percent above what they would have been in the absence of training. However, this earnings increase comes at the cost of substantial foregone earnings while workers are in training and in the period immediately after training. Most workers received less than a year of training. Thus the effect of program participation on earnings is correspondingly smaller than six to seven percent and, in particular, much less than the average earnings loss that accompanies displacement.

I. Introduction

Recent studies using longitudinal data have shown that worker displacement is associated with substantial long-term earnings losses (Ruhm, 1991; Jacobson, LaLonde, and Sullivan, 1993). These losses are substantial for both males and females and for workers employed in a variety of industries. As the costs of worker displacement have become increasingly apparent, and the incidence of displacement has become more widely spread among industrial sectors, policy makers have devoted more attention toward aiding these workers. One concrete step that they have taken is to increase resources for retraining displaced workers. In the U.S., the Clinton Administration proposes to expand public expenditures on employment and retraining services, and in Europe some commentators and analysts believe such programs may be a promising way to reduce chronically high unemployment rates (Saint-Paul, 1994) .

Heightened support for these retraining programs has occurred even though there is little evidence about their likely impacts. By contrast to the many studies of public sector-sponsored training for disadvantaged persons, there have been relatively few evaluations of its impacts on dislocated workers. This lack of evidence largely reflects the greater emphasis that U.S. policy makers have placed in the past on training economically disadvantaged (low income) persons.

Much of our knowledge about of how training affects displaced workers comes from several demonstration programs conducted during the 1980s (Leigh, 1990). Another more recent study examines the effect of training on a relatively small subset of displaced workers who lost their jobs as a result of increased import competition (Corson, Decker

Gleason, and Nicholson, 1993). Together, these studies indicate that displaced workers benefit from job search assistance because they found jobs sooner than similarly skilled nonrecipients; that access to classroom vocational instruction or on-the-job training usually has little effect on subsequent earnings; and that female displaced workers probably benefit more from employment and training services than do their male counterparts.

This paper adds to the relatively sparse literature on retraining programs for displaced workers by analyzing the long-term effects of a classroom instruction program operated for residents of Allegheny County, Pennsylvania during the mid-1980s. Although this was a small isolated program, it was significant for several reasons. First, it subsidized more intensive and longer-term services than are usually available to displaced workers. Second, its design included several features that are part of current proposals to improve retraining services for the displaced. Third, unlike the earnings data available for nearly all other training evaluations, the data available for this evaluation allow us to follow participants for up to eight years after leaving training. Fourth, program operators have provided us with substantially more detailed information about the type, intensity, and duration of classroom training than has usually been available for other evaluations. Finally, because we are studying a classroom training program for displaced workers, we also can estimate the returns to postsecondary schooling received by prime-age adults. The returns to schooling for this group has received little attention in the literature, yet the likely success of most existing and proposed retraining programs requires that these returns be substantial.

We find that displaced workers benefited from classroom training. The results for

men suggest that a year of schooling raised their long-term earnings by 6 to 7 percent. The effects on women's earnings were somewhat smaller. Further, like other studies, we also found that males benefited modestly from job search assistance.

Although we find evidence that classroom training raises earnings, the gains associated with a year of schooling fall far short of the losses incurred by workers when they were displaced. Moreover, despite having their training subsidized, most participants did not acquire even a years worth of schooling. Consequently, the effect of program participation on subsequent earnings is even smaller than the foregoing estimates would suggest. One reason why participants may not stay in the program longer is that longer participation is associated with lower earnings during training. One interpretation of this result is that retraining displaced workers is more costly than training the economically disadvantaged because foregone earnings losses are greater.

The plan for the remainder of the paper is as follows: Section II provides some institutional background on public sector-sponsored retraining programs for displaced workers, and describes the program and data analyzed in this paper. Section III presents our econometric model for estimating the effects of training for displaced workers. Section IV presents our estimates and some concluding remarks follow in Section V.

II. Retraining Programs for Displaced Workers

A. Existing Public Sector-Sponsored Programs

Ever since Congress established the Trade Adjustment Assistance (TAA) Program in 1962, U.S. policy makers have provided limited assistance to displaced workers. This particular program targets the relatively small fraction of displaced workers who lost their

jobs as a result of trade liberalization or import competition. Currently, TAA participants must be in enrolled in a training program as a prerequisite for receiving extended unemployment benefits. Because Congress designed TAA to serve only those displaced as a result of foreign trade, the program serves relatively few persons. For example, in 1990, approximately 19,000 persons enrolled in TAA sponsored training programs at a cost of $80 million.

In recent years, most displaced workers who have received public sector-sponsored retraining services have participated either in programs authorized under the Economically Displaced Worker Adjustment Act (EDWAA) or in the Pell Grant program.[1] EDWAA programs provide clients with a diverse set of services that last for an average of 14 weeks. Displaced workers may receive job search assistance, on-the-job training, or classroom instruction in vocational, remedial, or college level skills. EDWAA also provides for a rapid response service designed to counsel recently laid off workers about alternative programs and to help them develop realistic adjustment plans. Eligibility for these services extends to all long-term unemployed so that in principle as many as one million workers per year are eligible to receive them. Unlike programs funded under TAA, however, EDWAA participants are not eligible to receive extended unemployment insurance benefits or stipends while they participate in training. In practice, funding constraints have limited annual participation in EDWAA programs to about 120,000 workers, at a cost of

[1]EDWAA amended Title III of JTPA, which in 1981 provided retraining of displaced workers. Unlike programs for the disadvantaged, Title III requires that state governments "match" federal funds dollar for dollar. States unwilling to do so generally would not receive federally funding and as a result would provide few retraining services for displaced workers.

approximately $200 million.

To provide for these training services, the federal government allocates EDWAA funds for training to state and local authorities, who in turn, usually subcontract training services from nonprofit and private organizations. Under EDWAA, states receiving federal funds for retraining displaced workers must "match" the federal contribution with funds from their own budgets. Although local authorities may subcontract for training services from community organizations, proprietary schools, vocational institutes, and private employers, in practice one of the most common providers of training services are two year community or "junior" colleges, 4 year colleges, and universities. For example, approximately 40 percent of those enrolled in TAA sponsored programs providing job-skill training, and 73 percent of those enrolled in TAA sponsored programs providing general education, received these services at one of these academic institutions (Corson, Decker ,Gleason, and Nicholson, 1993).

By contrast to TAA and EDWAA programs, which Congress designed specifically for displaced workers, Congress designed the Pell Grant program for any low income person seeking aid in order to further their post secondary schooling. Until recently, a special provision in the program's rules waived the normal limit on an applicant's assets and based eligibility on current instead of the previous years income. As a result of this provision, displaced workers have been able to receive grants to cover the tuition costs of retaining and schooling. Many displaced workers have taken advantage of this provision. During the 1990-91 academic year over 75,000 displaced workers received Pell Grants. Approximately 30% of displaced Pell grantees attended proprietary schools, another 10%

attended four year colleges, and the remainder enrolled in community colleges.

B. The Role of Community Colleges

The prominent role played by academic institutions, especially community colleges, in providing public sector-sponsored training mirrors the increased role that these institutions have played during the last 20 years in providing vocational training. Community colleges continue to offer academically inclined students college-level courses that many public and private four year colleges accept toward a Bachelor's Degree. However, students who do not wish to transfer to a four year college can acquire job-specific skills that traditionally have been provided by proprietary schools and vocational institutes (Freeman, 1974). Community colleges often offer programs in areas as diverse as computer information systems, food preparation and management, real estate, word processing, respiratory therapy, and automobile repair. Moreover completion of such courses can lead to certification in a particular trade or occupation or allow students to be eligible to take state licencing exams.

Because community colleges already have vocational programs in place, they are natural subcontractors for public sector-sponsored retraining programs. Often community colleges design special noncredit courses that are tailored to the special problems faced by displaced workers. For example, these programs may include components that teach job search skills and help displaced workers choose new careers. Although states spend most of their EDWAA funds on displaced workers receiving these relatively short-term noncredit services, they also spend some of their funds on participants enrolled in regular community college programs.

As discussed above in the introduction, relatively little is known about the effectiveness of classroom training programs for displaced workers. One recent study of the returns from community college schooling for teenagers and young adults indicates that an additional year of such schooling has the same effect on earnings as an additional year spent in a four year college (Kane and Rouse, 1993). However, available data sources offer little opportunity to examine the returns from post secondary schooling received by prime-age persons such as displaced workers.

C. The DWETP Program

Because we have access to unique sources of administrative data, this paper can address this question for a classroom training program established by the government of Allegheny County, Pennsylvania. This county, located in the western part of the state, has a population of approximately 2 million persons and includes the city of Pittsburgh, the traditional "capital" of the U.S. steel industry. Beginning in the late 1970s the local economy began to decline and by the 1982-83 recession, the county unemployment rate stood at 16.2 percent. At that time federal and state authorities provided few direct resources for retraining displaced workers. As a result, the local government established the Displaced Workers Educational Training Program (DWETP).

To initiate this program, the county government granted the Community College of Allegheny County (CCAC) $1 million dollars to provide recruiting and counseling services, to develop relevant curricula, and to pay participants' out-of-pocket expenses. CCAC also received an additional $2.4 million for the program through the federal government's Pell Program. Because most displaced workers were eligible to receive federal financial aid,

CCAC required eligible participants to apply for and use their Pell grants to pay for courses taken at the community college (Bednarzik and Jacobson, 1994).

Upon applying for the program, eligible displaced workers received career counseling from DWETP administrators. Although DWETP allowed participants to choose their own course of study including the duration of their participation and whether they attended classes full-or part-time, DWETP counselors assisted participants in devising a training plan. For example, applicants without high school degrees and with poor general skills might be advised to enroll in CCAC courses that prepared them for the Graduate Equivalency Diploma (GED) exam. Alternatively, those with poor quantitative skills who wished to participate in CCAC's computer information systems program first might be encouraged to take courses to improve their mathematics skills. In addition, to providing counseling, DWETP administrators also developed noncredit classes teaching job search skills and career development techniques. Finally, CCAC made an effort to schedule more of its regular credit classes at times that would allow DWETP participants both to go to school and to hold a regular job.

Enrollment in DWETP was not continuous, but took place during several "windows" between April 1983 through August 1985. During those times, county residents who were without full-time work, who had been laid off from their jobs, and who had received unemployment benefits after August 1981 were eligible to receive program services. The program paid for all tuition, fees, and supplies for as long as the participants remained at CCAC and did not work more than 30 hours per week. Aid from DWETP did not affect eligibility for unemployment insurance or welfare benefits. Participants could remain in the

program after securing full-time work, but they had to pay the tuition and other program costs themselves. Participation did not have to be continuous, students could leave for a semester or two and still return to the program and receive subsidized tuition.

DWETP appears to have increased total enrollment at CCAC during the period when the program was in effect. This result is important because if DWETP participants simply displaced other potential students, the program's social benefits would be greatly diminished. As shown by Table 1, new enrollments at CCAC rose to 14,418 students during the 1982-83 recession and subsequently began to decline in 1985. Among non-DWETP enrolles this decline began in 1984, the year when DWETP enrollments were at their peak. This decline is evident both among teenage and young adult students. As further evidence that DWETP students did not displace other students, the table indicates that as DWETP enrollments declined starting in 1985, enrollments of non-DWETP students did not increase.

D. <u>The Sample of DWETP Participants</u>

We used information from two administrative data files first to analyze the types of classroom instruction that DWETP participants received at CCAC and then to estimate the effect of this training on their subsequent earnings. First, from CCAC we obtained machine readable records of participants' social security numbers and demographic characteristics, listings of the credit and noncredit courses that they enrolled in, the grades they received in courses taken credit, and whether they received a degree or occupational certificate. Second, from the Pennsylvania Department of Labor we obtained the quarterly earnings records of these persons from 1974 through 1991, and for each calendar year their firms

4 digit SIC code, location, and number of employees. Because the program operated during the middle of the time period covered by our data, we have an unusually long earnings panel for each participant both prior to and following training. Previous evaluations of economically disadvantaged persons suggest that such series are crucial for identifying the impact of training (Ashenfelter and Card, 1985; Heckman and Hotz, 1989).

Our CCAC file had records for 8,229 DWETP participants and we were able to find quarterly earnings records for all but 19 persons. However, an additional 432 persons had either invalid or missing information on their year of birth, gender, and marital status or they did not permanently separate from their firms between 1978 and 1985. Among the remaining 7,778 persons, more than 3,000 were not consistently attached to Pennsylvania's wage and salary work force throughout the period covered by our study. For the purposes of this study, we excluded these persons from our sample because policy makers' interest in displaced workers has been in those with significant work experience and tenure at their previous jobs.[2] Therefore our study does not examine the effects of DWETP on those workers who did not maintain strong attachment to the work force in Pennsylvania

Accordingly, our sample is limited to DWETP participants who were permanently

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[2]Some of these 3,000 persons were workers who had been consistently attached to Pennsylvania's work force during the 1970s and never reappeared in the sample after leaving DWETP. Because our administrative data only covers wage and salary earnings in Pennsylvania, it is possible that some of these persons moved out of the state or started their own businesses. As a result, our estimates of the effect of classroom training on DWETP participants may be over (or under) estimated to the extent that those who left the state or became self-employed tended to benefit less (more) from training than other participants. In practice, we believe these concerns are minor because we find that the vast majority of workers excluded from the sample at this stage of the analysis exhibited relatively little attachment to Pennsylvania's work force during the 1970s.

displaced between 1978 and 1985 from a job that had lasted 3 or more years. This restriction allows us to include in our sample persons who may have lost a long-standing job in the late 1970s or early 1980s, and moved between receiving unemployment insurance and other marginal jobs of shorter duration until they enrolled in DWETP. Further, we excluded persons who had two or more consecutive calendar years without earnings between 1978 and 1991, except during the periods surrounding the 1982-83 recession and the training period. As a result, our sample of "high-tenure" displaced workers includes 2,720 males and 912 females. For purposes of comparison, we also analyzed the effects of DWETP for a sample of 641 "low-tenure" males who remained attached to Pennsylvania's work force. These males were displaced from jobs in which they had been employed for fewer than three years.

E. Characteristics of DWETP Participants

In Table 2 we present the means of participants' characteristics and the amount of classroom training that they received. The table allows for comparisons (i) between the full sample of DWETP participants and the sample of those who had worked for their employer three or more years when they were displaced; (ii) between female and male DWETP participants; and (iii) between those who did not complete any credit courses and those who completed at least one credit course.

As shown by the table, DWETP participants are relatively old for community college students, with an average age of approximately 34. Participants in the high tenure sample are older, have more tenure, and are more likely displaced from jobs in the primary metals and other heavy manufacturing industries than are participants in the full sample. Finally,

the characteristics of DWETP participants who did not complete any credit classes are similar to those who completed at least one such class.

The bottom half of Table 2 reveals that the average time of enrollment into DWETP was during the fourth quarter of 1983. At that time, they enrolled in a wide range of credit and noncredit academic and vocational courses. As the table indicates, DWETP participants enrolled on average in approximately one noncredit course. These courses usually taught job search skills, career development techniques, or repair skills. At the same time, DWETP participants enrolled in and completed on average approximately five credit classes, with women completing more classes than men. Unlike many classroom training services offered under EDWAA, DWETP participants took credit classes with regular community college students. As the table indicates, both males and females were most likely to complete courses that taught business or clerical skills, or taught subjects in the humanities. The most striking difference between the genders in the distribution of classes occurred in courses teaching trade or repair skills, which women were less likely to complete.

Finally, Table 2 reveals that approximately 23 percent of the male and 29 percent of the female participants earned a two year degree or an occupational certificate. Approximately, 14 percent of the males and 18 percent of the females received an Associate of Arts (AA) or Associate of Science (AS) degree. The credits earned toward these degrees can be transferred to many four year colleges. An additional 5 percent of both males and females received an Associate of Applied Science (AAS) degree. Because CCAC allows students to use some noncollege level courses toward these degrees, credits

earned by these students are not easily transferred to four year colleges. Accordingly, students earning an AAS degree usually acquire job-specific skills. Finally, another 5 percent of both males and females received a certificate certifying their competence in a particular occupation. Students earning a certificate spend less time at CCAC because certificates require fewer credits and a much narrower field of study than does an AA or AS degree.

Before discussing our econometric model of earnings and training, we examine the quarterly earnings of male and female DWETP participants. As shown by Figure 1, male participants' real quarterly earnings rose during the 1970s before starting to decline in 1979. After a modest recovery during 1981, these workers earnings fell sharply after their displacements. As late as 1991, their subsequent quarterly earnings remained $2,000 or 33 percent below their peak levels during the 1970s.

This substantial long-term loss is not unexpected (Jacobson, LaLonde, Sullivan, 1993b). What is more surprising is the difference between the earnings histories of males who did not complete any credit classes (the dotted line in the figure) and those who completed at least one such class (the black line in the figure). Prior to their displacements, the earnings of the two groups were essentially identical, suggesting that their skills also were similar. However, after their displacements, the earnings of two groups diverged while whose that completed classes continued in the program. By 1987, the earnings of the "completers" had caught up with those of the "noncompleters," and by 1991 the earnings of the completers were slightly above those of the noncompleters.

This difference is surprisingly small because the completers acquired nearly a year

of additional schooling. By contrast, conventional studies of the returns to schooling suggest that an additional year of schooling is associated with an 8 percent rise in earnings. Applying this rate of return to the present case would suggest that DWETP completers' quarterly earnings should be approximately $300 higher than those of the noncompleters. Of course there are reasons why additional schooling many have been effective in spite of completers' earnings being lower than expected. Among these reasons are (i) that completers lost more specific skills following their job losses, or (ii) that they were less likely to receive a job offer. Our econometric model developed below and the empirical work that follows accounts for these and other possibilities and shows that simple comparisons between the mean earnings of training completers and noncompleters yields misleading estimates of the effect of training.

Turning to Figure 2, we find evidence that DWETP may have raised the earnings of female participants. As the figure shows, prior to their displacement, the completers had lower quarterly earnings than the noncompleters. However, by the early 1990s, the earnings of the completers exceeded those of the noncompleters. These earnings patterns are consistent with the contention that DWETP raised the earnings of female participants. Finally, for purposes of comparison, Figure 3 presents the quarterly earnings of male workers who were displaced from jobs lasting less than three years. Although their earnings fell sharply around the time of their displacement, the earnings of those in the low tenure sample were substantially higher by the 1990s than were their earnings during the late 1970s. This result stands in contrast to workers in the high tenure sample. Further, like the female participants, the figure suggests that DWETP may have significantly raised the

earnings of those who completed classes.

III. Specification of the Econometric Model

To estimate the impact of classroom training on earnings we must specify a statistical model to represent workers' earnings histories and identify the effects of training with some subset of the model's parameters. In addition, this specification should take into account the fact that experienced displaced workers usually endure a substantial and permanent break in their earnings histories at the time of their job loss. Finally, our specification should exploit a principal strength of our administrative data - the fact that they cover a long period of time prior to and after DWETP - so as to obtain a detailed picture of the pattern of earnings gains associated with training.

Accordingly, we begin this section by defining the effect of displacement on workers' earnings. Next, we turn to specify the training effect and show how our specification differs from that usually employed in the program evaluation literature. Lastly, we include these two components into a standard model of worker earnings and discuss the likely importance of different sources of bias on our estimates of the training effect.

A. Specifying the Displacement Effect

In earlier work, we showed that displaced workers' earnings histories exhibit several systematic features (Jacobson, LaLonde, and Sullivan, 1993a). First, the events that lead firms to reduce their work forces alters the time-series pattern of workers' earnings before as well as after the date of their separations. Before separation, workers' earnings decline as a result of hours reductions, real wage cuts, or temporary spells of unemployment. Prior research indicates that these events begin to depress workers' earnings as early as three

years prior to their separations. Second, after their displacement, workers' earnings decline and remain below their previous levels as a result of prolonged unemployment, greater prevalence of part-time work, or a substantial loss of firm-specific or "match" capital resulting in lower wages in their new jobs. Finally, workers' earnings decline at different rates prior to displacement and recover at different rates following separation depending on their demographic characteristics or former industries. These differing rates may be correlated with their propensity to participate and remain in training.

In this study, we begin by pooling information for workers who were permanently displaced between 1978 and 1985 from a job lasting three or more years. Because the effect of displacement varies with time relative to the date of job loss, we can not specify the event of displacement as a single dummy variable that is equal to 1 after separation and to 0 prior to separation. Instead, we must characterize displacement by more than one variable so as to allow its effects on earnings to vary with time. In the most general specification, we would represent displacement by a vector of dummy variables, D^k_{it} where $k = -m, -(m-1), \ldots, 0, 1, 2, \ldots n$, that for $k > 0$ equal 1 if in time period t, worker i had been displacement k quarters earlier.[3] Similarly, when $k < 0$, $D^{-m}_{it} = 1$ if, in time period t, worker i will be displaced m quarters later. The vector of coefficients, δ^k, associated with these variables measures the effect of displacement on a worker's earnings *k* quarters following (or prior to) its occurrence.

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[3] In this study we ignore the possibility that training may have varying effects on different cohorts of displaced workers. Therefore, for any year t, $D^k_{it} = 1$ if worker *i* was displaced in quarter $t - k$. If workers were displaced from more than two jobs between 1978 and 1985, we dated their quarter of separation, s, as the quarter they separated from the job with the most tenure. (See Jacobson, LaLonde, and Sullivan, 1993b, Chapter 4).

The problem with this characterization of displacement is that because we have such long earnings histories, it leads to a large number of parameters in our statistical model. Therefore, in the empirical work below we restrict the vector of displacement parameters, δ^k to grow or decline along a quadratic trend during the 12 quarters prior to workers' separations, to be constant during the six quarters following their separations, and to grow or decline along another quadratic trend during the period that begins six quarters after their separations. To formally implement this scheme, we redefine the vector of displacement variables as follows:

$D^1_{it} = t - (s-12)$ if worker i is displaced at time s, and $s-12 < t \leq s$, and $D^1_{it} = 0$ otherwise;[4]

$D^2_{it} = D^1_{it} * D^1_{it}$;

$D^3_{it} = 1$ if worker i is displaced at time s, and s<t, and $D^3_{it} = 0$ otherwise;

$D^4_{it} = t - (s+6)$ if worker i is displaced at time s, and s+6<t, and $D^4_{it} = 0$ otherwise;

$D^5_{it} = D^4_{it} * D^4_{it}$.

In empirical work not reported below, we also allowed the displacement effects to vary during each of the first six quarters after displacement, but found that this less restrictive specification did not change our results.

We also found in our earlier work that the pattern of "displacement effects" varied among workers depending on their age and previous industry. This finding was especially true for workers displaced from the primary metals industries, who experienced larger losses, and for workers displaced from the Finance (FIRE) and other services industries,

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[4]For example in the 11th quarter prior to a worker's displacement $D^1_{it} = (s-11) - (s-12) = 1$; in the 10th quarter prior to displacement $D^1_{it} = 2$; and in the quarter of displacement $D^1_{it} = s - (s-12) = 12$.

who experienced smaller losses. Accounting for these differing effects may be important if workers' earnings losses were correlated with the amount of classroom training that they acquired while in DWETP. To control for this possibility, we interact a dummy variable denoting a workers' age category or former industry, E_{jit}, with a vector, F^k_{jit} that has five components, representing the quarters (i) during the predisplacement period, (ii) at the time of and just following separation, and (iii) during the period more than six quarters after separation. In the empirical work that follows, the coefficients, ϕ^k_j, associated with these interactions measures how the pattern of group j's earnings deviates from the pattern for the base group-persons born prior to 1950 who were displaced from industries other than primary metals, or FIRE and services. Formally, to account for varying effect that displacement may have on earnings, we define the following variables for groups j = 1, 2, ...J-1:

F^1_{jit} = t - (s-13) if worker i *from group j* is displaced at time s, and s-12 < t ≤ s, and F^1_{jit} = 0 otherwise;

$F^2_{jit} = F^1_{jit} * F^1_{jit}$;

F^3_{jit} = 1 if worker i *from group j* is displaced at time s, and s<t, and F^3_{jit} = 0 otherwise;

F^4_{jit} = t - (s+6) if worker i *from group j* is displaced at time s, and s+6<t, and F^4_{jit} = 0 otherwise;

$F^5_{jit} = F^4_{jit} * F^4_{jit}$.

The vector of coefficients associated with these terms as well as the displacement terms defined in the previous paragraph, $\{\delta^1, \delta^2, \delta^3, \delta^4, \delta^5, \phi^1_j, \phi^2_j, \phi^3_j, \phi^4_j, \phi^5_j\}$, describe the effect that displacement has on quarterly earnings.

B. Specifying the Training Effect

Having specified the effect that displacement has on workers' quarterly earnings, we turn to specify the effect that training has on earnings. The difference between the specification of the training effect in this paper and specifications used elsewhere is that we can exploit our long earnings histories and allow this effect to vary with time. By contrast, in most evaluations of training programs, the sampling frames are relatively short so that the program's impact can be estimated only for one or two years after training. In such instances, it is reasonable to specify the "training effect" as the coefficient of a dummy variable equal 1 in the periods after training, and zero otherwise. This specification assumes that training shifts earnings (presumably) upward by an amount equal to the estimated coefficient. In general, however, there is no reason to believe that the effect of training will be constant during the years after participants leave the program. The training effect may increase with time because more skilled workers are likely to receive more private sector training than their less skilled counterparts. Alternatively, the training effect may dissipate with time as persons who did not receive public sector-sponsored training acquire the same skills through other means.

Accordingly, we specify training to have separate effects on earnings during the periods when participants are in and out of training, and for those effects to rise (or fall) along a quadratic trend in the post-training period. The estimated "training effect" while workers are in the program measures the foregone earnings costs. In this study, we divide the training period into two parts. The first part accounts for instances when participants have begun training before permanently separating from their old employers. These

workers became eligible for and entered the program while collecting unemployment insurance benefits during a temporary layoff. The second part accounts for the period following their permanent displacements when the worker was enrolled in DWETP.

The estimated "training effect" after workers leave the program measures its benefits. These benefits may not be positive in each period after training, because it may take several years for the earnings of those with more training to "catch-up" and "overtake" the earnings of those with less training. Therefore, we allow training to have either a positive or negative effect on earnings when participants leave the program and for this effect to grow or decline at increasing or decreasing rates in subsequent years.

To express these ideas more formally, we define the following terms to capture the training effect both during and after participants leave the program:

$TA1_{it}$ = 1, if worker i is displaced at time s, and fstqtr $\leq t < s$, where fstqtr denotes the first calendar quarter in training, and $TA1_{it}$ = 0 otherwise;

$TB1_{it}$ = 1, if worker i is displaced at time s, $s < t$, and fstqtr $\leq t \leq$ lstqtr, where lstqtr denotes the last calendar quarter in training, and $TB1_{it}$ = 0 otherwise;

$T2_{it}$ = 1, if worker i is displaced at time s, and lstqtr < t, and $T2_{it}$ = 0 otherwise;

$T3_{it}$ = (t - lstqtr), if worker i is displaced at time s, and lstqtr < t, and $T3_{it}$ = 0 otherwise;

$T4_{it} = T3_{it} * T3_{it}$;

Based on these definitions, the coefficients associated with the first two terms measure the lower earnings associated with the training period. These lower earnings may result from the "investment" that workers make in their human capital. Alternatively, they may result simply from the correlation between low earnings and the propensity to take training. By

contrast, the estimated coefficients with the final three terms measure the effects of training on post-program earnings. They allow for the possibility that after leaving the program workers' earnings start out below (above) where they would have been without training, but rise (fall) along a quadratic trend.

Participants in DWETP did not receive a homogenous treatment of fixed length. In this study we have more information about the type of training received by the participant than is available in other program evaluations. To account for differences among participants in the training that they received, we interact the five "training" variables, $\{TA1_{it}, ...,T4_{it}\}$, with measures years of schooling, whether the participant received a degree or occupational certificate, the type of vocational or academic program that they enroll in, whether they enrolled in noncredit classes, such as the special DWETP job search assistance or career development courses, and their grade point averages(GPA). For example, we estimated the effect of an additional year of DWETP subsidized schooling by interacting each of the "training" variables, $\{TA1_{it}, ...,T4_{it}\}$, with years of schooling acquired in the program, SCHOOL. Consequently, the effect of schooling q quarters after the participant left the program is given by:

(1) $\tau^3*T2_{it}*SCHOOL + \tau^4*T3_{it}*SCHOOL + \tau^5*T4_{it}*SCHOOL$

$= \tau^3*SCHOOL + \tau^4*q*SCHOOL + \tau^5*q^2*SCHOOL,$

where τ^k, k = 1, ..., 5, are the coefficients associated with the interactions between each of the training variables and schooling.

Under some assumptions, we can interpret these estimated coefficients as estimates of the effect of that particular component of training on earnings. One clear

exception to this interpretation are for estimates associated with interactions between the training variables and participants' GPAs. One interpretation of students' GPAs is that all other things equal, higher GPAs may imply that the participant worked harder in the program and as a result received more training. Alternatively, students' GPAs may merely measure their inherent ability, particularly of skills that they were not compensated for prior to their job losses. Under this interpretation, including the GPA interaction in our model simply provides a better control for worker's ability.

C. <u>Specifying the Statistical Model of Earnings Histories</u>

The displacement and training effects defined above are among the principal components of our model of workers' quarterly earnings histories. In addition, we allow earnings for displaced worker i at date t to depend on fixed and time varying characteristics, and on time varying unobserved characteristics as follows:

$$(2)\ y_{it} = \alpha_i + \gamma_t + \mathbf{X}_{it}\beta + \sum D^k_{it}\delta^k + \sum E_{jit}\,(F^1_{jit}\,\phi^1_j + \ldots + F^5_{jit}\phi^5_j)$$
$$+ TA1_{it}\tau^1 + TB1_{it}\tau^2 + T2_{it}\tau^3 + T3_{it}\tau^4 + T4_{it}\tau^5 + \varepsilon_{it},$$

where E_{jit} is a dummy variable denoting whether worker i belongs to group j. In (2), the nontraining related variables are defined as follows: the vector $\boldsymbol{X}_{it}$ consists of workers' observed time varying characteristics, which in this paper are limited to a fourth order polynomial in age. The impact of permanent differences among workers' observed and unobserved characteristics is summarized by the "fixed effect" α_i. The γ_t's are the coefficients for a set of quarterly dummy variables that capture the general time pattern of earnings among displaced workers in Allegheny County. In the empirical work below, we control for these time effects by including in our model 72 quarterly dummy variables

covering the 18 years of earnings data available for this study. Finally, the error term, ε_{it}, is assumed to have constant variance and to be uncorrelated across individuals and time.

To measure these effects of training, we estimate (2) using a fixed effect estimator. Our framework holds constant workers' displacement experience and labor market activity during training to estimate the effect of completing additional classroom training on the temporal patten of earnings. Even though our sample contains only displaced workers who apply for DWETP, we can identify the parameters in (2) because of the variation in the timing of workers' layoffs and in the amount of training that they receive. The effect of completed training is identified both because a significant fraction of applicants did not complete any courses and because of the significant variation in the number of classes completed among those who completed at least one class. Intuitively, the program dropouts and no shows to the credit classes are the comparison group, and essentially "identify" estimates of the nontraining parameters in the model. Variation in the number of classes taken by those who complete at least one class "identify" estimates of the model's training parameters.

D. Potential Biases

The foregoing statistical framework addresses several sources of bias that may arise in a nonexperimental evaluation of training. In particular, our framework accounts for the possibility that persons with lower predisplacement earnings or with larger post-displacement earnings losses are more likely to receive training and to participate in the program for a longer period of time. However, even in our framework, biases may arise if workers with lower (permanent) rates of earnings growth or whose performance was

unusually poor in the quarters prior to separation are more (or less) likely to participate in training or to remain in the program a for longer period of time. In the case of lower predisplacement earnings growth, we would likely understate the effects of training because the estimated growth in earnings associated with training, (τ^4 and τ^5) would likely be too low.

In the case of unusually poor performance in the quarters prior to separation, the source of bias is less serious when the errors are correlated over time but are covariance stationary.[5] When the errors are stationary, the spurious effects of displacement are symmetric about the date of displacement.[6] For example, if it turns out that the estimated displacement effects are zero, say more than 3 years before workers lose their jobs, the spurious effects of displacement must also be zero 3 years after workers' separations. Accordingly, when firms displace workers partially on the basis of the error in (1), our displacement estimates will "regress to the mean" following workers' separations. Consequently, such biases are likely to be unimportant for measuring the long-term effects of training.

A more serious problem for estimating training effects arises when the error is nonstationary. In this case, when firms discharge recent poor performers there is no reason to expect their earnings to recover after their displacements. If workers with especially large "residuals" are more likely to remain in training, (because it is less costly) we are likely to understate both the short-term and long-term effects of the program.

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[5]For example, if the errors are serial correlated by following an AR1 pattern.

[6]See Heckman and Robb (1985) for a similar argument advocating the use of a symmetric differences estimator, when estimating the earning impact of employment and training programs.

However, when we refer to these workers as poor performers we do not necessarily refer to changes in their behavior that caused their productivity to decline. More likely workers' performances suddenly declined because a portion of their skills became obsolete. Indeed, because we restrict our analysis to workers with three or more years tenure prior to their separations, and because a majority of these persons were laid off from firms experiencing mass layoffs, it is unlikely that many workers in our sample left their firms as a result of their own poor performance. However, short of having experimental data, we see no obvious way of controlling for this potential source of bias in our analysis.

IV. Empirical Results

A. Alternative Specifications

This section presents the empirical results based on the econometric model developed in section III. We use up to eight variables to describe DWETP participants' program experiences. The one that we focus the most attention on is years of schooling at CCAC. This variable, denoted as "School" in the tables, is formed by computing the total number of credits that the participant earned while in the program and dividing that total by 30, the number of credits that a full time student would earn in a year. In addition to the schooling variable, in some specifications we also include interactions between whether the observation falls during the training or post-training periods and whether the participant enrolled in the DWETP job search assistance or career development courses, or in a noncredit "repair" class, whether the student received an AA or AS degree, an AAS degree, or an occupational certificate, and the student's GPA.

Despite the restrictions that we impose on our model, the most detailed specification

still generates 126 estimated coefficients. Accordingly, we present results only for those parameters related to DWETP participation. For example, in Table 3 we present the coefficients associated with the interactions between years of schooling and whether the observation falls during the DWETP or post-DWETP periods. The row labeled "DWETP prior to displacement" refers to the period when some participants have enrolled in the program before they have permanently separated from their old employer. Although all these persons eventually were displaced, they enrolled in the program while they were temporarily unemployed.

The label "DWETP after displacement" in the second row of Table 3 refers to the period following participants' displacements when they were enrolled in the program. During this time, we might expect the estimated coefficient to be negative if more schooling was associated with lower earnings. This relationship might result because participants who acquire more schooling are turning down potential offers in order to "invest" in their human capital. Alternatively, it might result because schooling is less costly to those workers who do not receive many job offers.

Finally, the last three rows of Table 3, capture the effect of training after participants leave DWETP. As indicated above, our specification allows the effect of schooling to vary during the 6 to 8 years that we can follow participants after they leave the program. Accordingly, we can use the estimated coefficients associated with the post-DWETP period to plot the estimated effects of the program for each quarter during that time span.

The table reports results for both male and female displaced workers based on five specifications of equation (1). In the first column, the only program variable accounted for

in the underlying specification is the schooling variable. In particular, this specification excludes the terms allowing the displacement effects to vary according to participants' former industries or their ages (i.e. the ϕ^j terms in (1) are set equal to zero.) Their inclusion in the second column of the table allows for the possibility that those who are older or displaced from certain industries may incur greater earnings losses and at the same time acquire more schooling. Without these controls for participants' former industries, we might tend to understate the effects of additional schooling.

In the third column of the table, we also include interactions between the training variables and participants' GPA's. The data reveals that those with higher GPA's also acquire more schooling. Therefore, without these controls some of the estimated returns to schooling might reflect returns to a dimension of ability not controlled through the "fixed-effect." Of course, higher GPA's may also mean that the participant acquired more skills while they were in the program.

In the fourth column of the table, we add interactions for the three most popular noncredit classes: job search assistance, career development, or one of the repair classes. These interactions allow for the possibility that participants may substitute between credit and noncredit classes. Without these controls we might understate the effects of schooling, because those with less of it actually enrolled in more noncredit courses. Table 2 provides some weak evidence of this phenomena, especially for men. Men who took no credit classes on average enrolled in 0.42 more noncredit classes than those men who completed at least one credit class. Finally, in column 5 of the table, we add controls for whether the person received an AA/AS or AAS degree or a certificate from CCAC. These variables

account for the possibility that part of the schooling effect that we measure is the effect of having received a credential.

B. Estimated Returns From Schooling

As shown by Table 3, subsidized schooling under DWETP lowers earnings during the training period, but raises them in later periods after participants have left the program. During the training period prior to displacement, male participants' quarterly earnings were $118 to $190 lower per year of acquired schooling. Although one interpretation of these lower earnings is that they represent the investment associated with training, they may result because workers on longer temporary layoff acquired more schooling. In the next row of the table we see that during the training period following displacement, males' quarterly earnings were $342 to $402 lower per year of acquired schooling. Once again, this "loss" may be the forgone earnings cost associated with classroom training, but it also might imply that participants without job offers stay in school longer. Turning to the right hand panel of Table 3, we see that these results also hold for women following their displacements.

After participants have left the program their earnings increase above the levels we would expect had they not acquired any subsidized schooling. The estimated coefficients for both males and females reveal that when they first leave the program their earnings are below their expected levels (row three of the table) but that their earnings rise with years since leaving the program at a decreasing rate. As can be seen by comparing the estimated coefficients to their standard errors, the coefficients determining this pattern are statistically significant at conventional levels.

Even with only three coefficients representing the effect of training during the 6 to

8 years that we follow participants after they leave the program, it is still difficult to envision from the coefficients in Table 3 what the pattern looks like. Therefore, we plot the relationship between the "training effect" and quarters since leaving the program. As shown by Figure 4, the fixed-effect estimates indicate that when male participants first leave the program their quarterly earnings are $100 to $300 below their expected levels. This difference might be due to lost labor market experience while in school. However, after that point, their returns to a year of schooling rise to approximately $200 to $400 per quarter by the 7th year (28th quarter) after leaving the program. Observe that controls for former industry have little effect on the results, but that controls for GPA (the dotted line in the figure) lower the estimated effects essentially by a constant amount during the entire post-training period. This result is consistent with the view that without controls for GPA the returns to schooling are biased upward because those who are more able acquire more schooling.

These estimates that control for GPA suggest that male DWETP participants earned a return to schooling that is comparable to that found in the literature. If, as the figure suggests, the returns have leveled off to approximately $250 per quarter by the 7th year after training and that this effect persisted throughout the remainder of a worker's career, then a crude estimate of the long-term effect of DWETP subsidized schooling on earnings is approximately 6.3% ($250 divided by the average quarterly earnings of $4,000).[7] Of

[7]Because we control for age in our earnings equation, this estimated return understates somewhat the return that we would have estimated had we controlled for worker's potential experience. The amount that we understate the returns to schooling depends on the returns to labor market experience for workers in their mid-30s.

course as Table 3 and Figure 4 indicate, despite the subsidy that participants received from the DWETP program, this return was achieved at a cost of lower earnings during the training period and during the first nine quarters of the post training period.

We found a similar pattern of training effects for female participants. As seen in Figure 5, the effects for women are initially negative, but rise at a decreasing rate. Like the estimates for males, those that control for GPA are lower than those that do not control for this variable. By the 7th year after leaving the program, the effects for women are lower than those of males and have been declining for several quarters. Thus, contrary to the pattern implied by the mean quarterly earnings in figures 1 and 2, the fixed-effect estimates suggest that the returns to schooling for women are lower than are those for men. By contrast, Figure 6 suggests that the returns to schooling for low tenure males are still rising during the 7th year after leaving the program and that these returns substantially exceeds our estimate for high tenure men. However, we should note the sample size of low tenure men is relatively small and that the coefficients used to generate the trend in Figure 6 are only marginally significant.

C. Estimated Returns From Other Program Components

Our specification also allows us to examine the relationship between post-program earnings and whether the participant enrolled in a noncredit course or received a degree. As shown by Figure 7, enrollment in job search assistance appears to have had a modest impact on the earnings of male participants. After controlling for years of schooling, whether the participant received a degree, whether they enrolled in other noncredit courses, and their GPA, we find that the quarterly earnings of males who enrolled in the DWETP job

search assistance course were approximately $150 higher than what they would have been otherwise. This effect appears to persist throughout most of the post training period. This result is consistent with results found in the rest of the literature which indicate that displaced workers benefit from job search assistance. However, as shown by Figure 8, DWETP women did not appear to benefit from this course.

The estimated effects of the other noncredit courses on males' and females' earnings is more ambiguous than is the evidence on job search assistance. As shown by Figures 7 and 8, career development is associated on the whole with lower earnings for males and essentially no gains for females, whereas the opposite holds for noncredit repair courses. Finally, as shown by Figures 9 and 10, there is not a systematic positive or negative effect of having an AA/AS or AAS degree on males' and females' post program earnings. For males however, the coefficients generating the patterns depicted in Figure 9 are statistically significant at conventional levels. By contrast to the results for AA/AS and AAS degrees, there is a consistently negative earnings effect of having received a certificate on post program earnings. This result suggests that participants would have been better off taking all the courses associated with attaining a certificate, but not bothering to collect to it from CCAC. However, another explanation for this finding is that our underlying model is misspecified. This explanation suggests that those who took classes toward attaining a certificate would have had lower earnings after their displacements even if they had never participated in DWETP. For example, those who enrolled in such programs may have been workers who experienced especially large earnings losses as a result of their displacements.

D. Testing the Underlying Econometric Specification

In this paper we take two different approaches to "test" our underlying specification and to examine the impact that any misspecification of our statistical model is likely to have on our results. First, we allow for the possibility that the program variables, such as schooling, affect earnings not only during and after the program, but also prior to workers' displacements. If our model was specified correctly we would not expect that years of DWETP subsidized schooling, enrollment in noncredit classes, or whether participants attained a degree to be correlated with their earnings and their earnings "dips" prior to their job losses.

As shown by Table 4, the program variables are correlated with workers' earnings declines prior to displacement. In the upper portion of the table we allow participants' earnings to deviate from their expected levels during the period 0 to 3 years prior to their displacements and for this deviation to depend on years of DWETP subsidized schooling, GPAs, and other program variables. The results indicate that both males and females who subsequently acquired more schooling experienced somewhat larger declines in their predisplacement earnings. For example, the -5.146 figure in the first column implies that a male displaced worker who acquired one year of additional DWETP subsidized schooling had earnings that fell by approximately $5 per quarter faster than an otherwise comparable worker. When we introduce other program variables into the model, the effects of schooling on predisplacement earnings declines become statistically insignificant at conventional levels.

In the lower panel of Table 4, we allow participants' earnings to deviate from their

expected levels during the period 0 to 6 years prior to their displacements. During this period, the effects of additional DWETP schooling on predisplacement earnings declines are similar to the results obtained for the 3 year period prior to job loss.[8] Because those who subsequently acquired more schooling had somewhat slower earnings "growth" prior to their job losses, they may be more likely to have had slower earnings growth after their job losses. As a result, estimates from our "fixed-effects" model likely understate the effect of DWETP schooling. Our fixed effects model does not control for differences among workers "trend" rates of earnings growth.

The other results reported in Table 4 indicate significant correlations between the size of workers' predisplacement earnings declines and their GPAs, whether they enrolled in noncredit classes, and whether they received an AAS degree or an occupational certificate. These results for GPA and for the two credentials are consistent with each other. For example the 3.105 figure in the first column of Table 4 indicates that a male, whose GPA was one point higher than an otherwise comparable worker, had earnings that declined by approximately $3 per quarter less prior to his job loss. This result is consistent with the view that DWETP participants who had higher GPAs were more able as indicated by their higher rate of earnings "growth" prior to their displacements. Consequently, interpreting the returns to higher GPAs as an effect of DWETP would tend to overstate the returns to a student of working harder to obtain better grades. Similarly students who

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[8]In results not reported in the table, we allowed workers' predisplacement earnings to deviate from their expected levels along a quadratic (instead of a linear) trend depending on the amount of DWETP schooling that they subsequently completed. During the three years prior to their displacements, we found that males who later acquired more schooling initially had a significantly steeper decline in predisplacement earnings. However, the coefficient associated with the "squared term" indicated that by the quarter of their displacements this gap has vanished.

subsequently received AAS or occupational certificates had substantially larger earnings declines prior to their job losses. These degrees require less rigorous studies than are required for an AA or AS degree, and likely are acquired by less able students. Therefore, the larger earnings declines prior to job loss for students who receive an AAS or an occupational certificate may result from these persons having a lower "tend" rate of earnings growth. This finding would explain why we found in figures 9 and 10 that these credentials had negative effects on postprogram earnings.

A second approach for "testing" our econometric specification examines whether all CCAC classes have the same effect on earnings. It might be that participants receiving certificates enrolled in courses with lower returns than those who did not receive a certificate. We can test this possibility by replacing the schooling variable in our model with variables denoting the type of credit classes that participants completed while in DWETP. Accordingly, we examined the separate returns from completing what we define as "hard" classes and "easy" classes. We designated academic math and science courses, and vocational courses in nursing, other health related fields, trades and repair, and computer information systems as hard courses. All other vocational and academic courses we classified as easy courses. Approximately 45 percent of the credit classes taken by male DWETP participants and 27 percent of those taken by female DWETP participants fell into the "hard" category.

Figure 11 presents the estimated returns associated with completing one class in each category after controlling for whether the participant enrolled in noncredit courses and their GPA. As shown by the figure, there are apparently substantial returns associated with

completing a "hard" classes and no gain associated with completing an "easy" class. These results suggest that although our previous estimates provided a measure of the average return to schooling, they masked considerable variation in the returns to different classroom programs. Notice that for females the returns to completing one "hard" class equals $100 per quarter. At that rate, completing 10 such classes would essentially eliminate the losses associated with worker displacement (See Figure 2).

We find evidence that this difference between the returns to "hard" and "easy" classes results at least in part from differences between the "investments" that individuals taking these classes make in their human capital. We find that while males are in training an additional "hard" class is associated with a $54 decline in quarterly earnings. This figure compares with only a $22 decline for an additional "easy" class. Therefore, during training the quarterly earnings of a male who completed one years worth of "hard" classes would be $322 less than that of a comparable male who completed a years worth of "easy" classes. We find that completing additional "hard" classes has a similar, although smaller, impact on the quarter earnings of females.

V. Concluding Remarks

The foregoing discussion of alternative specifications indicates the value of implementing a richer specification of earnings and program impacts in subsequent versions of this paper. Among directions we plan to explore are allowing our model to include individual-specific trends and for the returns to schooling to vary according to the participants' academic or vocational concentrations. In addition, we also plan to add to the analysis several comparison groups. The first group includes workers displaced from firms

in Allegheny country who did not participate in DWETP. A second group includes displaced workers who were not eligible to participate in DWETP, but enrolled in CCAC courses on their own. The third and fourth groups includes nondisplaced workers who did and did not enroll in CCAC courses. With these additional data, we should be able to better identify the effects of displacement, the effects of classroom training, and the effects of subsidized schooling on displaced workers subsequent earnings.

At this stage, our study indicates that DWETP classroom training raised displaced workers earnings. This result suggests that prime-age students benefit from community college schooling, just as younger students appear to benefit from such schooling. However, these gains are small compared to the earnings losses associated with displacement. Further, unlike training the economically disadvantaged, or educating teenagers and young adults, retraining displaced workers is relatively costly, because time spent training is associated with larger foregone earnings.

As a result, despite the apparent gains associated with the program, it is unclear whether DWETP was a productive social investment. For example, males who accumulated a years worth of schooling were in the program for approximately five quarters. One interpretation of the figures in Table 3 is that time spent in the program is associated with an earnings loss of $1,785 ($357*5). Next, if we discount (at a 5 percent rate) the earnings gains and losses (in Figure 4) associated with a year of schooling after training, we arrive at a benefit of $2,430 dollars. Finally, adding the foregone earnings to the postprogram benefits we have a private net benefit to DWETP of approximately $645. Because DWETP subsidized tuition and supplies, the social benefits of the program may

be close to zero even seven years after the program ended. We will readdress this question of the private and social benefits of classroom training in future versions of the paper.

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Figure 1:Earnings of Male DWETP Participants

Quarterly Earnings of males with earnings in each TWO calendar years from 1978 to 1991, except for 1982 through 1985, and 3 or more years tenure when displaced from any firm. Program Enrollment begins 8/83. Sample Sizes: No Classes-1081, Classes-1740

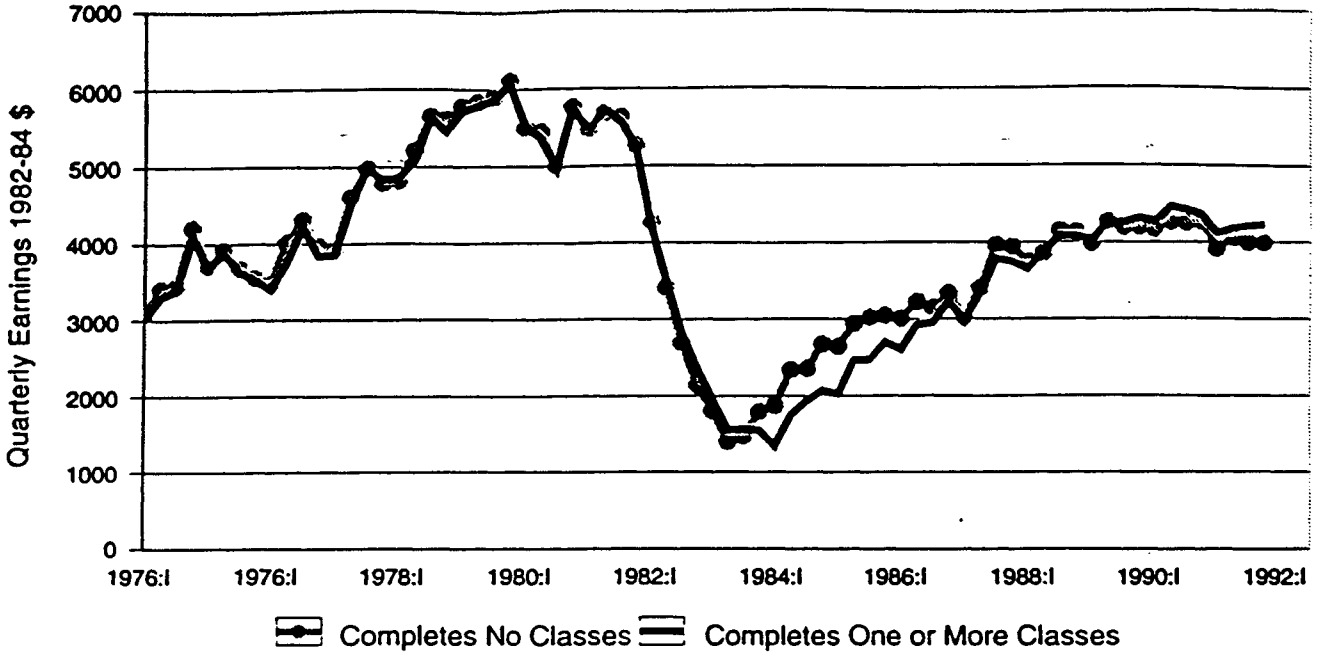

Figure 2: Earnings of Female DWETP Participants

Quarterly Earnings of males with earnings in each TWO calendar years from 1978 to 1991, except for 1982 through 1985, and 3 or more years tenure when displaced from any firm. Program Enrollment begins 8/83. Sample sizes: No Classes-344, Classes-639

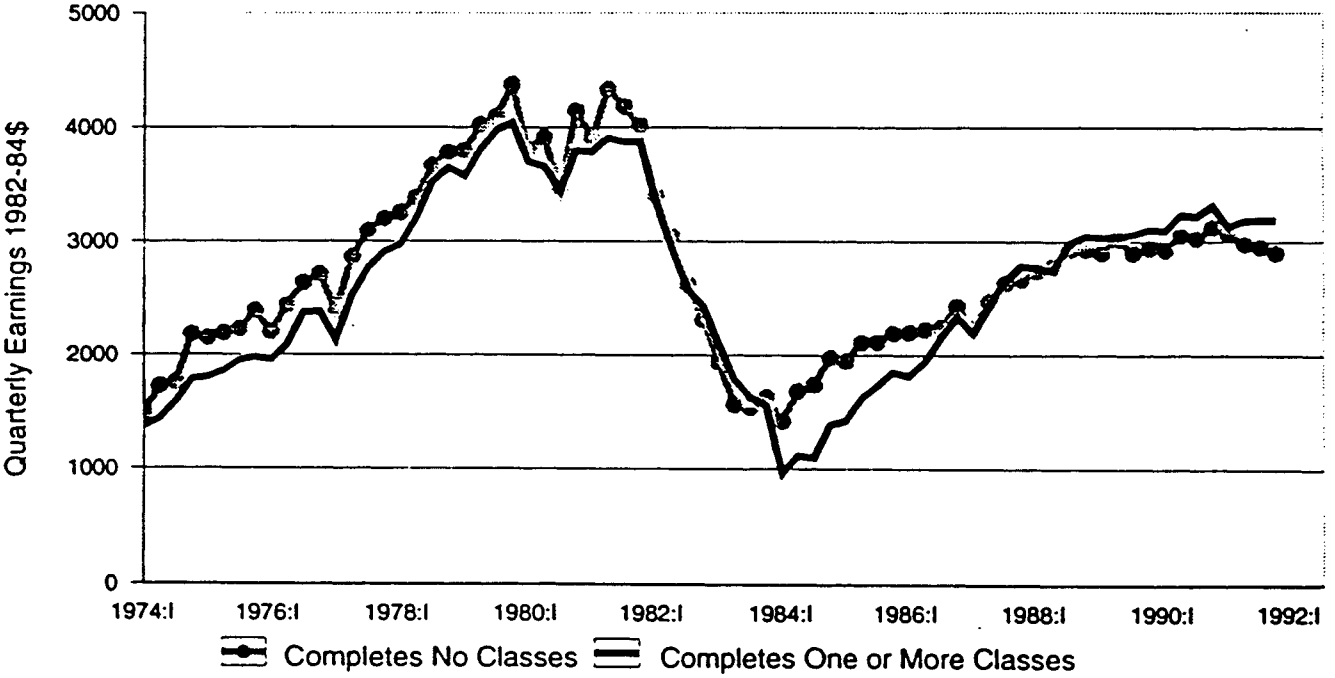

Figure 3: Earnings of Low-Tenure Male DWEPT Participants

Quarterly Earnings of males with earnings in each TWO calendar years from 1978 to 1991, except for 1982 through 1985, and less than 3 years tenure when displaced from firm. Program Enrollment begins 8/83. Sample Sizes: No Classes-209, Classes-423

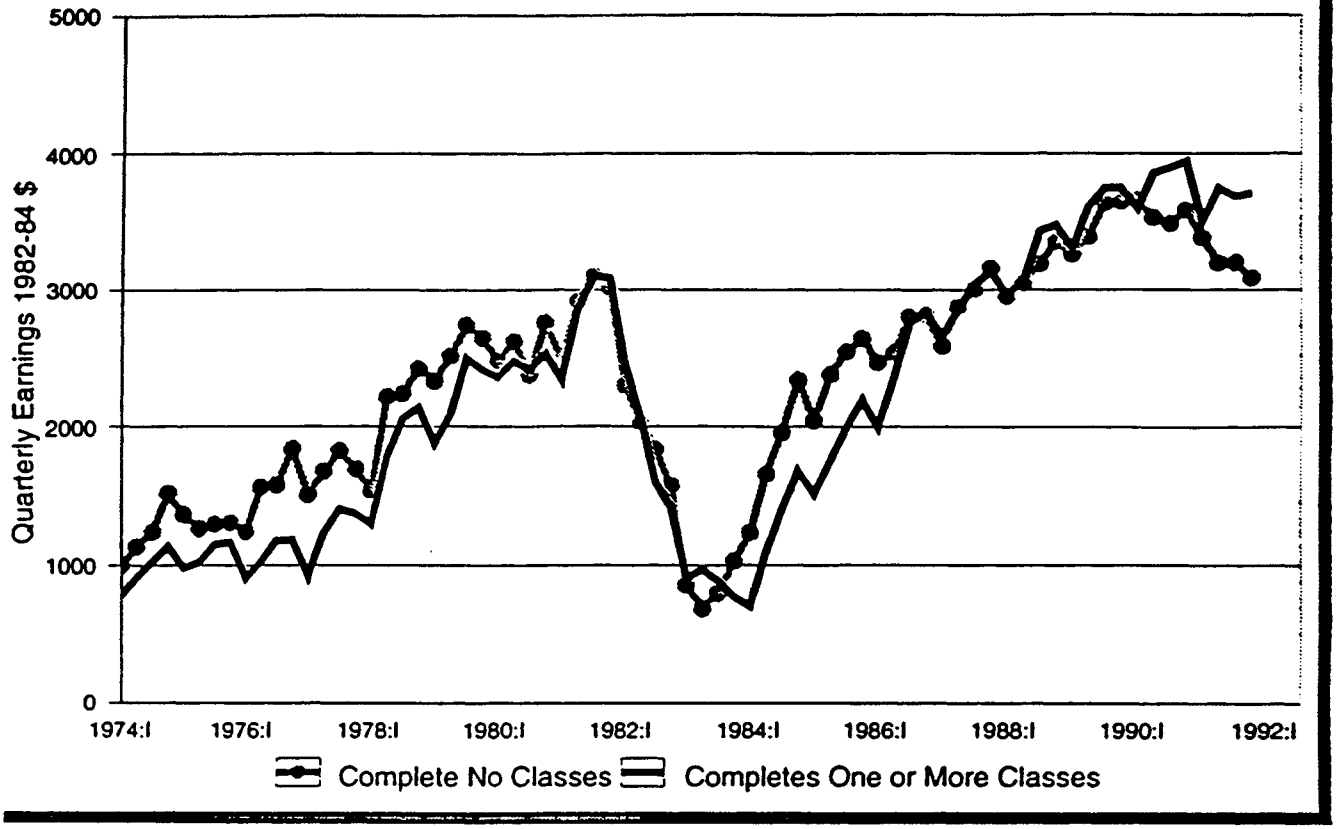

Figure 4: Impacts of Schooling on Male Displaced

Impact of Additional Year of Vocational or Academic Schooling on Earnings

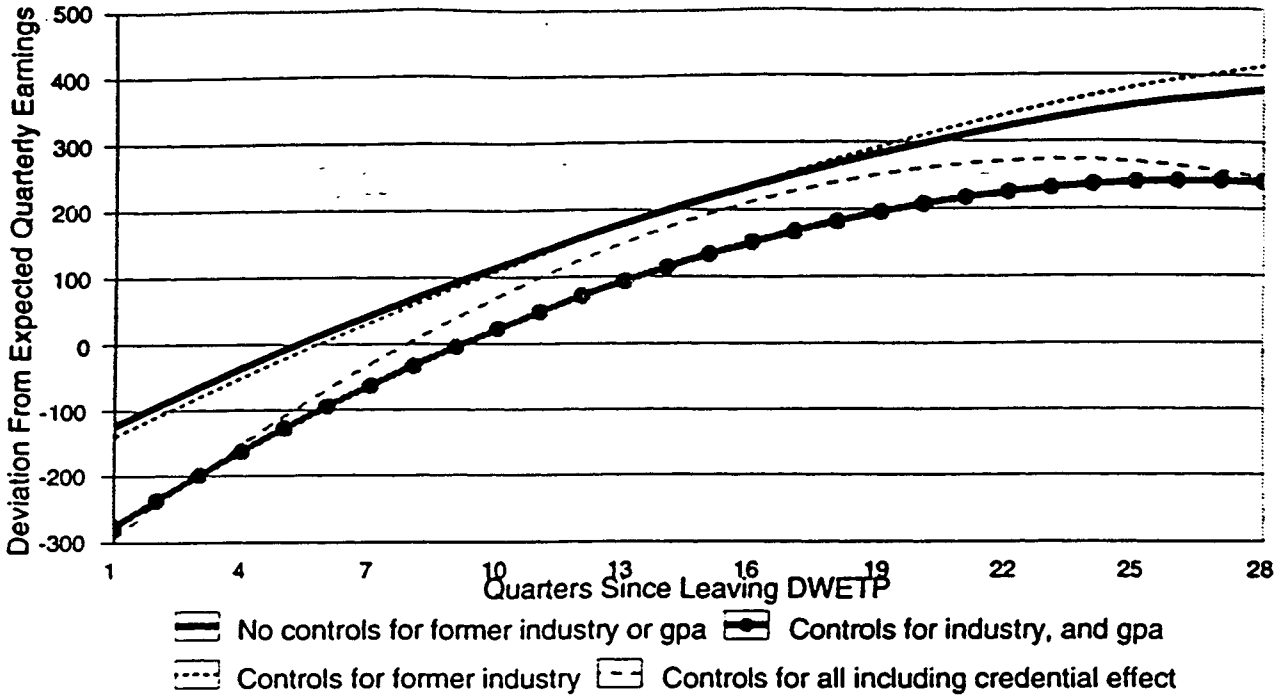

Figure 5: Impact of Schooling on Female Displaced

Impact of Additional Year of Vocational or Academic Schooling on Earnings

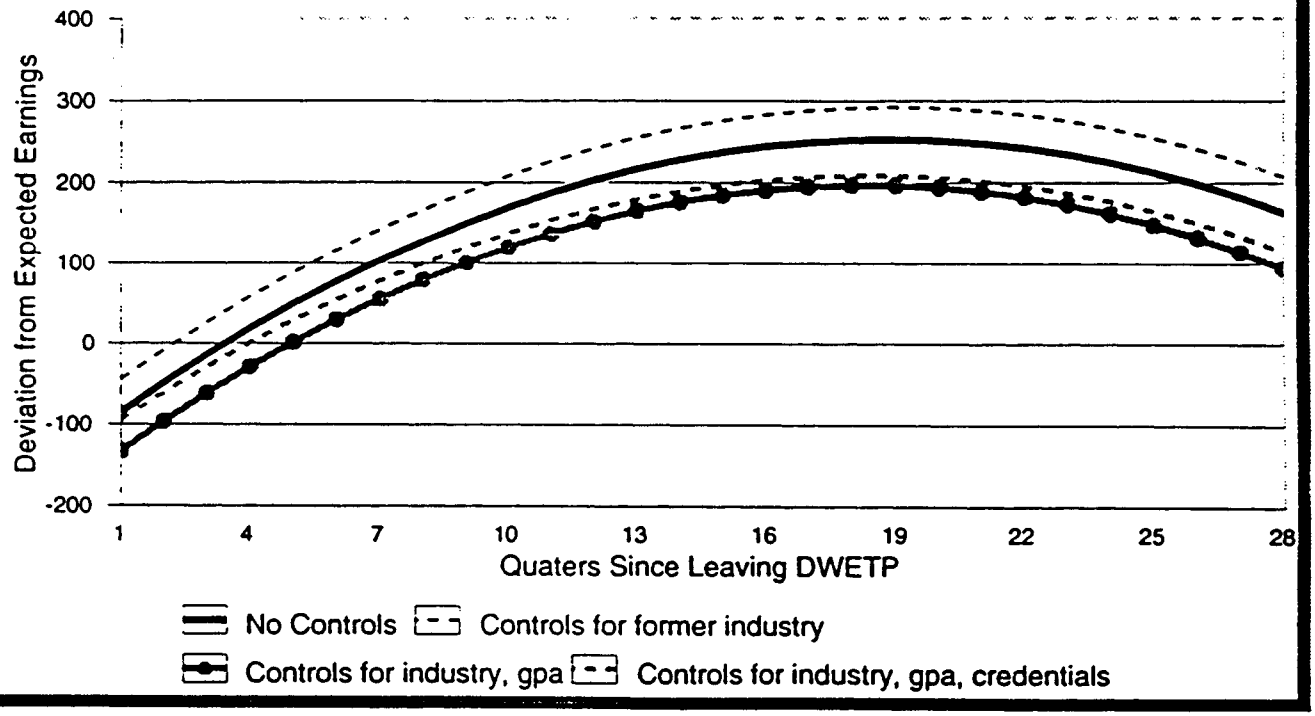

Figure 6: Impact of Schooling on Low Tenure Displaced

Impact of Additional Year of Vocational or Academic Schooling on Earnings

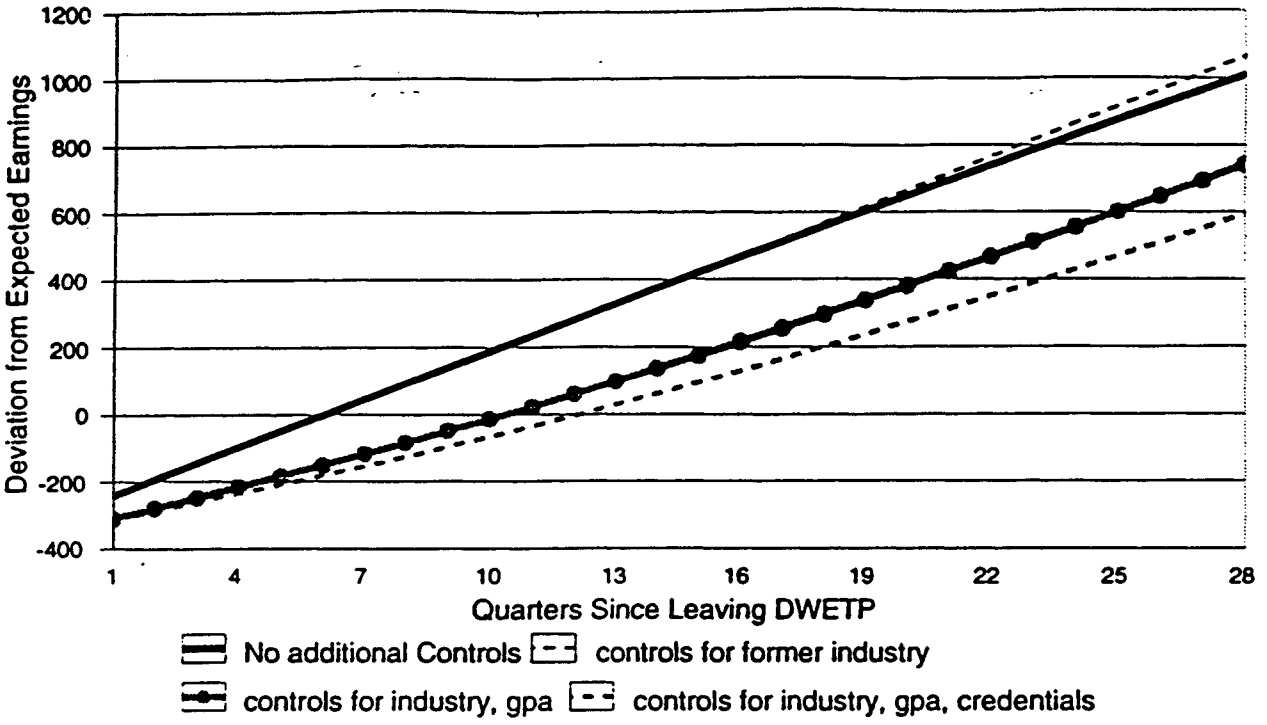

Figure 7: Impact of Noncredit Courses on Male Displaced

Impact of Enrolling in noncredit DWETP Job Search Assistance, Career Development, and Repair courses on Earnings

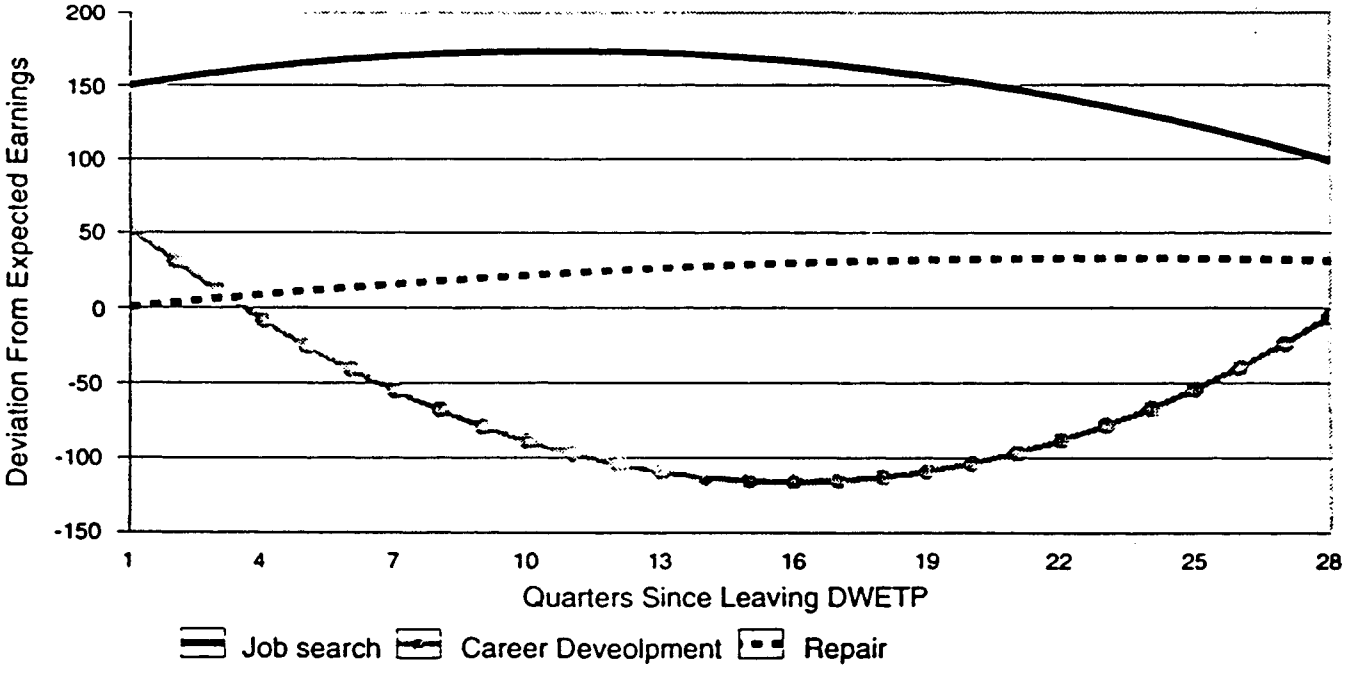

Figure 8: Impact of Noncredit Courses on Female

Impact of Enrolling in noncredit DWETP Job Search Assistance, Career Development, and Repair courses on

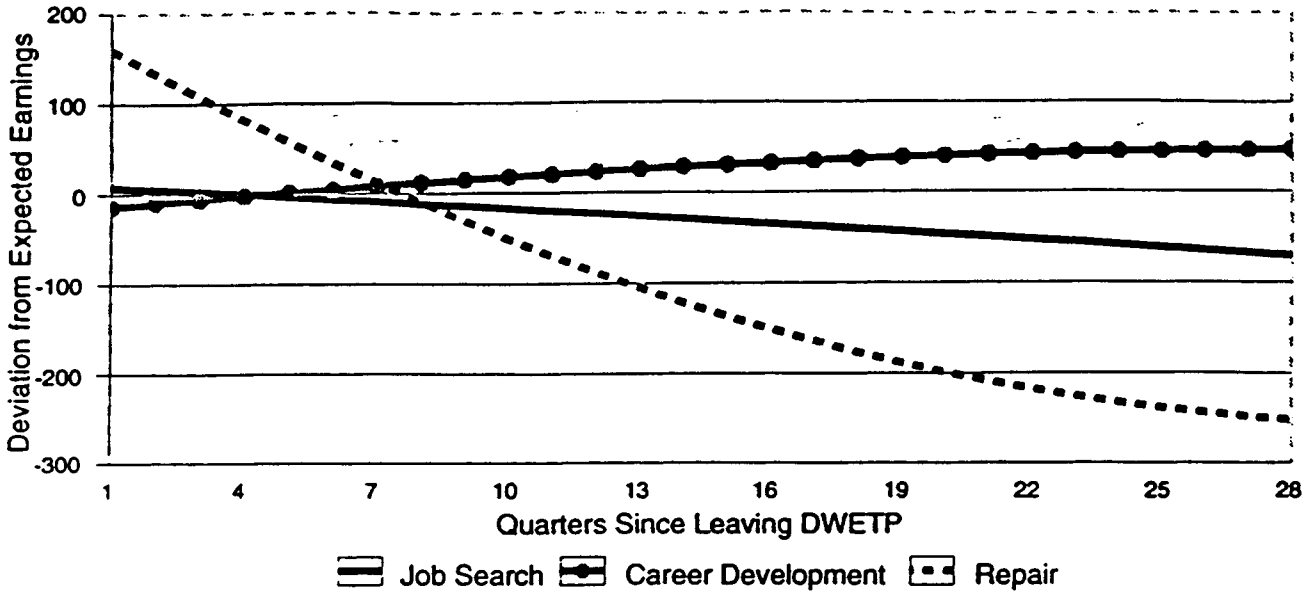

Figure 9: The Impact of Credentials on Displaced Males

Based on model that controls for years of DWEPT subsidized schooling, former industry, noncredit courses, and gpa. Graphs measure deviation from expected quarterly earnings.

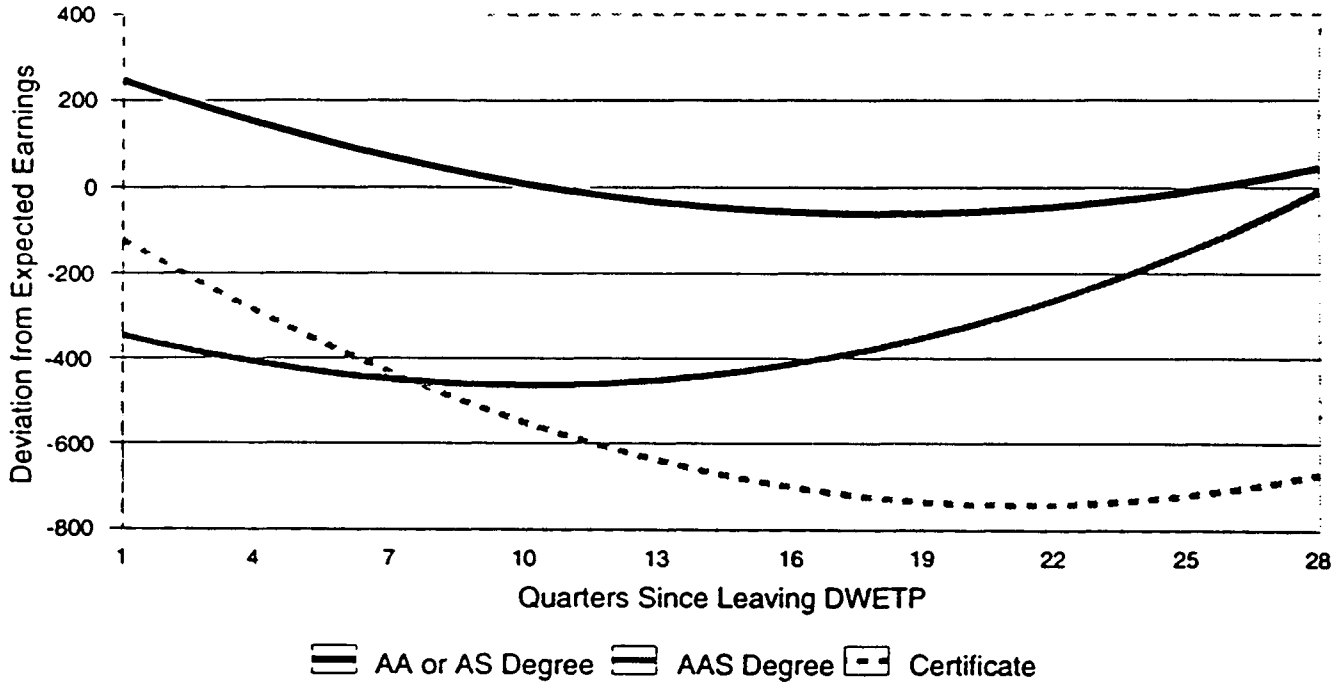

Figure 10: Impact of Credentials on Displaced Females

Based on model that controls for years of DWEPT subsidized schooling, former industry, noncredit courses, and gpa. Graphs measure deviation from expected quarterly earnings.

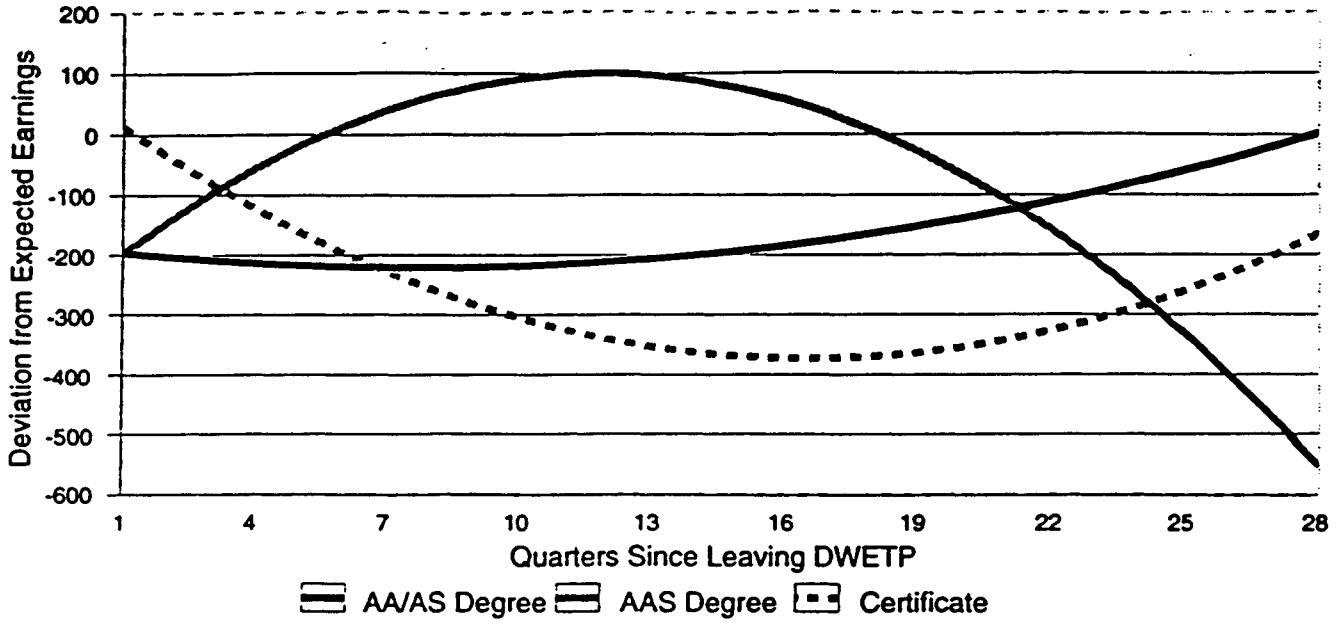

Figure 11: Returns From "Hard" and "Easy" Classes

Based on model that controls for number of DWEPT subsidized classes, former industry, noncredit courses, degrees and gpa. Graphs measure deviation from expected quarterly earnings.

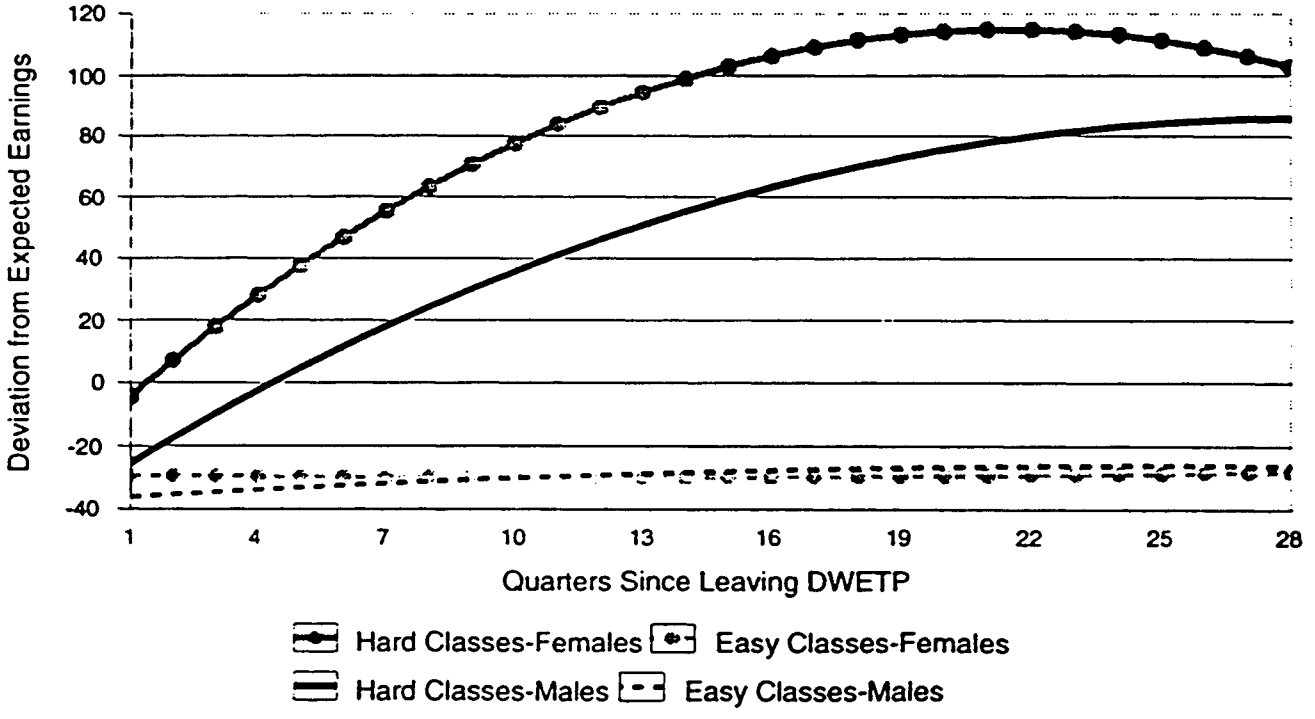

Table 1:New Enrollees In Academic Programs at the Community College of Allegheny County 1980 - 86.

	1980	1981	1982	1983	1984	1985	1986
Total	**12,069**	**12,258**	**13,785**	**14,418**	**14,375**	**11,976**	**10,078**
A10							
Non-DWETP	**11,894**	**12,056**	**13,566**	**13,819**	**11,178**	**11,023**	**10,045**
Age17-20	3,577	3,841	4,756	4,615	4,035	3,835	3,343
Age 24-33	2,973	3,231	3,610	3,830	2,886	2,791	2,566
A5							
DWETP	**0**	**202**	**219**	**599**	**3197**	**953**	**33**

Notes: Some DWETP participants enrolled at CCAC prior to entering the program.

Table2:Mean Characteristics of Female and Male DWETP Participants

		Women				Men			
		Full Sample	High Tenure	No Classes	Classes	Full Sample	High Tenure	No Classes	Classes
Age at DWETP	Mean	34.906	36.515	37.156	36.222	33.280	34.372	35.201	33.882
	Stan. Dev.	9.677	9.084	9.571	8.845	8.625	8.109	8.590	7.772
Married (%)	Mean	0.400	0.404	0.385	0.412	0.508	0.618	0.610	0.623
	Stan. Dev.	0.490	0.491	0.487	0.493	0.500	0.486	0.488	0.485
Prior Tenure (quarters)	Mean	16.821	24.556	23.703	24.946	21.137	27.330	27.220	27.395
	Stan. Dev.	11.218	9.150	8.959	9.217	12.024	9.061	8.824	9.200
Predisplacement Industry (%) -	Mean								
	Stan. Dev.								
...primary metals	Mean	0.181	0.285	0.311	0.273	0.346	0.461	0.441	0.474
	Stan. Dev.	0.385	0.452	0.464	0.446	0.476	0.499	0.497	0.499
...other durables	Mean	0.087	0.115	0.154	0.097	0.209	0.243	0.250	0.239
	Stan. Dev.	0.282	0.319	0.361	0.297	0.406	0.429	0.434	0.426
...TCPU	Mean	0.021	0.022	0.021	0.022	0.028	0.017	0.012	0.020
	Stan. Dev.	0.145	0.147	0.144	0.148	0.165	0.130	0.108	0.142
...Trades	Mean	0.277	0.268	0.238	0.281	0.135	0.092	0.097	0.089
	Stan. Dev.	0.448	0.443	0.426	0.450	0.342	0.289	0.296	0.285
...Other services	Mean	0.328	0.215	0.385	0.225	0.121	0.067	0.069	0.065
	Stan. Dev.	0.470	0.411	0.487	0.418	0.326	0.249	0.254	0.246
Measures of Classroom Training	Mean								
	Stan. Dev.								
First DWETP Quarter	Mean	59.806	60.300	60.175	60.358	59.807	60.178	60.343	60.081
	Stan. Dev.	2.252	2.407	2.357	2.429	2.161	2.271	2.374	2.202
# noncredit classes	Mean	0.985	1.061	1.133	1.029	0.842	0.895	1.161	0.738
	Stan. Dev.	1.539	1.636	1.550	1.674	1.904	2.024	1.161	1.739
# for credit classes	Mean	6.518	6.269	0.000	9.133	4.953	4.894	0.000	7.785
	Stan. Dev.	7.856	7.771		7.862	6.672	6.685		6.970
% that completes 1 or more classes	Mean	0.694	0.686	0.000	1.000	0.633	0.629	0.000	1.000
	Stan. Dev.	0.461	0.464			0.482	0.483		

Notes:Prior Tenure measures quarters of tenure in predisplacement job, where years of service prior to 1974 is censored. Under prior industry are primary metals defines as firms with 2 digit SIC code of 33; other durables are firms with 2 digit SIC code of 34 through 37; TCPU are firms in the Transportation, Communications, and Public Utility sectors; trades include Wholesale and Retail trades; other services include FIRE and business and personal services. First DWETP Quarter = 60 corresponds to the fourth quarter of 1983.

Table2.Mean Characteristics of Female and Male DWETP Participants

# classes taken in subject area-	Mean								
	Stan. Dev.								
... BUS/ADM/CLERIC	Mean	1.887	2.113	0.000	3.078	0.857	0.857	0.000	1.364
	Stan. Dev.	3.406	3.629		4.028	2.299	2.343		2.836
... NURSING	Mean	0.263	0.246	0.000	0.358	0.062	0.064	0.000	0.101
	Stan. Dev.	1.337	1.307		1.566	0.648	0.641		0.806
... HEALTH/SCIENCE	Mean	0.856	0.779	0.000	1.134	0.592	0.648	0.000	1.031
	Stan. Dev.	2.263	2.163		2.533	2.096	2.326		2.866
... TRADES/REPAIR	Mean	0.090	0.075	0.000	0.109	0.576	0.599	0.000	0.953
	Stan. Dev.	0.764	0.699		0.842	1.653	1.582		1.910
... COMPUTER/MATH	Mean	0.764	0.586	0.000	0.853	0.880	0.874	0.000	1.390
	Stan. Dev.	1.457	1.264		1.449	1.931	1.978		2.347
... LETTERS/HUMAN	Mean	1.659	1.453	0.000	2.117	1.300	1.199	0.000	1.906
	Stan. Dev.	2.731	2.308		2.521	2.242	2.116		2.402
... FUN STUFF/OTH	Mean	0.219	0.211	0.000	0.307	0.143	0.138	0.000	0.219
	Stan. Dev.	1.033	1.085		1.298	0.143	0.893		1.118
... SOC SCI/PUB SEC	Mean	0.770	0.694	0.000	1.011	0.474	0.444	0.000	0.707
	Stan. Dev.	1.634	1.580		1.821	0.474	1.202		1.454
% Earning Degree or Certificate-	Mean								
	Stan. Dev.								
Associate of Arts (AA) or Science (AS)	Mean	0.188	0.175	0.028	0.243	0.139	0.133	0.158	0.196
	Stan. Dev.	0.391	0.381	0.165	0.429	0.346	0.339	0.004	0.397
Associated of Applied Science (AAS)	Mean	0.052	0.053	0.000	0.077	0.045	0.053	0.004	0.082
	Stan. Dev.	0.222	0.223		0.266	0.208	0.225	0.063	0.275
Certificate	Mean	0.049	0.048	0.000	0.070	0.044	0.050	0.015	0.071
	Stan. Dev.	0.215	0.214		0.256	0.204	0.218	0.121	0.256
# of observations	Mean	2469	912	286	626	5309	2720	1010	1710
	Stan. Dev.								

Notes:Prior Tenure measures quarters of tenure in predisplacement job, where years of service prior to 1974 is censored. Under prior industry are primary metals defines as firms with 2 digit SIC code of 33; other durables are firms with 2 digit SIC code of 34 through 37; TCPU are firms in the Transportation, Communications, and Public Utility sectors; trades include Wholesale and Retail trades; other services include FIRE and business and personal services. First DWETP Quarter = 60 corresponds to the fourth quarter of 1983.

Table 3: The Effects of One Year of Community College Schooling on Displaced Workers Earnings

		High Tenure Males					High Tenure Females				
		No additional controls	Also controls for former industry	Also controls for industry and gpa	Controls for industry, gpa, and noncredit	Controls for industry, gpa, and degrees	No additional controls	Also controls for former industry	Also controls for industry and gpa	Controls for industry, gpa, and noncredit	Controls for industry, gpa, and degrees
DWEPT prior to displacement	Coefficient	-118.143	-121.389	-166.596	-156.002	-190.315	79.913	20.827	-46.833	-46.329	5.248
	Stan. Err.	30.834	30.618	35.088	35.119	44.648	34.153	33.673	38.484	38.682	56.300
DWEPT after displacement	Coefficient	-342.499	-346.578	-357.639	-359.360	-402.398	-271.776	-270.756	-292.177	-283.067	-238.353
	Stan. Err.	26.218	26.037	26.492	74.504	34.897	30.179	29.694	32.211	32.418	41.996
post DWETP - constant term	Coefficient	-123.901	-140.249	-275.008	-276.892	-294.438	-85.487	-44.820	-133.381	-136.238	-94.932
	Stan. Err.	40.392	40.134	43.968	44.019	52.533	48.869	48.047	52.486	52.655	67.909
post DWETP- linear trend term	Coefficient	30.689	31.239	40.383	40.350	50.827	37.897	37.480	38.083	37.777	34.912
	Stan. Err.	5.860	5.821	6.468	6.472	7.574	7.310	7.182	7.908	7.924	10.082
post DWETP- quadratic term	Coefficient	-0.449	-0.398	-0.790	-0.784	-1.139	-1.061	-1.042	-1.097	-1.092	-1.004
	Stan. Err.	0.207	0.205	0.229	0.229	0.259	0.268	0.263	0.289	0.290	0.355

Table 4: Impacts of Classroom Instruction on Predisplacement Earnings

		High Tenure Males	High Tenure Females	Low-Tenure Males
4 to 6 years Prior to Displacement	Coefficent			
	Stan. Error			
T0	Coefficent	5.499	14.791	-7.071
	Stan. Error	4.567	6.232	9.030
T0*School	Coefficent	0.561	-13.210	16.381
	Stan. Error	4.194	5.480	8.182
T0*Job Search	Coefficent	16.724	25.228	-18.963
	Stan. Error	6.871	9.481	18.024
T0*Career Dev.	Coefficent	-13.137	4.302	56.128
	Stan. Error	5.367	8.542	13.678
T0*Repair	Coefficent	2.089	-82.678	-0.359
	Stan. Error	1.256	21.024	2.576
T0*AA/AS Degree	Coefficent	-0.869	-17.994	0.623
	Stan. Error	7.867	10.767	14.827
T0*AAS Degree	Coefficent	29.120	-10.586	-48.569
	Stan. Error	10.883	15.778	26.910
T0*Certificate	Coefficent	-15.876	19.721	3.378
	Stan. Error	10.226	14.714	21.098
T0*gpa	Coefficent	1.109	2.386	0.011
	Stan. Error	1.747	2.311	4.024
1 to 3 years Prior to Displacement	Coefficent			
	Stan. Error			
T1*School	Coefficent	-47.847	-9.209	-12.981
	Stan. Error	13.954	18.373	27.139
T1sq*School	Coefficent	4.721	0.763	0.424
	Stan. Error	1.392	1.830	2.619
T1*Job Search	Coefficent	17.515	4.236	-88.900
	Stan. Error	23.028	32.030	58.978
T1sq*Job Search	Coefficent	-2.962	-2.349	6.932
	Stan. Error	2.280	3.195	5.683
T1*Career Dev.	Coefficent	-24.779	-69.088	166.539
	Stan. Error	17.968	28.675	45.270
T1sq*Career Dev.	Coefficent	0.473	4.268	-14.639
	Stan. Error	1.790	2.843	4.382
T1*Repair	Coefficent	11.132	-167.301	20.616
	Stan. Error	4.258	69.749	8.575
T1sq*Repair	Coefficent	-0.601	11.469	-2.091
	Stan. Error	0.426	6.331	0.844
T1*AA/AS Degree	Coefficent	39.900	-71.575	12.756
	Stan. Error	26.176	35.979	49.231
T1sq*AA/AS Degree	Coefficent	-3.285	7.518	-4.420
	Stan. Error	2.612	3.583	4.759
T1*AAS Degree	Coefficent	-24.931	-99.900	292.492
	Stan. Error	36.469	53.080	89.119
T1sq*AAS Degree	Coefficent	-0.193	4.504	-22.826
	Stan. Error	3.627	5.267	8.779
T1*Certificate	Coefficent	-98.023	106.002	62.921
	Stan. Error	34.218	49.362	69.366
T1sq*Certificate	Coefficent	6.243	-12.195	-2.800
	Stan. Error	3.402	4.881	6.744
T1*gpa	Coefficent	13.411	9.704	22.521
	Stan. Error	5.861	7.751	13.250
T1sq*gpa	Coefficent	-1.010	-0.316	-1.326
	Stan. Error	0.582	0.768	1.284
F-test for joint significance	Coefficent	6.5702384	6.0233022	4.1364577
	Stan. Error	p value < .0001	p value < .0001	p value < .0001

Notes: T0 equals the number of quarters between the current quarter and the quarter 6 years prior to displacement if observation falls between 3 and 6 years prior to displacement and zero otherwise. T1 equals the difference between the current quarter and the quarter three years prior to separation if observation falls between the displacement quarter and 3 years prior to displacement.

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