

Working Paper Series

The Return from Community College Schooling for Displaced Workers

Louis S. Jacobson, Robert J. LaLonde and
Daniel G. Sullivan

Working Papers Series
Macroeconomic Issues
Research Department
Federal Reserve Bank of Chicago
December 1997 (WP-97-16)

FEDERAL RESERVE BANK
OF CHICAGO

The Returns from Community College Schooling for Displaced Workers

Louis S. Jacobson
Westat Inc.

Robert J. LaLonde
Michigan State University
and
N.B.E.R.

and

Daniel G. Sullivan
Federal Reserve Bank of Chicago

December 1997

The authors thank the Community College of Allegheny County, the Pennsylvania Department of Labor, and Allegheny County Planning Department and the Washington State Training and Education Coordinating Board for providing the data and technical assistance for this project. We also have benefited from comments by John Ham, James Heckman, Guido Imbens, and participants at the HSFR Conference on Unemployment and Labor Market Policy, in Sweden, and workshops at Chicago, Princeton, Northwestern, the National Bureau of Economic Research and the Federal Reserve Bank of Chicago. Some of this research was funded under U.S. Department of Labor ETA contract 99-0-0584-75-055-01. The views expressed in this paper are solely those of the authors and do not necessarily represent the views of the Federal Reserve Bank of Chicago or the Federal Reserve System.

The Returns to Schooling for Displaced Workers

Abstract

Recent studies have shown that displaced workers experience substantial long-term earnings losses. As these losses have become increasingly apparent, and the incidence of displacement has become more widely spread among industrial sectors, policy makers have expanded resources for retraining programs. This paper adds to the relatively sparse literature on the returns to schooling acquired by adults, by analyzing the impact of community college schooling acquired by displaced workers around the time of their job losses. Using administrative data from two states, we find that the equivalent of a year of schooling raised displaced workers' long-term earnings by about 2 to 5 percent. Although significant if not somewhat smaller than conventional estimates of the returns to schooling, these gains from schooling usually are not enough to offset the permanently lower earnings associated with displacement. However, these average impacts mask substantial heterogeneity in the impacts of different types of schooling. Skills acquired from more technically oriented vocational and academic math and science courses have large returns, whereas most other types of courses are associated with zero or sometimes negative returns.

Louis S. Jacobson
Westat Inc.
1650 Research Road
Rockville, MD 20850-3129

Robert J. LaLonde
Department of Economics
101 Marshall Hall
Michigan State University
East Lansing, MI 48824

Daniel G. Sullivan
Economic Research
Federal Reserve Bank of Chicago
230 S. LaSalle St.
Chicago, IL 60604

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, 1993a, Schoeni, 1996). 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 resources toward retraining these workers (Farber, 1993). In the U.S., policy makers during both the Reagan and Clinton Administrations expanded public expenditures on retraining services. And in Europe some analysts believe expanded retraining to be a promising way to reduce chronically high unemployment rates (Lindbeck, 1993; Layard, Nickell, Jackman, 1994; and Saint-Paul, 1994).

Heightened support for retraining has occurred even though there is relatively little evidence about its likely impacts.¹ Evaluations of retraining programs for displaced workers provide evidence not only on how such programs affect the labor market prospects of this group, but also provide an opportunity to measure the returns to schooling received by prime-aged adults. Displaced workers whether they are participants in a government program or enroll in training on their own often receive this instruction at a local community college. However, these individuals differ from most community college students as they are considerably older and in particular older than individuals who are the subject of other studies of the returns of community college schooling (Kane and Rouse,

¹ Much of our knowledge about how training affects displaced workers comes from several demonstration programs conducted during the 1980s summarized by 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).

1993; Leigh and Gill, 1997).

This paper adds to the relatively sparse literature on retraining programs for displaced workers, and on the returns to schooling received by adults by analyzing the long-term effects (i) of subsidized community college schooling acquired during the mid-1980s by displaced workers who were residents of Allegheny County, (Pittsburgh) Pennsylvania, and (ii) of unsubsidized community college schooling acquired during the early 1990s by displaced workers in Washington State. We constructed the samples used in this study from state administrative earnings records and community college transcripts. Because we assembled our sample from administrative data, it includes a large number of earnings histories that cover substantial periods of time before workers' displacements as well as during the "follow-up" period following schooling. In addition, the transcript records provide unusually detailed information about the type, intensity, and duration of schooling. A benefit of these panel data is that we can estimate the gains from schooling and how these gains evolve over time using a "fixed-effect" type estimator (Angrist and Newey, 1991). Therefore, unlike conventional "cross-sectional" studies of the return to schooling, our estimates control for unobserved differences in ability that affect earnings and the decision to acquire retraining following displacement.

We find that community college schooling affects displaced workers' earnings in two ways: First, during the time that displaced workers are enrolled in courses their earnings are lower the greater the number of courses that they are currently enrolled in. Second, in the post schooling period, schooling is associated with modestly increased earnings. However, this overall gain masks substantially different returns among the courses taken. We find that credits completed in courses teaching quantitative or more technically oriented vocational subject matter generates positive and

sometimes large earnings gains. By contrast, courses teaching non-quantitative or nontechnical vocational skills are associated with lower earnings. Our results indicate that displaced workers who enrolled in courses offering largely nontechnical subject matter would usually have been better off simply returning to the work force and working.

The plan for the remainder of the paper is as follows: Section II discusses the role played by community colleges in retraining programs for displaced workers, and then describes the data and community college schooling analyzed in this paper. Section III presents our econometric model for estimating the effects of community college schooling. Section IV presents our estimates and some concluding remarks follow in Section V.

II. Schooling and Retraining for Displaced Workers

A. The Role of Community Colleges

The prominent role played by community or “junior” colleges in worker retraining policy motivates our interest in the impact of their courses and programs on the long-term earnings of adult workers. This role has grown during the last two decades as these institutions give increased priority to vocational training. Although community colleges continue to offer academically oriented courses, they have expanded their selection of vocational programs to include subject areas traditionally taught in proprietary schools and vocational institutes (Freeman, 1974; Grubb, 1993). Course offerings are in areas as diverse as computer information systems, food preparation and management, real estate, word processing, respiratory therapy, the construction trades, 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

providers for public sector-sponsored retraining programs. Funding from several federal programs has supported community college services for the displaced workers. These programs include those funded under the Trade Adjustment Assistance Act (TAA), the Economically Displaced Worker Adjustment Act (EDWAA), and the 1972 Higher Education Amendments (Pell Grants).² Community colleges receiving EDWAA funding sometimes design special non-credit courses that are supposed to address the problems faced by displaced workers. For example, these programs may include components that teach job search skills and help displaced workers choose new careers. But EDWAA also funds participants enrolled in regular community college courses. In these programs,

² Established by Congress in 1962 and amended several times since then, the TAA program provides extended unemployment insurance benefits to unemployed workers who participate in retraining and who the Secretary of Labor determines have lost their former jobs as a result of foreign trade. Recent statistics indicate that approximately 40 percent of those enrolled in TAA sponsored job-skill training, and 73 percent of those enrolled in TAA sponsored general education, received these services at community or four year colleges (Corson, Decker, Gleason, and Nicholson, 1993).

In 1988, Congress established EDWAA as an amendment to Title III of the Job Training Partnership Act. EDWAA provides retraining services without extended unemployment benefits to permanently unemployed workers. One important change that it made in the existing legislation was to require that at least one-half of its funds be spent on retraining services, instead of job search and other related employment services. Eligibility for EDWAA services extends to all permanently unemployed persons. Until recently, funding levels have limited annual participation in EDWAA programs to about 120,000 workers, at a cost of approximately \$200 million. Since fiscal year 1994, expenditures have exceeded \$1 billion annually.

Although it was not designed specifically for displaced workers, the Pell Grant program has provided relatively low income displaced workers with grants to cover the cost of retraining and schooling. Until recently, the program included a provision in its rules that allowed administrators to waive the normal limit on an applicant's assets and base their eligibility on current instead of the previous years income. As a result of this provision, displaced workers were eligible 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 percent of displaced Pell grantees attended proprietary schools, another 10 percent attended four year colleges, and the remaining 60 percent enrolled in community colleges.

displaced workers take classes with younger non-displaced workers and full-time students. Because of the important role that community college courses play in retraining initiatives, this paper's objective is to examine whether displaced workers benefit from this schooling and the promise that both increased and longer participation holds for reducing their earnings losses.

B. Data Sources

The empirical analysis presented in this paper is based on a data set constructed by matching displaced workers' state unemployment insurance earnings records with their community college transcripts. The unemployment insurance earnings records provide information about individuals' quarterly earnings records, their birth year and gender, their quarter of separation, tenure at separation, and for each calendar year their primary employer's 4-digit SIC code, location, and level of employment. From the community colleges, we obtained machine readable records of enrollees' demographic characteristics, listings of the credit and noncredit courses that they enrolled in, and the grades that they received in courses taken for credit.

For most individuals, including those in our comparison samples of displaced workers who did not enroll in community college courses, we have an unusually long earnings panel both prior to and following their displacements and their community college schooling experience. We can follow some workers for up to 10 years following their schooling in the Pittsburgh sample, and for up to 5 years following their schooling in the larger Washington State sample. Previous evaluations of economically disadvantaged persons indicate that a panel with these characteristics is potentially crucial for identifying the impact of training (Ashenfelter and Card, 1985; Heckman and Hotz, 1989). (The Appendix provides further details about the construction of the sample.)

1. The Pittsburgh Sample

Our first sample consists of individuals displaced from jobs during the early 1980s in Allegheny County, Pennsylvania. This county has a population of approximately 2.4 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's unemployment rate stood at 16.2 percent. At that time, federal and state authorities provided few direct resources for retraining displaced workers. Therefore, in response to the worsening economic conditions, the county government established the Displaced Workers Educational Training Program (DWETP). Local authorities in turn subcontracted with Community College of Allegheny County (CCAC) to operate the program. CCAC provided recruiting and counseling services, developed relevant curricula, and encouraged participants to enroll and complete regular community college courses.

Enrollment in DWETP took place during several "windows" between April 1983 through August 1985. During these times, county residents who (i) were without full-time work, (ii) had been laid off from their jobs, and (iii) 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, as workers could leave CCAC for a semester or two and still return to the program and receive subsidized tuition.

Our Pittsburgh sample includes more than 3,200 DWETP participants who were permanently

displaced between 1978 and 1985 from a job that had lasted 3 or more years. Of this group approximately 1,000 persons were “dropouts” in that they enrolled in but did not complete at least one community college course. In addition, we also have a sample of more than 3,500 similar displaced workers who never enrolled in DWETP. We excluded “low-tenure” displaced workers from the sample because their characteristics usually differ from the profile of displaced workers targeted by various public policies. We allowed for a wide window of displacement so that the sample could include individuals 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. Finally, to ensure that our sample included workers who had a history of strong attachment to Pennsylvania’s workforce, we excluded persons who had two or more consecutive calendar years without earnings between 1974 and 1992, except during the periods surrounding the 1982-83 recession and their participation in DWETP.

2. The Washington State Sample

Our second sample consists of individuals displaced from jobs during the early 1990s throughout Washington State. Starting in 1990 the state’s economy worsened along with the national economy and its unemployment rate rose. Several sectors were especially hard hit including the aerospace and wood products industries. Although the state legislature enacted a special program in 1993 to provide education and retraining services to displaced workers through the state’s community colleges, there is as yet sufficient follow-up data available to evaluate the program’s benefits.³

³ Our sample includes 3,300 displaced workers who enrolled in community college courses as part of the state’s ESHB 1988 program referenced in the text. However, because individuals did not begin enrolling in the program until early 1994, we have at most seven quarters follow-up earnings

However, during this period many of the state's displaced workers attended community college on their own. By merging individuals' machine readable transcripts from the state's community colleges with their unemployment insurance (UI) earnings records, we constructed a sample containing nearly 26,000 workers who were displaced between 1990 and 1994 and who enrolled in at least one community college course around the time of their job losses. This group includes approximately 9,000 "dropouts" who enrolled in but never completed any community college courses. Our sample also includes an additional 64,000 workers who were displaced during the same period, but never enrolled in any community college courses.

As with the Pittsburgh sample, we excluded from the Washington State sample workers (i) who were not consistently attached to Washington State's wage and salary work force, and (ii) who had accumulated less than 3 years tenure with their former employer when displaced. There are, however, two important differences between the two samples. First, the displaced workers in the Washington State sample acquired schooling without the benefits and subsidies available from special programs such as DWETP. Second, although the Washington State sample is substantially larger, because it covers workers obtaining schooling during the 1990s the follow-up period is much shorter.

C. Characteristics of Displaced Workers.

The characteristics of displaced workers who enroll in community college classes are similar to their counterparts who never enroll in such classes. As shown by Table 1, displaced workers in both the Pittsburgh and Washington State sample are on average in their mid to late 30s, and

records and for most participants only a few quarters of follow-up earnings records.

substantial fractions of both groups were displaced from outside the durable goods industries. As might be expected from a sample covering 1990s displacements this fraction is especially large for the Washington State sample (Farber, 1996). Because of the high representation of steel workers in the Pittsburgh sample, the fraction of female displaced workers is substantially lower than in the Washington State sample. Finally, in both samples the quarter of displacement is approximately the same for enrollees, dropouts, and non-trainees as are their earnings the years prior to their job losses.

There are differences among the enrollees, dropouts, and non-trainees in both the Pittsburgh and Washington State samples. As might be expected, participants tend to be younger and are more likely to be female. Further, they are more likely displaced from durable goods industries. This difference is especially striking among participants in the Pittsburgh sample. Overall in both samples, the characteristics of enrollees and non-trainees differ by more than the characteristics of enrollees and dropouts. This observation leads us to use the dropouts as an alternative comparison group in our empirical work.

As shown by Panel B of Table 1, participants enrolled in and completed on average approximately 20 to 30 credits.⁴ One of the most striking differences between the genders' schooling is in the distributions of courses teaching more technically oriented vocational skills or science and math subjects. In both samples, a larger share of the total credits completed by females were in less technically oriented subjects.

Before discussing our econometric model of earnings and schooling, we examine the

⁴ In the Pittsburgh sample the local community college operated under a semester system. Therefore a year "worth" of schooling was equal to 30 credits. By contrast in Washington State the community colleges operated under a quarter system. As a result, a year "worth" of schooling was equal to 45 credits.

quarterly earnings of the enrollees, dropouts, and non-trainees in our two samples. As shown by Figures 1a and 1b, participants' real (1995 dollars) quarterly earnings declined during the three year period before their displacements. This evidence of pre-displacement earnings declines has been reported elsewhere (Jacobson, and LaLonde, and Sullivan, 1993a). Their earnings fall sharply after their displacements. Further, in both samples displaced workers' quarterly earnings remain \$1,000 - \$2,000 below their peak predisplacement levels. This pattern is particularly pronounced for the enrollees and dropouts and is less so for the non-trainees, especially in the Pittsburgh sample.

Of course there are several reasons why earnings comparisons among these groups do not tell us whether community college schooling was effective. Our econometric model developed below and the empirical work that follows addresses some of these issues.

III. The Econometric Model

To measure the returns from community college schooling for displaced workers, we have considered and estimated several statistical models of the following general form:

$$(1) y_{it} = X_{it}\beta + \delta_{it}(s_i, z_i) + \tau_{it}(c_{it}, f_i, l_i, z_i) + \alpha_i + \gamma_t + \varepsilon_{it}.$$

According to (1), workers' earnings, y_{it} , depend on observed characteristics that vary with time, $X_{it}\beta$; characteristics of their displacement $\delta_{it}(s_i, z_i)$; the community college schooling that they obtained, $\tau_{it}(c_{it}, f_i, l_i, z_i)$; unobserved individual fixed-effects; time effects; and an independent and identically distributed disturbance. In this study, the observed characteristics are a fourth order polynomial in age and these terms' interactions with a dummy variable indicating a worker's gender. Including such controls is important because even among the population of displaced workers those who enroll in community college courses and complete more classes tend to be younger and thus even without additional schooling would have more steeply rising earnings

profiles.

Our previous research documents the temporal pattern of displacement's impacts on workers' earnings (Jacobson, LaLonde, and Sullivan, 1993). These earnings' impacts depend on the time since (or until) the date of displacement, s_i , and on worker characteristics, z_i . Accordingly, we define the earnings impact of displacement during quarter t as follows:

$$\delta_{it}(s_i, z_i) = \delta_{t-s_i} = \delta_k,$$

where $k = t - s_i$. Letting $D^{k_{it}} = 1$ if worker i was displaced at time $t - k$, we write the displacement effect as

$$\delta_{it}(s_i, z_i) = \sum \delta_k D^{k_{it}}$$

In our empirical work, we allow k to range from -12, the twelfth quarter prior to job loss, to 67, which is when the sample ends for some individuals in the Pittsburgh sample. (In the Washington State sample, k ranges up to 20.)

In order to account for the possibility that the earnings impact of displacement is correlated with whether a worker receives community college schooling, we also allow these displacement effects to vary by workers' characteristics. Instead of interacting these characteristics with the vector of displacement indicators, $D^{k_{it}}$, we have found that a more parsimonious specification adequately accounts for differences between the average pattern of displacement effects, δ_k , and the pattern for workers with characteristics, z_i . We summarize this departure using four variables defined as follows:

$$F^1_{it} = t - (s_i - 12), \text{ if } s_i - 12 \leq t \leq s_i \text{ and is equal to 0 otherwise;}$$

$$F^2_{it} = (F^1_{it})^2;$$

$$F^3_{it} = 1 \text{ if } s_i < t, \text{ and is equal to 0 otherwise;}$$

$F^4_{it} = 1/(t - s)$, if $s < t$, and is equal to 0 otherwise.

This specification forces the displacement effects for workers with characteristics z_i to differ from the average effect according to a quadratic function during the twelve quarters prior to displacement; and according to the inverse of the time since displacement during the post-displacement period. The coefficient associated with the F^3_{it} term indicates the departure from the average long-term impact of displacement for workers with characteristics z_i . Therefore, the displacement effect in our econometric model becomes:

$$(2) \delta_{it}(s_i, z_i) = \sum \delta_x D^*_{it} + F^1_{it}z_i\phi_1 + F^2_{it}z_i\phi_2 + F^3_{it}z_i\phi_3 + F^4_{it}z_i\phi_4.$$

The most important part of the model is our specification of the “schooling effect,” $\tau_{it}(c_{it}, f_i, l_i, z_i)$. We model this effect as a function of the amount of schooling completed measured in credit hours, c_{it} ; the first and last quarters that worker i was enrolled in school, f_i and l_i ; and the workers’ characteristics. We expect that schooling may cause workers to forego earnings during the period when workers are enrolled in school, and that their earnings loss would depend on the number of credits taken. However, it seems reasonable to allow for economies of scale in classes taken during a semester or quarter. Therefore, we specify the impact of schooling on earnings while displaced workers are enrolled in school as:

$$(3a) \tau_{it}(c_{it}, f_i, l_i, z_i) = \psi + \kappa c_{it}, \text{ if } f_i \leq t \leq l_i,$$

and where c_{it} is the number of credits completed during the current quarter. In our empirical work below we also allow these parameters to vary according to workers’ characteristics.

During the period after workers leave their community college programs, we find that there is a transition period associated with their schooling in which the schooling effects are usually substantially lower (and often negative) in the short-term than they are in the long-term. This

finding underscores the importance of using long follow-up periods when evaluating education and training programs for adults. To capture this temporal pattern in schooling effects we specify the post-schooling effects as follows:

$$(3b) \tau_{it}(c_{it}, f_i, l_i, z_i) = \tau_0 + \tau_1 c_{it} + \tau_2 [1/(t - l_i)] + \tau_3 [1/(t - l_i)] c_{it} \text{ if } l_i < t.$$

This specification allows schooling to affect earnings regardless of the number of credits completed through the parameters τ_0 and τ_2 . During the first quarter after enrollees complete their last class this impact is equal to the sum of τ_0 and τ_2 . Because the term $[1/(t - l_i)]$ becomes small with the passage of time since workers last enrolled in community college courses, over the long-term, this impact becomes just τ_0 .

We measure the impact of completing additional credits in the short-term by $\{\tau_1 + \tau_3[1/(t - l_i)]\} c_{it}$. Similarly, the long-term impact of additional credits is captured by the parameter, τ_1 . In our empirical work below we also allow each of these parameters to vary according to workers' characteristics. Such interactions allow us to measure the extent of heterogeneity in the schooling effects.

Our analysis of the data also revealed the importance of another extension of our model. In equation (3b), we treat each credit without regard to the type of course completed. Because our data contains detailed information about these classes' content, we can observe how the schooling effects vary depending on the subject matter of the classes. Accordingly, we also extend our model and treat c_{it} as a vector denoting different types of completed credits. In our simplest extension of the model, we divided the completed courses into two types: (i) academic science and math courses or courses teaching more technically oriented vocational subject matter; and (ii) all other vocational and academic classes including those in the social sciences and humanities. We also estimated models

that further disaggregated these categories of courses.

IV. The Impact of Community College Schooling

The estimated schooling effects generated from our econometric framework differ from those generated from a conventional training evaluation framework, because they use another source of variation in the data. Instead of relying on differences between trainees' and non-trainees' earnings, our framework uses the information on differences in the number of credits completed among trainees who complete community college courses. By relying on this approach, we circumvent one problem common to training program evaluations: namely that those in the comparison group did not "select" themselves into training. In our case, the reported impacts of "training" use the variation in earnings of individuals who self-selected themselves into community college schooling and completed different numbers of courses. In effect, the training participants serve as their own comparison group. Indeed, the schooling effects in our model are identified even without a conventional comparison group such as a sample of non-trainees or program dropouts.

A. Conventional Estimates of the Training Effect

To highlight the differences between our approach to estimating the impact of community college schooling and the conventional approach used to estimate training effects, we present the results from a more conventional analysis. In such an analysis, the impact of training is the estimated coefficient associated with a dummy variable indicating whether the individual received training. Usually, no information is available or no account is taken of the quantity or intensity of the training received. Therefore, the conventional estimate of the training effect is the difference between the trainees' regression-adjusted earnings and the earnings of a sample of non-trainees who

serve as a comparison group. When sufficient panel data is available as in our case, analysts often employ a fixed effects estimator.

As shown by Table 2, all but two of the conventional estimates of the long-term impacts of training are positive and the training effect increases with time since leaving school. Further, in every case the training effect is initially negative. However, the table reveals that these results depend somewhat on the sample studied and whether we use the non-trainees or the dropouts as a comparison group. When using the Pittsburgh sample, the estimates of the long-term training effect are opposite in sign depending on which comparison group we use. When using the Washington State sample the estimates generated from the two comparison groups are more similar although the gap between them is large relative to the estimated standard errors. Clearly, in at least one case or the other, the underlying econometric model is misspecified.

The negative short term impacts of training is shared by the four sets of estimates that distinguish between short and long term effects. Indeed, even when estimating all the parameters in (3), we consistently find this result throughout this study. The impact of training during the k th quarter after workers complete their last course is measured as the sum of the "Long-term effect" plus $1/k$ times the "First quarter loss." For example, as shown by Panel A, column (4), the predicted training effect 4 quarters after leaving school is $-\$67$ (or $164 + (0.25 \cdot -923)$). This result suggests that there is an adjustment period following the completion of community college courses that is associated with modest earnings losses. But over time, trainees earnings approach and in some cases apparently surpass the earnings of non-trainees. This result underscores the importance have having several years of post-schooling earnings data when evaluating the impacts of retraining for this population of workers.

Despite, the negative short-term effects of training, the largest long-term impacts of retraining are comparable if not somewhat larger than the returns widely reported in the schooling literature. For example, the long-term impact of \$284 reported in Panel B for the Washington sample is based on a sample of trainees that completed on average approximately one-half year of schooling (see Table 1) . Given that their post-displacement earnings average approximately \$5,500 per quarter, this impact is comparable to more than a 10 percent “return” to schooling.

As a result of exploiting our data’s information on the amount of schooling acquired while enrolled in a local community college, we believe that such conventional estimates are too large. The likely problem is that the underlying econometric model does not adequately adjust for differences between trainees’ and non-trainees’ characteristics that affect the rate of growth in their earnings following their displacements. Those individuals who were sufficiently motivated to complete community college courses would likely have more rapidly growing earnings after their displacements even without schooling.

B. Estimates of the Gains (Losses) from Additional Schooling

1. In-School Effects on Earnings

Before presenting the corresponding results based on our econometric framework, we first examine the impact of schooling on displaced workers earnings while in school. One of the most consistent findings from our analysis of both the Pittsburgh and Washington State samples is that displaced workers’ earnings are lower while they are enrolled in community college classes. More importantly, this earnings deficit is larger the more classes that a student takes during an academic quarter. As shown by the first rows of Panels A and B in Table 3, enrolling and completing community college courses is associated with a \$150 to \$300 earnings loss per completed credit

during that academic quarter (semester). These losses are larger in the Pittsburgh sample and for males. Moreover, these findings are extremely robust to alternative statistical specifications, the types of courses taken, and the worker's demographic and labor market characteristics. Further, in results not shown in the table, we find that this earnings penalty becomes larger as displaced workers accumulate more community college credits.

These results have a natural interpretation in the context of the human capital model. If schooling is an investment, the in-school earnings losses represent part of the forgone earnings cost of this investment. Such an interpretation indicates that the foregone earnings costs of retraining displaced workers are substantial and likely larger than the costs associated with providing the training. For example, if the foregone earnings costs of acquiring additional schooling averages \$200 per completed credit, then a displaced worker who acquired two years of schooling or 90 (quarter) credits would earn on average \$18,000 less than an otherwise observationally equivalent worker who did not acquire any schooling during the same period. Unemployment insurance benefits might offset approximately one-third of these losses. However, the remaining in-school losses are still sufficiently large so that even if the direct costs of retraining are completely subsidized, any benefit from retraining must offset substantial private losses in order for it to have been a worthwhile investment for the individual.

An alternative explanation suggests that we have overstated the foregone earnings costs associated with schooling. Instead, the estimated in-school earnings loss may arise because displaced workers who do not receive any job offers complete more schooling. If displaced workers adopt the strategy of continuing to take courses until they receive a job offer, then in our framework those who are not lucky enough to return to work quickly after their job losses, compensate to some extent

for the bad luck associated with their prolonged unemployment by making productive investments in themselves at a time when it is inexpensive to do so. This investment has a positive return and in the long-term such displaced workers may end up earning more than their counterparts who returned to work quickly. However, as we shall show below this payoff sometimes is sufficient to compensate them for their substantial earnings losses while unemployed.

2. Post-Schooling Effects on Earnings

As indicated in Section III, estimates based on our econometric model reveal that community college schooling is associated with lower earnings during the first few quarters after displaced workers complete their last course, but with long term earnings gains. These results are not sensitive to which comparison group we use in the analysis, although they do depend on a worker's demographic characteristics.

Before presenting these estimate it is important to note that our estimated impacts of community college schooling for the Pittsburgh and the Washington State samples are not directly comparable because CCAC (Pittsburgh) operates on a semester system, whereas the Washington State community colleges operate on a quarter system. In terms of class time, this difference means that a Washington State credit is equal to approximately two-thirds of a Pittsburgh credit.

As shown by Table 3, displaced workers in the Pittsburgh sample experienced lower earnings during the first quarter after completing their last course that amounted to approximately \$30 per credit. However, in the long-term they experienced an approximately \$3 per credit increase in their quarterly earnings. Together, however, the "First quarter loss" and "Long-term effect" estimates indicate that the impact of schooling is less than zero for up to about 10 quarters after displaced workers' complete their last course. The impacts of schooling are larger in the Washington State

sample. Initially, enrollees' earnings were approximately \$8 per credit less (ie. $7.2 + -15.2$) than if they had not enrolled in any courses. However, in the longer-term their quarterly earnings gains amount to approximately \$7 per completed credit. For this sample the cross over point occurs after only two quarters. These results suggest an adjustment process of varying length after schooling so that the gains from schooling take time to manifest themselves and should not be expected until several periods after leaving school.

To compare our estimates of the long-term impact of community college schooling on earnings to the "returns" reported in the schooling literature, we multiply each estimate by the number of credits completed when a student is enrolled full-time during the academic year, and then divide this product by displaced workers' average quarterly earnings at the end of the sample period. Based on these computations, we expect that completing a year worth of additional schooling is associated with a 1.5 percent rise in earnings in Pittsburgh sample and a 5 percent rise in earnings in the Washington State sample. These gains appear to somewhat lower than returns reported in the schooling literature generally, and the community college literature, in particular (Kane and Rouse, 1993). Further, as we expected, both of these figures are smaller than the estimated returns to schooling implied by the conventional estimates of the training effect.

For the purposes of evaluating how well community college schooling helped displaced workers offset some of the long-term losses associated with their displacements, these percentage gains overstate the gains for the average enrollee. In the Pittsburgh sample where tuition and other costs were subsidized, enrollees completed on average 0.8 of a year worth of credits, whereas in the Washington State sample enrollees completed on average 0.5 of a year worth of credits. Therefore, the retraining received in community colleges raised participants' long-term earnings by

approximately 1 to 3 percent per year. As other research has shown, displaced workers who had accumulated more than a few years of tenure with their previous employer would expect to incur substantially larger permanent earnings losses (Jacobson, LaLonde, and Sullivan, 1993; Ruhm, 1991). Consequently, even completing a year worth of community college credits offsets only a fraction of the losses associated with displacement.

3. Heterogeneity in Schooling

The foregoing analysis suggests that retraining has a very modest impact on displaced workers' earnings. But a closer examination of the community college transcript data reveals that we obtain this result because displaced workers enroll in many classes that are associated with essentially no earnings gains or additional earnings losses. To document the substantial heterogeneity in the earnings impacts of different courses, we classified each community college course in the two samples into the nine categories described in Appendix Table A. We then aggregated these categories into two groups: "Group 1" courses taught more technically oriented vocational and academic math and science subject matter, whereas "Group 2," courses included less technically oriented vocational classes, as well as all other academic classes.

To estimate the impact of each category of courses, we modified our econometric model so that completed Group 1 and Group 2 credits each have separate "In-school," "First Quarter Loss," and "Long-term" effects in the estimation. We also can estimate an analogous version of our model that allows for separate effects for the nine categories of courses. Finally, because our results are not sensitive to which comparison group we use, we also combine the samples of non-trainees and dropouts for this analysis.

As shown by Panel A of Table 4, Group 1 courses are associated with substantial long-

term earnings gains, whereas completing Group 2 courses makes displaced workers worse off. The four sets of results obtained for Group 1 courses among males and females in the two samples are similar, although the impact of such courses on females in the Pittsburgh sample are especially large. These estimates are very large compared with estimates of the returns to formal schooling reported in the schooling literature. For example, if a male displaced worker completed 45 Group 1 credits (ie, one academic year) in Washington State community colleges, we would estimate that his or her long-term quarterly earnings would be raised by more than \$700 per quarter. This increase would be equal to approximately 15 percent of post-displacement earnings. Because their estimated impacts per completed credit are larger and their post-displacement earnings are lower, the percentage increase in the earnings of females who complete Group 1 courses is even larger in both the Pittsburgh and Washington State samples.

There are several reasons why the foregoing example might convey a misleading impression as to how Group 1 courses affected the earnings of displaced workers who attended CCAC and Washington State community colleges. First, as shown by Table 1, the typical displaced worker who enrolled in community college courses completed less than 15 Group 1 credits. Second, workers who enrolled in Group 1 credits also usually completed Group 2 credits. Often the community college requires such courses as part of a particular program that teaches largely Group 1 skills. As indicated by Table 4, however, Group 2 courses are associated with lower earnings. Therefore, if the male displaced worker who completed 45 Group 1 credits also completed 45 Group 2 credits, we expect that the earnings gain associated with the Group 1 courses be offset by a \$360 (ie. $-\$8 * 45$) earnings loss associated with the completed Group 2 courses. Under these circumstances, the total earnings gain generated from completing two years worth of community

college credits would amount to 7 percent or 3.5 percent per year of schooling. Indeed, as shown by Table 1, male displaced workers complete approximately equal numbers of Group 1 and Group 2 credits.

It is important to recognize that the sharply differing returns to Group 1 and Group 2 credits are not the result of heterogeneity among individuals who complete such courses. By design, we identify the Group 1 effects from variation in the number of Group 1 credits completed among those individuals who complete such credits. To make this point empirically, we reestimated our model after excluding displaced workers who completed only Group 2 courses or less than three Group 1 courses. We obtained essentially the same results for both the impacts of Group 1 and Group 2 courses when we used this subsample of enrollees.

To explore the source of the large returns to Group 1 credits, we reestimated our statistical model to obtain estimates of the impact of completed credits in each of the nine course categories described above. As shown by Panel B of Table 4, it is clear that the large returns from Group 1 credits result from especially large impacts of courses in the health-related fields. Two other categories, the technical/professional vocations and academic science/math courses also sometimes generate substantial returns per completed credit. However, most of the other categories of courses usually generate small if not negative returns to schooling.

The large gains experienced by displaced workers who successfully complete courses in the health related fields are likely sufficient to offset most if not all of the earnings losses associated with their displacements. For example, supposed a female displaced worker in Washington State decided go back to school and complete a program in a health related field. Further, suppose that during the course of two years this retrainee completed 40 credits in health related courses and 50

credits more in other academic courses. The health related courses are associated with a long-term earnings gain of approximately \$1,300 per quarter (40 times \$33). As shown by the table, the returns from the academic class would depend on the mix of math and science classes compared with social science and humanities classes. However, because the impact of these types of courses is relatively small, they likely have only a slight effect on our estimate of the gains from completing majors in health related fields. Further, as shown by the table, the predicted gain associated with completing such a program in the Pittsburgh sample is even larger for females. In both cases, this gain is larger than the expected long term losses associated with displacement. Consequently, for the types of students who can successfully complete such a program, retraining can offset most if not all of the losses from displacement. However, it is worth noting that even though male displaced workers benefit from completing health-related courses, relatively few men enroll in such classes.

For most other programs, especially those that teach Group 2 skills, our results suggest that displaced workers are probably better off searching for alternative employment than seeking retraining. Indeed, the results, especially for the Pittsburgh sample, suggest that completing such courses not only does not benefit displaced workers, but in fact may cost them because of lost labor market experience or job tenure. Under this interpretation of the Group 2 results, it is not surprising that the earnings losses associated with such courses completed by males tend to be larger than those completed by females.

Another set of results in Table 4 is noteworthy because they bear on the likely success of retraining the least skilled displaced workers. As shown by Panel B of the table, returns to basic skills courses are close to zero or substantially negative. Although students who take such courses do not tend to take many community college courses, our results indicate that on average such

courses might do more material harm than good. We find these results unsurprising in light of recent findings indicating that programs providing basic skills that culminate in a GED have little impact on long-term earnings.⁵

4. Heterogeneity in Effects

We generally find that the foregoing results hold among different demographic groups. As indicated by Tables 3 and 4, both males and females experience very modest earnings gains associated with from community college schooling. But as has been reported in training evaluations of economically disadvantaged persons, women tend to benefit more than men from such retraining (LaLonde, 1995). Although this difference largely results because women are more likely than men to complete health related courses, in most categories of courses the estimated effects for females are larger than for males.

We also find that the pattern of results shown in Tables 3 and 4 hold by age and tenure of the displaced worker. Displaced workers over 40 as well as those with more than 6 years tenure with their former employers experience similar gains from completing Group 1 credits and similar losses associated with Group 2 credits. These two groups usually experience among the largest losses associated with their displacements. The one exception we found was for males over 40 in the Pittsburgh sample for whom we could find little evidence that they benefited from any form of community college schooling. On balance, however, these results suggest that community college schooling can benefit a large cross section of displaced workers, provided that they acquire more technically oriented skills.

⁵ However, these results represent only the average impact of such courses. It is possible that some students successfully complete such classes and are then in a position to pursue a program in an area that promises higher returns.

V. Conclusions

This paper shows that displaced workers who acquired training through local community colleges experienced small earnings gains. These gains were small both because the average return from individual courses tended to be modest, and because displaced workers acquired relatively little training. For example, in the Pittsburgh sample, most enrollees did not acquire even a year's worth of schooling despite having their training subsidized. More important for policy purposes is that on average the gains associated with community college schooling fall substantially short of the long-term losses associated with worker's displacements.

One reason why participants may not complete more schooling than they do is that longer participation is associated with significantly lower earnings during training. Therefore, even if programs exist that subsidize the direct costs of retraining, they may have limited impact on the duration of participation in community college schooling. One interpretation of this result is that retraining displaced workers is more costly than training the economically disadvantaged because foregone earnings losses are usually much larger.

Another cost associated with displaced workers' schooling is the adjustment period that occurs after they complete their last community college course. Although our estimates of the duration of this loss were not consistent between the samples or among demographic groups, in every case examined we found evidence that the impact of schooling at least during the first few quarters was close to zero or substantially negative. These findings underscore the importance of using long-term follow-up data to evaluate the impact of schooling for displaced workers.

In the end do displaced workers and society benefit from retraining obtained through community college? If we interpret the "While in-school" effects as foregone earnings costs of

schooling, then the answer is mixed. For example, the Washington State results indicate the foregone earnings costs associated with completing one years worth of credits (including the post-schooling adjustment period) amount to nearly \$10,000. The long-term impact on earnings of acquiring this much schooling is about 1,100 annually (or \$6 per credit times 45 credits equals \$270 per quarter). Given that enrollees in the sample are on average in their mid to late thirties, and have perhaps twenty five years over which to realize a return, these figures suggest that community college generates a real return on their investment of approximately 8 percent. This estimated return assumes of course that the long-term earnings gains persist well beyond the sample frame. But, it does not take into account any unemployment insurance benefits the displaced worker might have received while in school.

To the extent that the direct costs of providing community college schooling are subsidized in whole or as is more typical in part, the social returns to this investment are somewhat smaller. A similar calculation using estimates based on the entire Pittsburgh sample suggests that the increased earnings associated with schooling do not cover the private much less the social costs, nor as we have seen do the benefits cover the costs of many community college programs. However, estimates from both samples indicate that displaced workers able to acquire more technically oriented skills, especially in the health-related fields, experience substantial returns to their investments.

References

Ashenfelter, Orley, and Card, David (1985). "Using the Longitudinal Structure of Earnings to Estimate the Effect of Training Programs." Review of Economics and Statistics 67 (November): 648-60.

Angrist, Joshua, and Newey, Whitney (1991). "Over-Identification Tests in Earnings Functions With Fixed Effects," Journal of Business and Economic Statistics, 9(3): 317 - 323 (July)..

Bednarzik, Robert; and Jacobson, Louis (1994). "Analysis of the Dislocated Workers' Educational Training Program (DWETP): A Locally Funded Voucher-Like Program in Pittsburgh, Pennsylvania, mimeograph, Westat Inc.

Corson, Walter; Decker, Paul; Gleason; and Nicholson, Walter (1993). International Trade and Worker Dislocation: Evaluation of the Trade Adjustment Assistance Program, Final Report DOL contract No: 99-9-0805-75-071-01, Princeton: Mathematica Policy Research Inc.

Farber, Henry (1993). "The Incidence and Costs of Job Loss: 1982 - 1991," Brookings Papers on Economic Activity: Microeconomics, 1993(1): 73 - 119.

Farber, Henry (1996). "The Changing Face of Job Loss in the United States," unpublished mimeograph, Princeton University.

Freeman, Richard B. (1974). "Occupational Training In Proprietary Schools and Technical Institutes," Review of Economics and Statistics, 63:310 - 318.

Grubb, Norton (1993). "The Long-Run Effects of Proprietary Schools on Wages and Earnings: Implications For Federal Policy," Education Evaluation and Policy Analysis, 15(1): 17 - 33 (Spring).

Heckman, James, and Robb, Richard (1985). "Alternative Methods for Evaluating the Impact of Interventions." In Longitudinal Analysis of the Labor Market Data, ed. J.J. Heckman and B. Singer. Cambridge: Cambridge University Press.

Heckman James J., and Hotz, V. Joseph (1989). "Choosing Among Alternative Nonexperimental Methods for Estimating the Impact of Social Programs: The Case of Manpower Training." Journal of the American Statistical Association 84 (December): 862-74.

Jacobson, Louis S.; LaLonde, Robert J.; and Sullivan, Daniel G. (1993a). "Earnings Losses of Displaced Workers," American Economic Review, 83(4):685 - 709.

---- (1993b). The Costs of Worker Dislocation. Kalamazoo, Michigan: W.E. Upjohn Institute for Employment Research.

Kane, Thomas; and Rouse, Cecila (1993). "Labor Market Returns to Two- and Four- year College," mimeograph Princeton University.

Layard, Richard; Nickell, Stephen; and Jackman, Richard (1994). The Unemployment Crisis. Oxford: The Oxford University Press.

Leigh, Duane E. (1990). Does Training Work for Displaced Workers: A Survey of Existing Evidence, Kalamazoo, Michigan: W.E. Upjohn Institute for Employment Research.

Leigh, Duane E. and Andrew Gill (1997). "Labor Market Returns to Community Colleges: Evidence for Returning Adults," Journal of Human Resources, 32 (2): 334 - 353 (Spring).

Lindbeck, Assar (1993). Unemployment and Macroeconomics. Cambridge, Massachusetts: The MIT Press.

Ruhm, Christopher (1991), "Are Workers Permanently Scarred by Job Displacements?" American Economic Review, 81:1, 319-323.

Saint-Paul Gilles (1994). "Out in the Cold," European Economic Perspectives, London: Centre for Economic Policy Research, 4: 5-6.

Schoeni, Robert (1996). "Wage Losses of Displaced Workers," Unpublished mimeograph. Santa Monica: The Rand Corporation.

Table A

Classifications of Washington State Community College Classes

A. Quantitative or Technically Oriented Vocational courses:

Health related courses
Technical/professional courses
Technical trades
Science/math academic courses.

B. Nonquantitative Courses:

Sales/service courses
Vocational courses (not in A)
Social Science/humanities courses
Health/PE/consumer oriented courses
Basic skills education
Other courses.

Table 1

Characteristics and Schooling Completed By Displaced Workers

Panel A: Characteristics

Characteristics	Pittsburgh Sample			Washington State Sample		
	Non-trainees (1)	Dropouts (2)	Enrollees (3)	Non-trainees (4)	Dropouts (5)	Enrollees (6)
Female	0.25 (0.44)	0.20 (0.40)	0.22 (0.42)	0.38 (0.48)	0.48 (0.50)	0.51 (0.50)
Age	37.1 (9.2)	35.7 (8.3)	34.8 (7.7)	39.7 (9.3)	38.8 (9.1)	36.8 (9.0)
Manufact.	0.49 (0.50)	0.71 (0.45)	0.72 (0.45)	0.30 (0.46)	0.31 (0.46)	0.37 (0.48)
Steel	0.17 (0.38)	0.43 (0.49)	0.45 (0.50)	---	---	---
Tenure	25.4 (9.3)	28.0 (8.7)	28.5 (8.9)	19.6 (5.5)	19.5 (5.5)	19.6 (5.5)
Sep. Date	82:II	82:IV	83:I	92:IV	93:I	93:I
Nobs	3,850	936	1,729	64,088	10,235	15,959

Table 1 (continued)

Panel B: Completed Schooling:

Course Type*	Pittsburgh Sample			Washington State Sample		
	All (1)	Males (2)	Female (3)	All (4)	Males (5)	Females (6)
Total credits	26.0 (23.2)	25.1 (22.3)	28.9 (25.8)	28.8 (34.0)	30.1 (34.8)	27.5 (33.0)
Group 1	10.5 (14.0)	14.7 (15.8)	12.6 (11.8)	12.9 (22.1)	16.3 (25.6)	9.5 (17.3)
Group 2	15.5 (17.2)	10.6 (12.8)	17.2 (20.2)	15.9 (19.4)	13.6 (20.9)	18.0 (23.9)
Health	1.7 (6.3)	1.6 (6.3)	2.0 (6.3)	1.8 (8.5)	1.1 (6.7)	2.4 (9.9)
Trades	2.6 (5.9)	3.2 (6.4)	0.3 (2.5)	4.4 (15.6)	8.2 (20.7)	0.7 (5.7)
Sci/Math	3.4 (5.9)	3.5 (6.1)	3.3 (5.3)	2.1 (6.3)	2.1 (6.6)	2.1 (6.0)
Tech Voc.	6.6 (10.3)	6.5 (10.3)	7.0 (10.5)	4.6 (11.8)	4.8 (12.9)	4.4 (10.6)
Service	1.1 (3.5)	1.1 (3.5)	1.2 (3.3)	3.7 (10.7)	2.4 (8.6)	5.0 (12.3)
Hum/SS	6.1 (8.6)	5.7 (8.2)	7.6 (9.7)	6.3 (12.2)	5.5 (11.5)	7.1 (12.8)
Basic Skill	2.1 (3.3)	2.1 (3.3)	2.2 (3.3)	2.6 (6.1)	2.7 (6.3)	2.5 (5.8)
Other voc.	2.1 (5.9)	1.2 (4.0)	5.4 (9.1)	2.7 (7.8)	2.9 (8.6)	2.5 (6.9)
PE/Home	0.5 (2.8)	0.4 (2.6)	0.7 (3.4)	0.6 (2.1)	0.4 (1.5)	0.8 (2.5)
Nobs	1,729	1,343	386	15,959	7,967	7,992

Notes: The CCAC operated under a semester system so that a full academic year constituted 30 credits; an academic year in Washington State is 45 quarter credits.

Table 2

Conventional Estimates of the Impact of Classroom Training
 [Impact of completing at least one course on quarterly earnings]

	<u>Comparison Group</u>			
	<u>Non-Trainees</u> (1)	(2)	<u>Dropouts</u> (3)	(4)
<u>Panel A: The Pittsburgh Sample</u>				
Long-term Effect	-\$413 (24)	-\$185 (27)	\$12 (28)	\$164 (31)
First Quarter Loss*	---	-1,568 (79)	---	-923 (79)
<u>Panel B: The Washington State Sample</u>				
Long-term Effect	318 (11)	571 (22)	129 (14)	284 (17)
First Quarter Loss*	---	-628 (36)	---	-461 (31)

Notes:

* - The predicted impact of training during the kth quarter after an individual completes her last course is given by the 1/k time the "First quarter penalty" plus the "Long-term effect." For example, as shown in Panel A, column 4, the predicted impact of training after 4 quarters is $1/4 * (-\$923) + \164 or $-\$67$.

Estimates based on (3a) and (3b) in text, except that the post-schooling variables have been replaced by a single dummy variable indicating whether an individual completed at least one course. This amounts to restricting τ_1 and τ_2 to equal 0. In column (1) of the table we also restrict τ_2 to equal 0.

Table 3

The Impact of Community College Schooling on Earnings
 [Impact of a community college credit on quarterly earnings]

	Comparison Group/Sub-Sample						
	Non-Trainees			Dropouts			Combined
<u>Panel A: The Pittsburgh Sample</u>	All	Males	Females	All	Males	Females	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
While in School	-\$258 (14)	-\$279 (16)	-\$201 (29)	-\$271 (13)	-\$293 (15)	-\$209 (27)	-\$260 (14)
Long-term Effect	3.5 (1.0)	0 (1.1)	15 (1.8)	2.9 (0.9)	-1.0 (1.1)	14.0 (1.7)	3.6 (0.9)
First Quarter Loss*	-30 (3.3)	-32 (3.9)	-30 (6.3)	-35 (3.1)	-37 (3.7)	-35 (5.9)	-32 (3.3)
<u>Panel B: The Washington State Sample</u>							
While in School	-191 (3.1)	-223 (4.0)	-146 (4.5)	-191 (2.8)	-221 (3.7)	-146 (4.1)	-193 (3.0)
Long-term Effect	7.2 (0.7)	7.2 (0.9)	7.2 (0.9)	6.1 (0.6)	6.1 (0.8)	6.2 (0.9)	6.7 (0.7)
First Quarter Loss*	-15 (1.2)	-17 (1.7)	-13 (1.8)	-16 (1.1)	-17 (1.6)	-13 (1.7)	-16 (1.2)

Notes: Estimates based on (3a) and (3b) in the text. Estimates of ψ , τ_0 , and τ_2 are not reported in the table. Washington State community colleges operate under a quarter, instead of a semester, system. Therefore one Washington State credit equals 0.67 of a Pittsburgh credit.

* - See notes to Table 2 for description of First Quarter Loss* term.

Table 4

The Impact of Community College Courses on Earnings
[Long-term impact on quarterly earnings by type of community college credit]

<u>Course Type</u>	<u>The Pittsburgh Sample</u>		<u>The Washington State Sample</u>	
	<u>Males</u>	<u>Females</u>	<u>Males</u>	<u>Females</u>
	(1)	(2)	(3)	(4)
Panel A:				
Group 1 credits	\$18 (2)	\$40 (4)	\$16 (1)	\$20 (2)
Group 2 credits	-30 (2)	-12 (4)	-8 (2)	-1 (1)
Panel B:				
Health related	32 (5)	117 (11)	48 (5)	33 (3)
Trades and repair	0 (4)	-16 (22)	18 (1)	35 (6)
Science/Math	54 (6)	72 (15)	3 (5)	1 (6)
Tech vocational	-9 (3)	-2 (5)	4 (3)	6 (4)
Service/Admin.	-29 (9)	13 (18)	-5 (4)	7 (3)
SS/Humanities	-34 (4)	-26 (8)	-2 (3)	1 (3)
Basic Education	-75 (7)	-1 (16)	-11 (5)	2 (2)
Other vocational	-20 (7)	-17 (5)	-5 (4)	-15 (4)
PE/Homemaking/other	28 (10)	50 (15)	-45 (18)	-5 (12)

Notes: See text and Appendix for description of Group 1 and Group 2 courses. Table reports estimates of τ_j from (3b) in the text.

Figure 1a: Earnings of Displaced Workers in the Pittsburgh Sample

Quarterly Earnings of Workers Displaced in Early 1980s

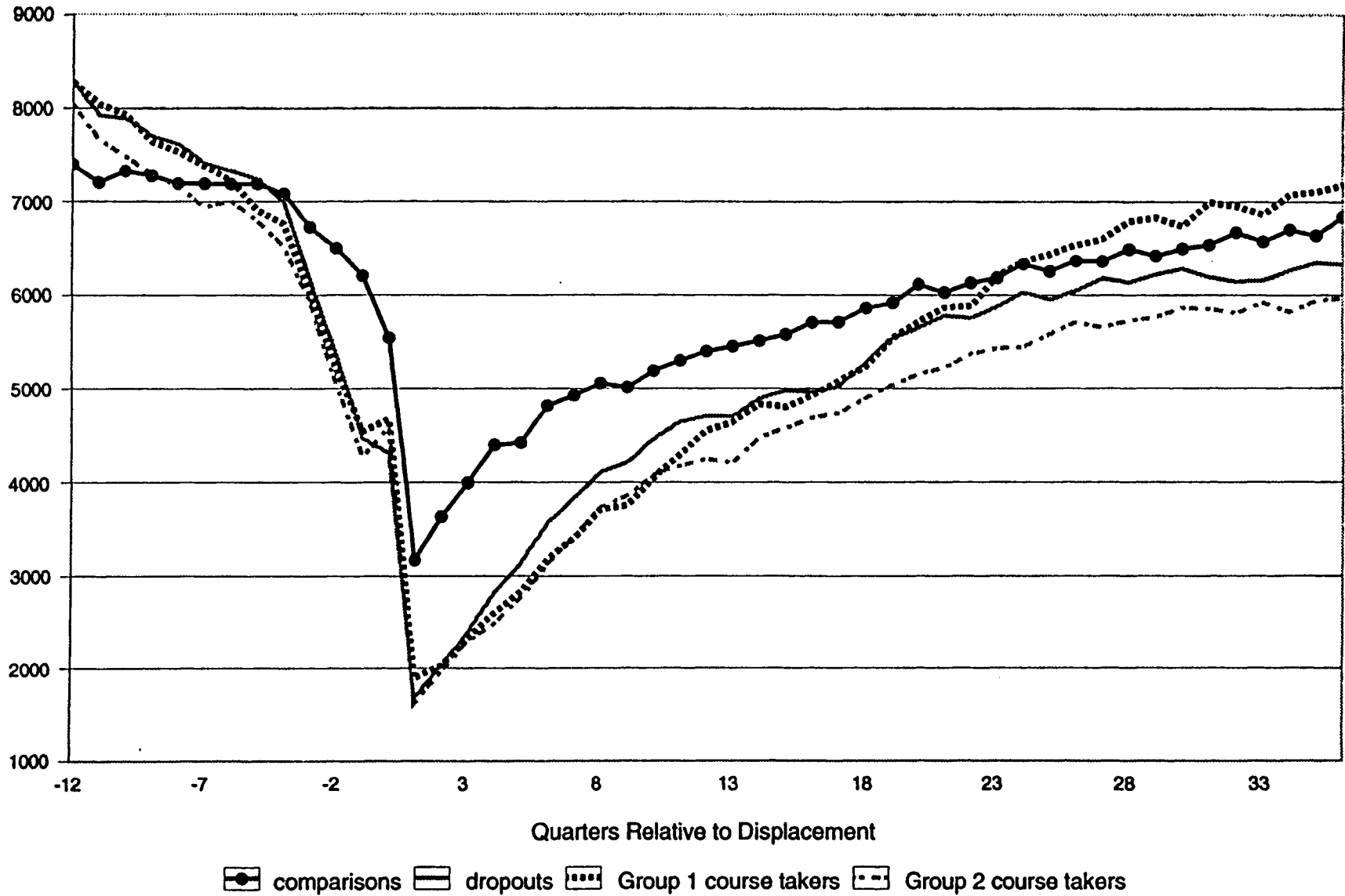


Figure 1b: Earnings of Displaced Workers in the Washington State Sample

Quarterly Earnings of Workers Displaced in Early 1990s

