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Net Impact and Benefit-Cost Estimates of the Workforce Development System in Washington State

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**Net Impact and Benefit-Cost Estimates
of the Workforce Development System
in Washington State**

Upjohn Institute Technical Report No. TR06-020

Kevin M. Hollenbeck
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Technical Report

W.E. Upjohn Institute for Employment Research
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Abstract

This study estimates the net impacts and private and social benefits and costs of 11 workforce development programs administered in Washington State. Six of the programs serve job-ready adults: Workforce Investment Act (WIA) Title I-B Adult programs, WIA Title I-B Dislocated Worker programs, Community and Technical College Job Preparatory Training, Community and Technical College Worker Retraining, Private Career Schools, and Apprenticeships. Three of the programs serve adults with employment barriers: Community and Technical College Adult Basic Skills Education, Division of Vocational Rehabilitation programs, and Department of Services for the Blind programs. The other two programs serve youth: WIA Title I-B Youth programs and Secondary Career and Technical Education.

The net impact analyses were conducted using a nonexperimental methodology. Individuals who had encountered the workforce development programs were statistically matched to individuals who had not. Administrative data with information from the universe of program participants and Labor Exchange registrants (who served as the comparison group pool) supported the analyses. These data included several years of pre-program and outcome information including demographics, employment and earnings information from the Unemployment Insurance wage record system, and transfer income information such as Food Stamps and Temporary Assistance for Needy Families (TANF) reciprocity and benefits.

A variety of estimation techniques was used to calculate net impacts including block matching, comparison of means, regression-adjusted comparison of means, and difference-in-difference comparison of means. We estimated *short-term* net impacts that examined outcomes for individuals who exited from the education or training programs (or from the Labor Exchange) in the fiscal year 2003/2004 and *longer-term* impacts for individuals who exited in the fiscal year 2001/2002. Short-term employment impacts are positive for nine of the 11 programs and negative (although not statistically significant) for the other two. Short-term earnings impacts are also positive for nine of the programs, positive but not statistically significant for one of the programs, and negative for the remaining program. The longer-term impacts are similar and even a little better. Employment impacts are positive for all 11 programs, and earnings impacts are positive for ten of the 11. The benefit-cost analyses show that virtually all of the programs have discounted future benefits that far exceed the costs for participants, and that society also receives a positive return on investment.

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1 OVERVIEW OF THE STUDY

The Washington State Workforce Training and Education Coordinating Board (WTECB) has a commitment to accountability and data-driven performance monitoring and management. Biennial evaluations provide the public with data about the extent to which participants in the state workforce development system (1) achieve workplace competencies, (2) find employment, (3) achieve family-wage levels of earned income, (4) are productive, (5) move out of poverty, and (6) are satisfied with program services and outcomes. The performance data for these outcomes come from administrative data or surveys of program participants (or employers of participants).

The WTECB has a seventh evaluative outcome—return on investment—that is most appropriately calculated by using data from nonparticipants as well as participants. The data burden is greatly expanded as compared to what is required for the other six criteria, and so the strategy that the State follows is to examine this outcome every four years. Net impact/return on investment studies were done in 1997 and 2002.¹ This report provides the most recent net impact estimates of the Washington State employment preparation and training system and its economic value to the State.

Why are Net Impact and Cost-Benefit Analyses Useful?

Washington's systematic calculation of net impacts of its workforce development programs and their costs and benefits is rare, and indeed may be unique, among states. Why does the state

¹The 1997 study is documented in Washington State Workforce Training and Education Coordinating Board, *Workforce Training Results: An Evaluation of Washington State's Workforce Training System, 1997*. Second Edition. Olympia, WA: 1997. Also Battelle, "Net Impact Evaluation: Appendix A, Technical Appendix," no date. The 2002 study is documented in Washington State Workforce Training and Education Training Board, *Workforce Training Results 2002: An Evaluation of Washington State's Workforce Development System*. Olympia, WA: 2003 and K. Hollenbeck and W. Huang, *Net Impact and Benefit-Cost Estimates of the Workforce Development System in Washington State*, Upjohn Institute Technical Report No. TR03-018, July 2003.

insist on these analyses? Presumably, the state recognizes that investment in workforce development requires considerable public resources and needs to be accountable to the public for achieving results. But the state also seems to recognize that it is important to dissect carefully the results that are achieved in order to assure the public that its return of training investments is positive and that improvements that are warranted can be implemented.

Individuals who participate in training or educational programs may experience successful outcomes such as the six outcomes listed above. However, it is not always clear that positive outcomes for individuals are the direct result of their participation in the programs. There could have been some other intervening factor(s) such as an improving economy that cause positive results. In social science evaluation, trying to tie outcomes directly to the intervention(s) is called the attribution question. Can participants' successes be *attributed* to participation in the program or might some other factor coincidental to the program have played a role?

A net impact analysis must be conducted to answer the attribution question. Such an analysis attempts to answer the question of how do outcomes compare to what would have happened to participants if there were no program and individuals were left to their next best alternatives. To find the answer, we construct a comparison group of individuals who are very similar to the participants in each of the programs but who did not receive training or enroll in education.² We observe both the participants and comparison group members over time. We then attribute to the program any differences in outcomes that we observe for program participants to those of comparison group members.

The net impacts of workforce development programs are likely to be positive for participants. (The programs are delivering valuable skills to individuals who will use those skills in

²Experimental evaluation uses a randomly assigned control group.

the labor market.) However accountability generally goes beyond positive net impacts. Of interest to the public is whether the net impacts (outcomes for program participants minus outcomes for similar individuals comprising a comparison group) aggregated over all participants will have exceeded the costs of the program. Thus to get a full picture of the return on investment, it is necessary to compare the programs' net benefits to their costs.³

Programs, Outcomes, and Time Periods

The report describes analyses (net impact and benefit-cost) of 11 programs. Six of the programs serve job-ready adults: Workforce Investment Act (WIA) Title I-B Adult programs, Community and Technical College Job Preparatory Training, Private Career Schools, Apprenticeships, Title I-B Dislocated Worker programs, and Community and Technical College Worker Retraining. Three of the programs serve adults with employment barriers: Community and Technical College Adult Basic Skills Education, Division of Vocational Rehabilitation (DVR) programs, and Department of Services for the Blind (DSB) programs. The other two programs serve youth: WIA Title I-B Youth programs and Secondary Career and Technical Education.

For the participants in each of these programs, we estimate the net impacts of participation on the following outcomes:

- employment rates
- hourly wages
- hours worked per quarter
- quarterly earnings
- receipt of UI benefits
- receipt of TANF benefits
- receipt of Food Stamps
- enrollment in Medicaid

³If we were to be able to appropriately monetize all program benefits and to accurately discount their expected future value, then return on investment would be equal to the (benefit/cost) ratio – 1.

The first four outcomes are derived from the quarterly wage record data generated from the Unemployment Insurance (UI) system, and thus are measured over a calendar quarter.⁴ Quarterly earnings and hours worked per quarter come directly from employer wage record reports filed with quarterly UI tax payments. The state supplied these administrative data to us for this study. A processing step that the state undertook was to add together the information from multiple employers for those individuals who had more than a single employer in a quarter. Furthermore, the state personnel had gathered quarterly wage record data from surrounding states (Idaho and Oregon), and from the federal payroll. The data from the other jurisdictions contributed to quarterly earnings, but did not have hours information as is available in Washington wage record data. Throughout this study, we define employment as having at least \$100 in earnings in a quarter. Hourly wages are defined as total quarterly wages divided by hours worked in the quarter.

Unemployment Insurance benefits were gathered from the Washington UI system. UI receipt in a quarter is defined as having non-zero benefits in the calendar quarter. The last three outcomes— TANF benefits, Food Stamp benefits, and Medicaid eligibility were acquired from the Washington State Department of Social and Human Services. For TANF and Food Stamps, data on benefit levels and receipt were used. The levels were measured as quarterly benefits received by the assistance unit that included the individual who participated in the education or training program, and receipt was defined as having non-zero benefits in the quarter. Medicaid data were limited to enrollment during the quarter; no attempt was made to assign an “insurance” value or to calculate total assistance unit medical usage in a quarter.

⁴Appendix A provides details about data editing that was performed on the wage record data. In addition to the editing that is described there, we “trimmed” earnings and hours data. Specifically, we deleted from analyses observations in the top and bottom 1% of the quarterly non-zero earnings and hours distributions of the treatment and matched comparison groups in the analyses periods: i.e., quarters 3 to 6 before registration, quarter 3 after exit, and quarters 9–12 after exit.

The next chapter of this report details the methodologies that were used to calculate net impacts. The general idea is that we constructed data bases containing longitudinal data over a fairly substantial period about individuals who had participated in the 11 programs of interest or who had registered for services at the Labor Exchange (ES). The latter data were used to construct the comparison groups.⁵ We then statistically matched individuals who had participated in the programs to individuals in the comparison group, and compared outcomes. Differences in outcomes were attributed to the programs.

Two time periods were used for analysis purposes. The first period was the fiscal year running from July 2001 to June 2002 (hereafter referred to in this report as 2001/2002), and the second period was July 2003 to June 2004 (2003/2004). More specifically, an individual was considered to be a member of a “treatment” group if he or she exited from an education or training program during either of the two time periods. An individual was considered to be a member of the “comparison” group pool if they exited (last received services) from the Labor Exchange during either of those years.⁶

Note that because administrative data were used, sometimes the concept of exiting from a program was ambiguous and arbitrary, especially for individuals who exited without completing the program or training. Some education or training programs result in a certificate or credential for

⁵For three of the programs, we actually used administrative data on program applicants to construct the comparison groups. The programs were secondary career and technical education, Division of Vocational Rehabilitation programs, and Department of Services for the Blind programs.

⁶In program evaluation, populations of participants are often defined by entry date or as a cross-section of current enrollees. It is well-known that current enrollees are not representative of the population of all individuals who participate in a program because individuals with longer durations are more likely to be a current participant. The alternative of selecting all individuals who entered a program at a particular period of time captures the population of all individuals who participate in the program. The problem with using entry cohorts is that if programs last a long period of time (e.g., Community and Technical College Job Preparatory programs or Apprenticeships), it will take several years to get outcome data. The approach used in this study of defining the population by exit date is also representative of all individuals participating in the program, but allows a substantial number of quarters for outcome data. The “downside” to this approach is that the “treatment” received may differ for individuals in the same program simply because they started at different times and had different durations of participation.

individuals who successfully complete all of the requirements. In these cases, an individual's exit date was set at the date when they received the credential. However, individuals who stop attending a program are unlikely to report their action to program administrators, and so there may be a lag in the data that reflects how long it takes for the program's administrative information system to record the exit. Some programs use the rule that no contact over a 12-month period means that the individual exited the program; some programs use a six-month rule. All in all, we note that the exit date may be subject to measurement error, which therefore implies that length of time receiving treatment and initial outcome periods after treatment are somewhat subject to error.

Summary of Results

Table 1.1 provides a summary of short-term net impacts of the 11 programs on employment and earnings. The elements reported in the table show the increase (or decrease) in employment, defined as having at least \$100 in earnings in the third quarter after exiting from the program, and the increase (or decrease) in quarterly earnings, on average, for that quarter.⁷ Note that these results include all participants—those individuals who completed their education or training and those who left without completing. Separate net impact estimates for subgroups of participants, including completers only, are reported later in this document.

The employment impacts are in percentage point terms and all but two of them are statistically significant. The two that are not significant have a negative sign, but because they are not significant, they may be thought of as having zero net impact. All of the other impacts are positive. The employment rate of the comparison group is on the order of 60 to 70 percent, so these impacts range from about seven to 30 percent. The short-term earnings impacts vary. Ten of the 11

⁷The earnings impacts are not conditional on individuals having earnings, i.e., the means include observations with values of zero.

Table 1.1 Short-Term^a Net Impacts of Washington’s Workforce Development System, by Program

Program	Net Employment Impact (In percentage points)	Net Quarterly Earnings Impacts (2005 Q1 \$)
WIA Title I-B Adults	9.1	797
WIA I-B Dislocated Workers	11.6	1,083
WIA I-B Youth	-0.4 [†]	-258
Comm. and Tech. College Job Prep	9.2	1,564
Comm. and Tech. College Worker Retraining	7.8	376
Comm. and Tech. College ABE	-1.3 [†]	200
Private Career Schools	4.8	686
Apprenticeships	7.4	3,001
Secondary Career Technical Ed.	6.7	210
Vocational Rehabilitation	6.8	1,699
Dept. of Services for Blind	23.7	683 [†]

NOTE: Specific estimation techniques are described in later chapters.

^aDefined as three quarters after exit.

[†]Table entry not statistically significant.

programs have positive earnings impacts, although one of those, DSB, is not significant. Note that community and technical colleges job prep, apprenticeships, and DVR programs have quite large impacts. The only program with negative earnings impacts is the WIA Title I-B Youth program. This negative impact is statistically significant.

Table 1.2 provides estimates of the longer-term payoffs to education and training. All of the employment impacts are positive, and for the WIA Title I-B Youth program, adult basic education at community colleges, and vocational rehabilitation programs, the longer-term employment impacts are much larger than the short-term impacts. The earnings picture is similar in the longer term to the short-term net impact estimates. Ten of the 11 programs have positive impacts, and all are significant. The only program impact that is negative—Community and Technical Colleges ABE—is not significant. With the exception of secondary career and technical education and DSB programs, the longer term impacts are smaller in magnitude than the short-term impacts. Note that in percentage terms, these impacts are on the order of 20 percent.

Table 1.2 Longer-Term^a Net Impacts of Washington’s Workforce Development System, by Program

Program	Net Employment Impact (In percentage points)	Net Quarterly Earnings Impacts (2005 Q1 \$)
WIA Title I-B Adults	6.6	443
WIA I-B Dislocated Workers	6.4	752
WIA I-B Youth	10.3	317
Comm. and Tech. College Job Prep	6.7	1,008
Comm. and Tech. College Worker Retraining	4.6	298
Comm. and Tech. College ABE	5.9	-26 [†]
Private Career Schools	4.3	343
Apprenticeships	6.8	2,281
Secondary Career Technical Ed.	5.4	416
Vocational Rehabilitation	11.0	1,637
Dept. of Services for Blind	20.3	1,492

NOTE: Specific estimation techniques are described in later chapters.

^aDefined as average over quarters 9-12 after exit.

[†]Table entry not statistically significant.

Table 1.3 summarizes the benefit-cost estimates for the 11 programs. Due to data limitations, the benefit-cost estimates for private career schools are partial. The table presents the estimates of benefits and costs for the average participant, and it shows the benefits and costs to the public that are associated with the average participant. For participants, the benefits include net earnings changes (earnings plus fringe benefits minus taxes) and transfer income changes (UI benefits plus TANF plus Food Stamps plus Medicaid). These changes may be positive, indicating that the additional earnings and transfer income accrue to the participant, or they may be negative if earnings

Table 1.3 Discounted Benefits and Costs of Washington’s Workforce Development System, by Program

Program	First 2.5 years				Lifetime			
	Participant		Public		Participant		Public	
	Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost
WIA Title I-B Adults	3,982	1,060	2,970	5,481	31,008	1,060	4,926	5,481
WIA I-B Dislocated Workers	4,063	10,254	5,505	6,757	39,220	10,254	15,434	6,757
WIA I-B Youth	3,162	0	-1,098	6,314	25,769	0	7,567	6,314
Comm. and Tech. College Job Prep	12,223	6,177	4,150	7,560	91,619	6,177	16,927	7,560
Comm. and Tech. College Worker Retraining	2,376	8,542	1,692	5,172	19,541	8,542	5,812	5,172
Comm. and Tech. College ABE	735	140	-735	2,453	5,303	140	-5,303	2,453
Private Career Schools	3,271	na	2,370	0	29,596	na	6,067	0
Apprenticeships	27,195	-23,345	6,265	2,546	197,528	-23,345	49,463	2,546
Secondary Career Technical Ed.	2,918	-31	715	774	38,182	-31	7,467	774
Vocational Rehabilitation	7,433	-613	1,978	8,114	45,641	-613	9,379	8,114
Dept. of Services for Blind	18,614	1,010	4,390	23,243	68,375	1,010	16,107	23,243

NOTE: Benefits for a participant include discounted values of earnings and fringe benefits less taxes plus income transfers (TANF, Food Stamps, Medicaid, UI benefits); for the public, benefits include tax receipts minus transfer payments. Costs include direct program costs (public and participant, if tuition/fees) and foregone earnings (participant). Table entries in 2005 Q1 \$.

na Not available due to variability in tuition charges.

and/or transfers are projected to decrease. For the public, benefits include tax receipts plus reductions in transfer payments. Again, these may be positive (taxes are received and transfers are reduced) or, they may be negative. For participants, the costs are foregone earnings during the period of training and tuition/fees, if any. For the public, costs represent the budgetary expenditures necessary to provide the training/education services. The public costs are always positive, but some of the participant costs are negative because foregone earnings are negative (participants actually earn more during their training than if they had not participated). All of the benefits are expressed as net present values; they are adjusted for inflation and discounted back to 2005 at a rate of 3.0 percent. Costs are adjusted for inflation, but they are not discounted.

The first four columns of data in the table show the average participant's benefits and costs that accrue over the first 10 quarters after exiting from the program and over the expected working lifetime of the participant. From the participant's perspective, only two of the programs have discounted benefits that exceed costs over the 10-quarter time frame, while the other programs have costs that exceed benefits over the short-term period. However, all of the programs have discounted benefits that significantly exceed costs over the participants' working lifetime. From the public's perspective, eight of the 11 programs have benefits that exceed costs in the long-run, but only private career schools and apprenticeships have public benefits that exceed the public costs in the first 2.5 years. The benefit-cost analyses are detailed in chapter 14.

This report is organized as follows. The next chapter provides much of the technical detail underlying the net impact estimation including the statistical matching approaches and regression models used to adjust results. The following 11 chapters examine the results for the 11 workforce development system programs. The final chapter documents the cost-benefit analyses. Appendix A

discusses data editing and Appendix B presents explanatory notes for the regression adjustment models and the price indices used to convert nominal dollar figures into real terms.

2 GENERAL METHODOLOGY FOR NET IMPACT ESTIMATION

Probably most evaluators would agree that the best way to estimate the net impacts of a program is to conduct a random assignment experiment. If it were feasible to do so, an experiment could sort individuals who apply and are eligible for services randomly into two groups—those who are allowed to receive services and those who aren't. As long as assignment into treatment or control is random, then the evaluator can have high levels of statistical confidence that the program was responsible for any differences in outcomes.⁸

The issue is moot in the present context, however, because the programs being evaluated were essentially entitlements for which anyone in the state could participate. Experiments were not feasible. Thus this study relied on a nonexperimental methodology. Individuals who encountered the workforce development programs were compared to individuals who didn't, and members of the latter group were not randomly chosen. In other words, there were systematic (nonrandom) differences between the participants and the individuals to whom they were compared. Thus the statistical estimators used to calculate the net impacts require strong assumptions and/or multivariate conditionality to control for those differences.

Net Impacts Problem Statement⁹

The net impact evaluation problem may be stated as follows: Individual i , who has characteristics X_{it} , at time t , will be observed to have outcome(s) $Y_{it}(1)$ if he or she receives a “treatment,” such as participating in the workforce development system and will be observed to have outcome(s) $Y_{it}(0)$ if he or she doesn't participate. The net impact of the treatment for individual i is

⁸Even with an experiment, there may be implementation problems or behavioral responses that threaten its external validity. For example, problems such as crossover, differential attrition, or Hawthorne effects may arise.

⁹Much of this discussion comes from Hollenbeck (2004).

$Y_{it}(1) - Y_{it}(0)$. But of course, this difference is never observed because an individual cannot simultaneously receive and not receive the treatment.

The time subscript is dropped in the following discussion to simplify the notation without loss of generality. Let $W_i = 1$ if individual i receives the treatment, and $W_i = 0$ if i does not receive the treatment. Let T represent the data set with observations about individuals who receive the treatment for whom we have data, and let n_T represent the number of individuals with data in T . Let U represent the data set with observations about individuals who may be similar to individuals who received the treatment for whom we have data, and let n_U be its sample size. Some of the techniques described below identify a subset of U that contains observations that “match” those in T . This subset is C , and let n_C be its sample size. Names that may be used for these three data sets are Treatment sample (T), Comparison sample universe (U), and Matched Comparison sample (C).

Receiving the treatment is assumed to be a random event—individuals happened to be in the right place at the right time to learn about the program, or the individuals may have experienced randomly the eligibility criteria for the program—so W_i is a stochastic outcome that can be represented as follows:

$$(1) \quad W_i = g(X_i, e_i), \quad \text{where}$$

e_i is a random variable that includes unobserved or unobservable characteristics about individual i as well as a purely random component.

An assumption made about $g(\bullet)$ is that $0 < \text{prob}(W_i = 1|X_i) < 1$. This is referred to as the “support” or “overlap” condition, and is necessary so that the outcome functions described below are defined for all X .¹⁰

¹⁰Note that Imbens (2004) shows that this condition can be slightly weakened to $\text{Pr}(W_i = 1|X_i) < 1$.

In general, outcomes are also assumed to be stochastically generated. As individuals in the treatment group encounter the treatment, they gain certain skills and knowledge and encounter certain networks of individuals. Outcomes are assumed to be generated by the following mapping:

$$(2) \quad Y_i(1) = f_1(X_i) + e_{1i}$$

Individuals not in the treatment group progress through time and also achieve certain outcomes according to another stochastic process, as follows:

$$(3) \quad Y_i(0) = f_0(X_i) + e_{0i}$$

Let $f_k(X_i) = E(Y_i(k)|X_i)$, so e_{ki} are deviations from expected values that reflect unobserved or unobservable characteristics, for $k = 0,1$.

As mentioned, the problem is that $Y_i(1)$ and $Y_i(0)$ are never observed simultaneously. What is observed is the following:

$$(4) \quad Y_i = (1 - W_i)Y_i(0) + W_iY_i(1)$$

The expected value for the net impact of the treatment on the sample of individuals treated:

$$\begin{aligned} (5) \quad E[Y_i(1) - Y_i(0)|X, W_i = 1] &= E(\Delta Y | X, W = 1) \\ &= E[Y(1)|X, W = 1] - E[Y(0)|X, W = 0] \\ &\quad + E[Y(0)|X, W = 0] - E[Y(0)|X, W = 1] \\ &= \hat{f}_1(X) - \hat{f}_0(X) + \text{BIAS}, \quad \text{where} \end{aligned}$$

$\hat{f}_k(X)$, $k = 1, 0$, are the outcome means for the treatment and comparison group samples, respectively, and

BIAS represents the expected difference in the $Y(0)$ outcome between the comparison group (actually observed) and the treatment group (the counterfactual.)

The BIAS term may be called selection bias.

A key assumption that allows estimation of equation (5) is that $Y(0) \perp W|X$. This orthogonality assumption states that given X , the outcome (absent the treatment), $Y(0)$, is random

whether or not the individual is a participant. This is equivalent to the assumption that participation in the treatment can be explained by X up to a random error term. The assumption is called “unconfoundedness,” “conditional independence,” or “selection on observables.” If the assumption holds, then the net impact is identified because BIAS goes to 0, or

$$(6) \quad E[\Delta Y|X, W = 1] = \hat{f}_1(X) - \hat{f}_0(X)$$

In random assignment, the X and W are uncorrelated through experimental control, so the conditional independence assumption holds by design. In any other design, the conditional independence is an empirical question. Whether or not the data come from a random assignment experiment, however, because the orthogonality assumption holds only asymptotically (or for very large samples), in practice, it makes sense to regression-adjust equation (6).

Estimation of Net Impacts

T represents the data set(s) with treatment observations, and U represents the data set from which the comparison set of observations may be chosen. Note that T and U may come from the same source of data, or may be entirely different data sets. In the former situation, U has been purged of all observations that are also in T .

Various estimation techniques have been suggested in the literature, but they may be boiled down to two possibilities: (1) use all of the U set or (2) try to find observations in U that closely match observations in T . Note that identification of the treatment effect requires that none of the covariates X in the data sets are perfectly correlated with being in T or U . That is, given any observation X_i , the probability of being in T or in U is between 0 and 1. Techniques that use all of U

are called full sample techniques.¹¹ Techniques that attempt to find matching observations will be called matching techniques. Each will be described in turn.

Full sample estimators. Assuming that T and U have some resemblance to each other, the evaluator should calculate the simple difference in means of the outcome variables as a baseline estimator. This estimator essentially assumes away selection bias. It may be represented as follows:

$$(7) \quad \tau = \frac{1}{n_T} \sum_{i \in T} Y_i(1) - \frac{1}{n_U} \sum_{i \in U} Y_j(0)$$

This estimator can be regression-adjusted. If it is assumed that the same functional form holds for both $Y(1)$ and $Y(0)$, then the treatment effect can be estimated from a linear equation such as the following using the observations in the union of T and U :

$$(8) \quad Y_i = a + B'X_i + \tau W_i + e_i.$$

More generally, τ can be estimated by using two separate regression functions for the two regimes ($Y(1)$ regressed on X in T and $Y(0)$ regressed on X in U), using both models to predict a “treated” and “non-treated” outcome for all observations in both T and U .¹² The following average treatment effect can then be calculated:

$$(9) \quad \tau = \frac{1}{N} \sum_{i \in T, U} [\hat{f}_1(X_i) - \hat{f}_0(X_i)], \text{ where}$$

$$N = n_T + n_U \text{ and } \hat{f}_k(X_i) \text{ is predicted value for } k = 1, 0.$$

Equation (8) and the more general regressions in the first stage of (9) require strong parameterization assumptions. Heckman, Ichimura, Smith, and Todd (1998) relax those assumptions in a nonparametric kernel method. This method amounts to weighting the observations

¹¹Some of these techniques trim or delete a few outlier observations from U but will still be referred to as full sample techniques.

¹²Imbens (2004) points out this generalization. The intuition is similar to that of the basic Roy (1951) model with two regimes and individuals pursuing the regime for which they have a comparative advantage. However, Imbens (2004) notes, “These simple regression estimators may be very sensitive to differences in the covariate distributions for treated and control units.” (p. 12)

in U such that the observations closest to the treatment observations receive the highest weights.

This estimator may be written as follows (following Imbens 2004):

$$(10) \quad \hat{f}_k(X_i) = \frac{\sum_j Y_j K\left(\frac{X_j - X_i}{h}\right)}{\sum_j K\left(\frac{X_j - X_i}{h}\right)} \text{ for } k = 1, 0$$

where $j \in T$ if $k = 1$ and $j \in U$ if $k = 0$ and $K(\bullet)$ is a kernel function with bandwidth h .

$$(11) \quad \tau = \frac{1}{N} \sum_i \left[\hat{f}_1(X_i) - \hat{f}_0(X_i) \right]$$

Several of the full sample estimators rely on the observations' propensity scores, which are the estimated probabilities of being in the treatment group. Rosenbaum and Rubin (1983) showed that the conditional independence assumption, $Y(0) \perp W|X$ implies that $Y(0) \perp W|p(X)$, where $p(X)$ is the conditional probability of receiving the treatment ($= \text{Prob}(W = 1|X)$).

This result implies that the regression approaches in equations (8) through (10) can be re-estimated, at reduced dimensionality, with the X_i replaced by $p(X_i)$. That is, estimates can be generated as follows:

$$(8') \quad Y_i = a + B'p(X_i) + \tau W_i + e_i.$$

$$(9') \quad \tau = \frac{1}{N} \sum_{i \in T, U} \left[\left(\hat{f}_1(p(X_i)) - \hat{f}_0(p(X_i)) \right) \right]$$

$$(10') \quad \hat{f}_k(X_i) = \frac{\sum_j Y_j K\left(\frac{p(X_j) - p(X_i)}{h}\right)}{\sum_j K\left(\frac{p(X_j) - p(X_i)}{h}\right)} \text{ for } k = 1, 0.$$

The final type of full sample estimator is computed by a technique known as blocking on the propensity score (see Dehejia and Wahba 1998). The intuition here is to partition the union of the

treatment and full sample into “blocks” or strata by propensity score, such that there is no statistical difference between the covariates, X , in each block. This essentially achieves the conditional independence assumption locally in each block. Then the average treatment effect is a weighted average of the treatment effects in each block.

Assume there are K blocks. Let the k th block be defined as all treatment or full comparison sample cases with values of X such that $p(X) \in [p_{1k}, p_{2k}]$. Let NT_k be the number of treatment cases in the k th block and NU_k be the number of comparison cases from the full sample. The treatment effect with each block k is as follows:

$$(12) \quad \tau_k = \sum_{\substack{i=1 \\ i \in T}}^{NT_k} \frac{1}{NT_k} Y_i(1) - \sum_{\substack{j=1 \\ j \in U}}^{NU_k} \frac{1}{NU_k} Y_j(0)$$

and the overall estimated average treatment effect is given as follows:

$$(13) \quad \tau = \sum_{k=1}^K \frac{NT_k}{N} \tau_k$$

Matching estimators. As above, U denotes the set of observations from which a subset C (for matched comparison group) is chosen that will be used in the net impact analyses. The idea is to have C be comprised of the observations where individuals are most ‘like’ the individuals comprising T . Matching adds a whole new layer of complexity to the net impact estimation problem. The estimator becomes a function of how the match is done in addition to the characteristics of the sample. Since the matching process is a structured algorithm specified by the analyst, the statistical error associated with the net impact estimator now includes a component that may be identified as matching error in addition to the sampling error and model specification error.¹³

¹³This forces the analyst to use bootstrapping techniques to calculate standard errors.

There is a substantial and growing literature on how to sample individuals to construct the comparison sample.¹⁴ The first candidate approach is *cell-matching algorithms*. Variables that are common to both data sets would be used to partition (cross-tabulate) the data into cells. Then for each treatment observation, the cell would be randomly sampled (with or without replacement) to select a comparison group observation. A substantial drawback to cell-matching is that the cross-tabulation of data, if there are many common variables, may result in small or empty cells.¹⁵

More sophisticated comparison group construction can be accomplished with *nearest-neighbor algorithms*. These algorithms minimize a distance metric between observations in T and U . Letting X represent the vector of variables that are common to both T and U , and letting X_j, X_k be the values of X taken on by the j th observation in T and k th observation in U , then C will be comprised of the k observations in U that minimize the distance metric $|X_j - X_k|$ for all j . This approach is very mechanistic, but it does allow use of all of the X variables.

The literature usually suggests that the distance metric be a weighted least squares distance, $(X_j - X_k)' \Sigma^{-1} (X_j - X_k)$, where Σ^{-1} is the inverse of the covariance matrix of X in the comparison sample. This is called the Mahalanobis metric. If we assume that the X_j are uncorrelated, then this metric simply becomes least squared error. Imbens (2004) has a discussion of the effect of using different metrics, although in practice the Mahalanobis metric is used most often.¹⁶

In his work on training program evaluation, Ashenfelter (1978) demonstrated that participants' pre-program earnings usually decrease just prior to enrollment in a program. This implies that a potential problem with the nearest-neighbor approach is that individuals whose earnings have 'dipped' might be matched with individuals whose earnings have not. Thus, even

¹⁴See Heckman, Lalonde, and Smith (1999) and references cited there.

¹⁵King et al. (1994) used a variation of this approach.

¹⁶Note that Zhao (2004) uses a metric that weights distances by the coefficients in the propensity score logit. This is similar to the technique that Schroeder implemented in Hollenbeck, King, and Schroeder (2003).

though their earnings *levels* would be close, these individuals would not be good comparison group matches.

An alternative nearest-neighbor type of algorithm involves use of propensity scores (see Dehejia and Wahba 1995). Essentially, observations in T and U are pooled, and the probability of being in T is estimated using logistic regression. The predicted probability is called a propensity score. Treatment observations are matched to observations in the comparison sample with the closest propensity scores.

An important consideration in implementing the matching approach is whether to sample from U with or without replacement. Sampling with replacement reduces the “distance” between the treatment and comparison group cases, but it may result in the use of multiple repetitions of observations, which may artificially dampen the standard error of the net impact estimator. Another consideration is the number of cases to use from U in constructing C . Commonly, matching is done on a 1-to-1 basis, where the nearest neighbor is chosen. However, it is also possible to take multiple nearest neighbors.

The whole reason for matching is to find similar observations in the comparison group to those in the treatment group when the ‘overlap’ or statistical support is weak. Consequently, the nearest-neighbor approach may be adjusted to require that the distance between the observations that are paired be less than some criterion distance. This is called *caliper or radii matching*.

Once the matched sample C has been constructed, the net impact estimation can be done using the estimators analogous to those in equations (8) through (11). The outcome variable can be in terms of levels or difference-in-differences if the underlying data are longitudinal.

Estimation Procedures Used in This Study

With a wide variety of techniques available, the choice of estimation procedures is almost arbitrary. The literature does not single out any technique to be preferred. One factor that was taken into account, however, is that much of the analyses in this study examines programs that were analyzed in an earlier study, so it made sense to keep techniques consistent over time to minimize the number of factors that might cause results to differ. On the other hand, empirical analyses in Hollenbeck (2004) pointed to the full sample technique of block matching as dominating some of the other approaches in terms of precision (minimizing the standard errors.) So net impacts were estimated using two “matching” methods: blocking and caliper matching on propensity scores with replacement. Blocking produces an estimate that is essentially a weighted difference of means. Two regression-adjusted estimates were produced with the propensity score matched comparison groups: regression-adjusted levels and regression-adjusted difference-in-differences. The tables of results that are presented in this report show all three estimates.

Having all three estimates helps to indicate the stability of the results. In general, they are reasonably similar in magnitude, which arguably provides confidence about their reasonableness. However, to present the results to the Workforce Board, to summarize the results, and to have an estimate to be used in the cost-benefit calculations, it was necessary to select a preferred estimator. Table 2.1 summarizes the decisions that were made about this. In general, the preferred estimator came from the matched propensity score approach (to remain consistent with the 2002 study) and used regression-adjusted difference-in-differences (adjusts for individual-level *fixed* unobservables), unless the participants were likely to have structurally different pre-program labor market experiences from their post-program experiences. In this case, the preferred choice was the regression-adjusted levels estimator.

Table 2.1 Preferred Estimation Technique

Workforce Program	Comparison Sample	Preferred Estimator
WIA Title I-B Adults	Labor Exchange (age = [22,60])	Regression-adjusted difference-in-differences
WIA Title I-B Dislocated Workers	Labor Exchange (age = [18,60])	Regression-adjusted levels
WIA Title I-B Youth	Labor Exchange (age = [14,21])	Regression-adjusted levels
CTC Job Prep	Labor Exchange (age = [16,60])	Regression-adjusted difference-in-differences
CTC Worker Retraining	Labor Exchange (age = [16,60])	Regression-adjusted levels
CTC Adult Basic Education	Labor Exchange (age = [16,60])	Regression-adjusted difference-in-differences
Private Career Schools	Labor Exchange (age = [16,60])	Regression-adjusted difference-in-differences
Apprenticeships	Labor Exchange (age = [16,60])	Regression-adjusted difference-in-differences
Secondary Career and Technical Education	OSPI High School graduate data (not vocational completers)	Regression-adjusted levels
Vocational Rehabilitation	DVR administrative data (closure status = blank)	Regression-adjusted difference-in-differences
Department of Services for the Blind	DSB administrative data (closure status = 300)	Regression-adjusted difference-in-differences

Choice of Outcome and Base Periods

As mentioned in the first chapter, net impacts were calculated for each program using two different fiscal years. *Short-term* impacts were calculated by specifying the treatment group as all individuals who exited from a program in fiscal 2003/2004. *Longer-term* impacts were calculated by using individuals who exited in fiscal 2001/2002 as the treatment group. The comparison groups were drawn from administrative data for individuals who last received services from the Labor Exchange during those two fiscal years. (In other words, the counterfactual situation for the net impact analysis was that without the workforce development system programs, the next best alternative for participants would have been registering for services with the Labor Exchange.)

The outcomes that we used in equations (1) through (8), i.e., the Y_i , included the following:

- employment rates
- hourly wages
- hours worked per quarter
- quarterly earnings
- receipt of UI benefits
- receipt of TANF benefits
- receipt of Food Stamps
- enrollment in Medicaid

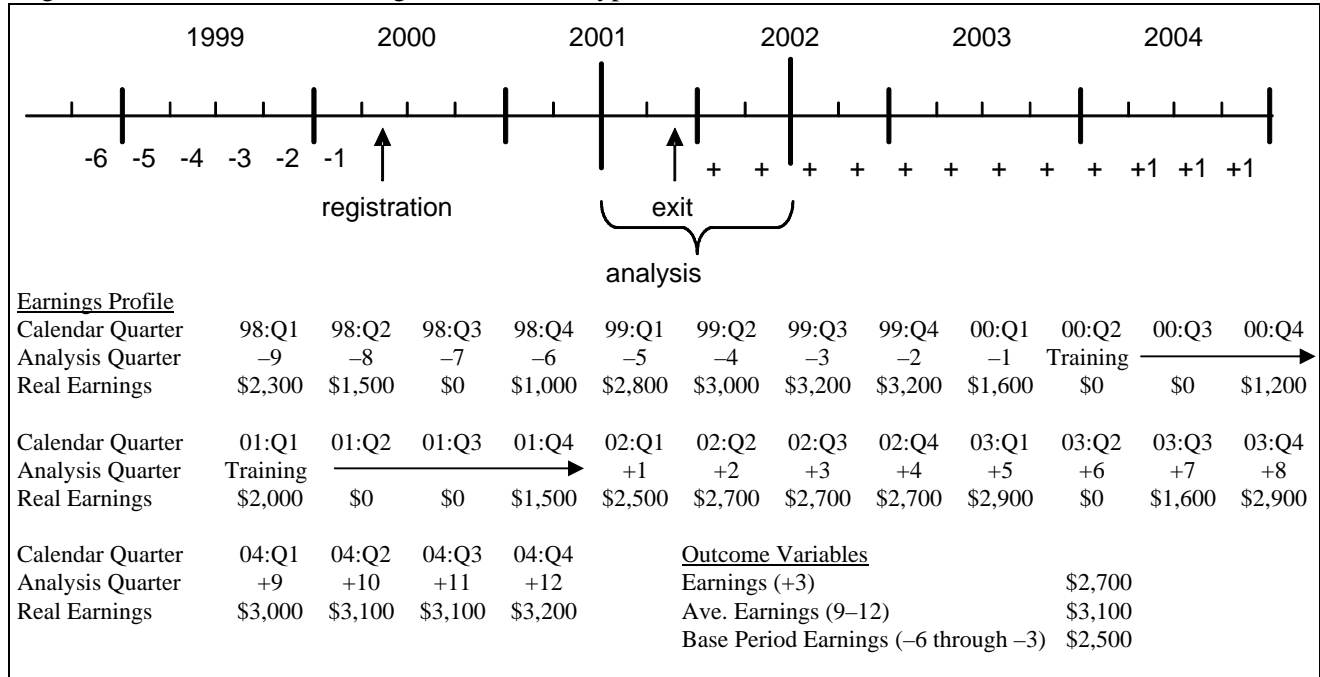
All of these were measured on a quarterly basis. Employment was defined as having at least \$100 in earnings in a quarter; hourly wage rate was defined as quarterly earnings divided by hours worked in the quarter; and receipt of a transfer or UI benefit was defined as nonzero benefits received during the calendar quarter.

We used two different approaches for identifying the specific periods over which to measure the short-term and longer-term outcomes. The first approach was to use the outcomes three quarters after exiting from the program, and the second was the quarterly average during quarters 9–12 after exiting from the program. The latest quarter for which we had data was Quarter 1 of 2005 (2005:Q1), so we were only able to use the first approach for the 2003/2004 program exiters. For difference-in-differences estimators, we specified the pre-program base period to be the average of quarters 3–6 prior to registration.

The timeline in Figure 2.1 is intended to help explain the analyses periods. The timeline shows the registration and exit dates for a hypothetical individual of adult age who registered for WIA Title I-B in April, 2000 (Quarter 2 of 2000) and exited from services in November, 2001 (Quarter 4 of 2001). The earnings profile shows that this person had average quarterly earnings of \$2,500 (real) in the base period (1998:Q4 to 1999:Q3), \$2,700 in the 3rd quarter after exit (2002:Q3); and \$3,100 average quarterly earnings in the 9th–12th post-exit quarters, which were 2004:Q1 to 2004:Q4. So in the regression adjustment of earnings levels, the dependent variables would have been \$2,700 and \$3,100 for the short-term and longer-term outcomes. In the regression

adjustment of difference-in-differences, the dependent variables would have been \$200 and \$600, respectively.

Figure 2.1 Timeline and Earnings Profile for a Hypothetical WIA Title I-B Adult Client



Subgroups

One of the advantages to relying on linked administrative data in an evaluation such as this project is that there are usually adequate sample sizes to examine the net impacts of the program interventions on subgroups of the population. Over the course of this project, we examined different subgroups for many of the programs. For example, the treatment groups usually comprised all individuals who had participated in a program and last received services during a particular fiscal year. This included individuals who “completed” the program and those who left without completing. Consequently in subgroup analyses, we examined “completers” versus “non-completers.” As would be expected, “completers” generally had more favorable outcomes.

The subgroup analyses that we performed are described in each of the chapters of this report. We limited the subgroup analyses to programmatic feature variables—such as particular types of interventions or completion status. Differences in outcomes by client characteristics—such as age, sex, or minority status—could be identified by the coefficients in the regression adjustments.

3 WORKFORCE INVESTMENT ACT (WIA) TITLE I-B ADULTS

The Workforce Investment Act (WIA) programs have replaced the Job Training Partnership Act (JTPA) programs as the primary federally-funded job development activities for individuals entering the workforce. Title I-B services include core services—skill assessment, labor market information, consumer reports on training programs, and job search and placement assistance—and intensive services. The latter services are individualized and tend to be sequential in nature—intensive assessment, individual counseling, employment planning, and prevocational and vocational training. There are no eligibility criteria for core services; they are available to all adults. The intensive services are provided to adults who are unable to obtain jobs through the core services. Highest priority is given to welfare and low-income clients.

Participant Characteristics

Table 3.1 provides descriptive data that compare the individuals in the treatment group to those in the comparison group pool (exitors from the Labor Exchange (LE) who were at least 22 but no more than 60 at the time of exit). The first two columns of numbers compare the WIA clients who exited in 2001/2002 to individuals who exited from the Labor Exchange in the same year (except that individuals who were served by Washington’s education and training programs were removed from the data). The final two columns compare the WIA exitors in 2003/2004 to LE exitors in the same year.

Note that there are two types of variables displayed in the table. The top panel of the table shows demographic and educational characteristics. The bottom panel presents variables that are

Table 3.1 Descriptive Statistics for WIA Adult Treatment Group and Comparison Group Universe

Characteristics	2001/2002		2003/2004	
	WIA Adult	Labor Exchange	WIA Adult	Labor Exchange
<u>Demographics and Education</u>				
Female	59.1%	38.5%	56.7%	41.3%
Minority	23.7%	25.6%	31.7%	27.7%
Mean, age at registration	36.6	38.0	36.7	38.8
Disability	18.0%	2.9%	9.1%	3.1%
Mean, years of education, at registration	12.3	12.1	12.4	12.4
In school at registration	1.1%	0.3%	0.2%	0.7%
Veteran	10.5%	9.4%	8.2%	11.3%
Limited English proficiency	7.8%	5.8%	13.8%	2.7%
On public assistance at registration	38.8%	3.3%	10.1%	10.8%
West WA	48.8%	77.6%	61.5%	71.7%
Urban county	39.4%	60.9%	43.3%	53.9%
<u>Employment and Earnings (prior to registration)</u>				
Employed at registration	17.7%	1.2%	16.5%	4.4%
Ave. percentage of (prior) quarters with employment ^a	63.5%	76.3%	63.1%	75.7%
Ave. quarterly earnings ^{a, b}	\$2,120	\$5,485	\$2,467	\$5,228
Mean, earnings trend ^c	-\$15.1	\$159.3	-\$6.8	\$113.5
Mean, earnings variance ^c (in 10 ⁶ \$)	\$3.1	\$14.1	\$5.0	\$11.8
Mean, number of quarters with job change ^b	3.3	2.6	3.8	2.7
Had earnings dip	60.1%	29.1%	56.8%	27.8%
Mean, number of quarters since dip at registration ^b	1.8	1.0	1.8	0.8
Ave. earnings dip ^b	60.1%	18.7%	46.3%	18.1%
Sample size	2,322	156,296	4,328	130,350

NOTE: All differences in means are statistically significant at the 0.05 level (t-test). Monetary data in 2000 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.

^bAverages include observations with values of zero.

^cTrend and variance calculations include quarters with zero earnings, if any.

intended to gauge the labor market history of individuals. The latter variables summarize the individuals' employment and earnings histories prior to registration with WIA (or with the Labor Exchange). Percent of quarters with employment measures the percentage of calendar quarters prior to registration for which we had historical data (back to approximately 1995) that the individual had earnings of over \$100.¹⁷ Average quarterly earnings is the average for quarters in which the individual had any earnings. Earnings trend is the slope coefficient on a straight line time trend of earnings prior to registration (including 0s). Earnings variance is the statistical variance of the quarterly earnings time series prior to registration. Larger variances suggest more instability in

¹⁷The numerator is the number of quarters with earnings that exceed \$100 ('00 \$) prior to registration; the denominator is potential number of quarters prior to registration that the individual could have had earnings. We started the "clock" for potential quarters in the earliest quarter in our data for which the individual had non-zero earnings.

earnings. Number of quarters with a job change is a measure of turnover. It is the number of quarters during the earnings histories prior to registration that the individual had a different employer from the previous quarter (the wage record data supplied by the state had a flag indicating different employer).

The last three variables refer to an earnings “dip” that may have occurred during the individual’s pre-registration earnings history. A “dip” is defined as a decrease in earnings of at least 20 percent from one quarter to the next. In addition to a dummy variable indicating the existence of such a dip, two other variables were entered in the model: number of quarters prior to registration at which the dip occurred and the percentage size of the dip.¹⁸

The table shows that the populations are quite dissimilar both in terms of demographic characteristics and labor market histories. In 2001/2002, almost 60 percent of the WIA clients who had exited were females as compared to about 40 percent of the Labor Exchange clients. Almost 20 percent had a disability when they registered for WIA, whereas only 3 percent of the Labor Exchange group had a disability. Almost 40 percent were receiving public assistance when they registered compared to just 3 percent. Almost 18 percent of the WIA exiters had been employed when they registered, and the average quarterly earnings for all WIA clients who had any earnings prior to registration was \$2,120 ('00 \$). Only about one percent of the Labor Exchange clients had been employed when they registered, but the average quarterly earnings prior to registration was \$5,485. Over 60 percent of the WIA clients had an earnings dip (defined as a quarter-to-quarter decrease in earnings of 20 percent or more), whereas less than 30 percent of the Labor Exchange clients had one.

¹⁸In the previous study, the participation models included several variables that described the pre-registration public assistance experience of the individuals. In this study, no pre-registration public assistance data were provided to us, so those variables had to be dropped from the models.

The populations were quite different in 2003/2004 as well. About 60 percent of the WIA clients were females as compared to 41 percent of the Labor Exchange clients. About 9 percent had a disability when they registered for WIA, whereas only 3 percent of the Labor Exchange group had a disability. About one-sixth of the WIA exiters had been employed when they registered; the average quarterly earnings for all WIA clients who had any earnings prior to registration was about \$2,500 ('00 \$). Only about four percent of the Labor Exchange clients had been employed when they registered, but their real average quarterly earnings prior to registration was \$5,228. Again, about 60 percent of the WIA adults had an earnings “dip,” whereas less than 30 percent of the Labor Exchange clients had one.

Participation Model

Table 3.2 provides the results from the logit estimation of participation in the WIA Title I-B adult program. More precisely, the adults (aged 22–60) who had exited from the Labor Exchange (but who had not received employment and training services in Washington) were pooled with the WIA adult clients who had exited. A “treatment” dependent variable was created; it was a dummy variable equal to 1 for the WIA participants (and 0 for the LE group). The “model” is not theoretically derived, and so inferences about causality should be cautiously formulated. The independent variables include the pre-registration employment and earnings variables, for which causality may be appropriate because they precede the participation outcome. The demographic variables, however, are control variables that likely have little causal influence.

The table provides the logit coefficient estimates and standard errors. While the magnitude of the coefficients is not easily interpreted, the sign and statistical significance are. If the coefficient is positive, then a change in the variable will increase the likelihood of participation. If the coefficient

Table 3.2 Coefficient Estimates from a Logit Model of Participation in WIA Title I-B Adult Programs

Characteristics	2001/2002		2003/2004	
	Coefficient	Std. Error	Coefficient	Std. Error
<u>Demographics and Education</u>				
Female	0.374***	0.052	0.176***	0.038
Minority	-0.179***	0.060	-0.196***	0.042
Age at registration	0.010***	0.002	0.002	0.002
Disability	1.957***	0.072	1.124***	0.064
Years of education, at registration	0.153***	0.011	0.121***	0.008
In school at registration	0.139	0.231	-2.437***	0.374
Veteran	0.067	0.086	-0.065	0.064
Limited English proficiency	0.801***	0.099	2.203***	0.066
On public assistance at registration	2.611***	0.056	-1.888***	0.071
West WA	-0.912***	0.049	-0.048	0.039
Urban county	-0.394***	0.050	-0.047	0.038
<u>Employment and Earnings (prior to registration)</u>				
Employed at registration	2.576***	0.074	1.107***	0.053
Percentage of quarters with employment	0.009***	0.001	0.0004	0.001
Average quarterly earnings ^a	-0.026***	0.002	-0.019***	0.001
Earnings trend ^a	-0.007*	0.004	-0.013***	0.004
Earnings variance ^b	0.206	0.192	0.205*	0.123
Number of quarters with job change	0.024***	0.008	0.058***	0.005
Had earnings dip	0.595***	0.128	-0.185*	0.097
Number of quarters since dip at registration	-0.122***	0.016	0.035***	0.012
Percent of earnings dip	1.166***	0.131	1.631***	0.098

NOTE: Model included last industry of employment prior to registration and an intercept term. Last industry of employment was coded at the "1 digit" level, i.e., Agriculture, forestry, fishing; Mining and construction; Manufacturing; Transportation, communication, and public utilities; Wholesale trade; Retail trade; Finance, insurance, and real estate; Services; and Public administration. Samples sizes were 158,618 and 134,678 for 2001/2002 and 2003/2004, respectively.

^aScaled in \$100 (2000 \$).

^bScaled in \$10⁸ (2000 \$)

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

is negative, then a (positive) change in that variable will decrease the likelihood of being a WIA exiter.

The coefficient estimates seem quite reasonable. The following variables are significantly correlated with being in the treatment group (i.e., a WIA adult exiter) in both years of data: Female, disability status, years of education, being on public assistance at time of registration (negative correlation in 2003/2004), limited English proficiency, being employed at registration, number of quarters with a job change (proxy for turnover), number of quarters between earnings dip and registration (negative correlation in 2001/2002), and size of the earnings dip. The following variables are significantly correlated with being in the Labor Exchange group (i.e., not being an individual who is served by the WIA Title I-B adult program): minority, being from Western

Washington (not significant in 2003/2004), being from an urban county (not significant in 2003/2004), average quarterly earnings prior to registration, and trend in earnings prior to registration (weakly significant in 2001/2002).

Propensity Score Statistics

The propensity score for an observation is the predicted probability using the estimated logit coefficients and the observation’s actual data. If the logit model has substantial predictive capability, then the mean propensity score for the comparison group should be small (near zero) and should be much less than the mean score for the treatment. A measure of how well the logit model discriminates between comparison group members and treatment group members is the cumulative percentile for the comparison group pool at the propensity score that is at the 20th percentile for the treatment group; a value of approximately 80 is “optimum.” Table 3.3 provides these data for the WIA Title I-B Adult analyses. Note that there is a considerable difference in the means between the WIA Adult and Labor Exchange samples, and the 20th percentile indicators have a relatively high value. The mean propensity scores for the treatment groups are roughly 0.20, whereas they are 0.01 and 0.03 for the comparison pool for 2001/2002 and 2003/2004, respectively. The 20th percentile indicators are approximately 80 percent, which suggest that the participation model performed well.

Table 3.3 Indicators of Propensity Score Model Quality for WIA Adult Analyses

Statistic	2001/2002	2003/2004
Mean p-score, WIA Adult	0.193	0.205
Mean p-score, Labor Exchange	0.012	0.026
Percentile Labor Exchange, at 20th percentile WIA Adult	82.37%	75.69%

Statistical Match

As described in the last chapter, two types of matching were done in this study: block matching and statistical matching. Block matching is a full sample matching technique. The statistical matching that was done used a “nearest neighbor” approach with the propensity score. For every observation j in T , we found the observation k in U that minimized the absolute value of the difference between the propensity score for j and k . We then added observation k to the comparison group sample, C . The statistical match was done with replacement, so some observations in U were the “matches” for more than one observation in the treatment group. Furthermore it was done with a caliper of 0.005.

Table 3.4 provides data about the sample sizes, number of matched observations that were duplicates, and a comparison of descriptive statistics between the treatment group and constructed comparison group for the statistical match. In matching with replacement, we are artificially reducing the variation in the matched comparison sample whenever the same observation is used multiple times. (This is the tradeoff that is made in order to get “better matches.”) Consequently, other things equal, matches would be preferred with a smaller number of observations that are used multiple times, and a smaller number of maximum matches. The table indicates that approximately 10 percent of the matched comparison group records are matched multiple times, and the maximum number of times for a record is 10 to 15 times.

It is also the case that there should be little non-random differences in characteristics between the treatment and matched comparison set. Table 3.4 presents the means of a number of variables in the treatment and matched comparison samples. Sample exclusions that account for the differences between the first two rows of the table were for observations that had missing data for any of the variables used in the match. Notice that means for the comparison group are quite close to the

Table 3.4 Matching Algorithm Statistics and Post-Match Comparison of Characteristics for WIA Adults

Statistic/Characteristic	2001/2002		2003/2004	
	WIA Adult	Labor Exchange	WIA Adult	Labor Exchange
Sample size	2,322	156,296	4,328	130,350
Sample size used in match	2,295	143,884	4,324	129,501
Matched sample size	2,295	2,295	4,324	4,324
Number of observations used once	—	1,709	—	3,080
Number of observations used multiple times	—	228	—	456
Maximum number of repeats	—	15	—	11
<u>Demographics and Education</u>				
Female	58.9%	58.4%	56.7%	56.2%
Minority	23.8%	21.7%	31.7%	32.8%
Mean, age at registration	36.6	36.5	36.7	36.9
Disability	17.6%	16.8	9.1%**	10.8%**
Mean, years of education, at registration	12.3	12.4	12.4	12.3
In school at registration	1.1%	0.7%	0.2%	0.2%
Veteran	10.3%	11.8%	8.3%	9.4%
Limited English proficiency	7.8%	7.4%	13.7%	14.2%
On public assistance at registration	38.2%	36.6%	10.1%**	13.5%**
West WA	48.8%	48.5%	61.5%**	58.5%**
Urban county	39.3%	40.4%	43.3%**	40.8%**
<u>Employment and Earnings (prior to registration)</u>				
Employed at registration	17.0%	17.3%	16.5%	17.4%
Percentage employed prior to registration	63.4%	61.6%	63.1%**	61.7%**
Average quarterly earnings ^a	\$2,126**	\$1,978**	\$2,467	\$2,391
Mean, earnings trend ^b	-\$15.8	-30.8	-6.8	-11.3
Mean, earnings variance ^b (in 10 ⁶ \$)	\$3.8	\$3.5	\$5.0	\$4.8
Mean, number of quarters with job change ^a	3.3	3.3	3.8	3.7
Had earnings dip	59.9%	61.2%	56.8%**	59.4%**
Mean, number of quarters since dip at registration ^a	1.8	1.8	1.8	1.8
Ave. earnings dip ^a	48.3%	49.7%	46.2%**	49.2%**
Sample size	2,295	2,295	4,324	4,324

NOTES: Monetary data in 2000 \$.

^aAverages include observations with values of zero.

^bTrend and variance calculations include quarters with zero earnings, if any.

** Difference in means is statistically significant at the 0.05 level (t-test).

treatment group as would be expected. Only a handful of characteristics had differences in means that were statistically significant.

Net Impacts

The major purpose of the study was, of course, to estimate the net impacts of the workforce development system programs on clients. In particular, net impacts were estimated for the following eight outcomes:

- employment
- hourly wage
- quarterly hours of employment
- quarterly earnings
- receipt and amount of Unemployment Compensation benefits per quarter
- receipt and amount of TANF benefits per quarter
- receipt and amount of Food Stamp benefits per quarter
- enrollment in Medicaid

Tables 3.5 and 3.6 provide the estimated net impacts for WIA Title I-B adult programs. The first table displays the short-term (3 quarters after exit) and the longer-term (9-12 quarters after exit) outcomes for the 2001/2002 cohort of program exiters. The second table is limited to the short-term net impacts for the 2003/2004 cohort. The first column in each of the tables presents the estimates from the block matching technique, which uses the full comparison set (i.e., *U*) and the treatment group. The second column presents a comparison of means between the treatment group and the matched comparison group. The third column presents an estimate from a regression adjustment of that mean. This column represents the preferred specification, although for some programs we use the levels of the outcome variables as the dependent variable and, for others, we use difference-in-differences. The coefficient estimates that are in “boxes” represent the final, “official” estimates using the preferred specification as chosen by WTECB staff. The final columns of the tables provide the means of the comparison group, both the full comparison group pool and the matched comparison group. These columns are provided so that the net impacts can be estimated on a percentage basis.

Table 3.5 shows the results for the analyses of the 2001/2002 cohort and table 3.6 provides the results for the 2003/2004 cohort. Our general strategy is to rely on the earlier cohort to provide the longer-term net impacts, and on the more cohort to provide the short-term impacts. However, as exhibited in the first table, we have also generated short-term impacts for the earlier cohort.

Table 3.5 Net Impact Estimates for WIA Adult Program for 2001/2002 Cohort

Outcome	Block Matching Estimator	Matched Sample Estimator		Comparison Group Means			
	Wtd. Diff. in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	9.6***	9.5***	9.7***	61.0	--	55.5	--
Ever-employed, longer term (%)	5.1***	6.4***	5.9***	68.4	--	61.4	--
Percent of quarters, longer term	6.0***	6.3***	5.7***	59.6	--	51.0	--
Percent of quarters, longer term, diff-in-diff	6.0***	5.5***	6.6***	-10.1	--	-5.6	--
Average hourly wage							
Short term (\$)	1.14***	1.09***	0.96***	10.43	16.90	7.09	12.59
Short term, diff-in-diff (\$)	1.18***	1.09***	1.29***	-0.41	-2.69	0.27	0.50
Longer term (\$)	0.57***	0.35	0.26	10.74	17.50	6.85	12.97
Longer term, diff-in-diff (\$)	0.61**	0.35	0.59**	-2.38	-0.37	0.04	1.04
Average quarterly hours							
Short term	51.4***	53.4***	50.8***	244.6	396.6	188.5	334.9
Short term, diff-in-diff	47.6***	45.5***	52.2***	-61.2	-24.9	1.4	24.3
Longer term	34.2***	37.4***	34.4***	257.0	401.3	190.4	336.7
Longer term, diff-in-diff	30.4***	29.5***	35.7***	-48.8	-19.8	3.3	37.6
Average quarterly earnings							
Short term (\$)	645***	626***	588***	4029	6534	2249	3995
Short term, diff-in-diff (\$)	599***	501***	614***	-1603	-650	185	481
Longer term (\$)	413***	421***	377***	4551	7049	2389	4186
Longer term, diff-in-diff (\$)	366***	296***	403***	-1081	-405	325	830
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-3.6***	-2.7***	-2.7***	27.1	--	13.9	--
Benefits, short term (\$)	-101.6***	-97.3***	-110.7***	754.9	2790.2	245.1	1763.7
Percent receiving, longer term	4.1***	4.7***	4.0***	12.9	--	10.5	--
Benefits, longer term (\$)	32.9***	40.0***	36.4***	88.9	1387.0	49.3	949.3
Public Assistance and Medicaid (average quarterly)							
Percent receiving, TANF, short term	-4.9***	-3.9***	-2.3***	2.0	--	10.8	--
TANF benefits, short term (\$)	-50.5***	-30.5***	-32.0***	20.6	1041.8	101.7	937.8
Percent receiving, TANF, longer term	0.3	1.0	0.7	2.3	--	9.1	--
TANF benefits, longer term (\$)	2.5	9.9	7.7	14.2	907.9	56.1	929.1
Percent receiving, FS, short term	-4.3***	-4.1***	-4.7***	7.1	--	28.5	--
FS benefits, short term (\$)	-39.0***	-32.5***	-35.7***	35.4	500.2	158.9	558.3
Percent receiving, FS, longer term	2.6**	3.0**	2.8**	10.1	--	29.5	--
FS benefits, longer term (\$)	3.1	11.7	8.1	36.4	461.0	127.0	523.6
Percent enrolled, Medicaid, short term	-4.8***	-5.7***	-7.5***	8.6	--	34.5	--
Percent enrolled, Medicaid, longer term	1.7	2.4*	2.0	9.0	--	27.0	--

NOTE: Monetary impacts in 2000 \$. See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 3.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 3.6 Net Impact Estimates for WIA Adult Program for 2003/2004 Cohort

Outcome	Block Matching Estimator		Matched Sample Estimator	Comparison Group Means			
	Wtd. Diff. in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	9.7***	9.3***	9.1***	62.8	--	58.5	--
Average hourly wage							
Short term (\$)	0.85***	0.84***	0.68***	9.70	15.29	7.23	12.2
Short term, diff-in-diff (\$)	1.79***	1.86***	1.90***	-3.82	-1.83	-0.76	-0.79
Average quarterly hours							
Short term	43.0***	41.8***	37.6***	257.0	404.9	223.6	376.4
Short term, diff-in-diff	56.3***	57.5***	59.8***	-64.5	-18.1	13.0	42.2
Average quarterly earnings							
Short term (\$)	396***	388***	317***	3883	6116	2691	4532
Short term, diff-in-diff (\$)	696**	708***	725***	-1974	-1101	-12	308
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	2.1***	2.0***	1.7***	6.4	--	5.0	--
Benefits, short term (\$)	22.1***	23.5***	21.9***	66.1	1036.5	38.2	767.6
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	0.0	-0.1	0.5**	2.9	--	5.5	--
TANF benefits, short term (\$)	-4.6	-5.4	-0.2	30.0	1017.5	54.7	998.3
Percent receiving FS, short term	4.1***	3.5***	5.1***	12.8	--	20.9	--
FS benefits, short term (\$)	16.8***	12.7**	20.8***	70.2	548.5	115.4	552.4
Percent enrolled Medicaid, short term	5.4***	5.0***	6.2***	12.3	--	20.5	--

NOTE: Monetary impacts in 2000 \$. See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 3.4.

*significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Note on unconditional versus conditional means. For many of the outcome variables, the issue of whether or not to use observations with values of 0 in the calculations of mean results arose. Means that are calculated without 0's are referred to as *conditional means*; means that include 0's are referred to as *unconditional means*. The reason to use conditional means is that many outcomes depend on whether or not an individual is in a particular status and on what occurs in that status. For example, to have quarterly earnings, an individual must be employed. If employed, the individual's earnings depend on hours worked and wage rates. If a program has impacts on the likelihood of

employment and on wage rates, then the unconditional level of earnings will confound both an employment and a wage rate effect. The conditional mean will not be influenced by the share of the treatment or comparison group that is employed. A similar argument can be made for the level of benefits received from a public assistance program. Benefits depend on being on the program and on the level of benefits received conditional of being on the rolls. The reason to rely solely on unconditional means is that we are interested in the effect of a program on the population that it serves. Furthermore, we are using the average or mean to measure that effect. Therefore the correct statistic is the unconditional mean. Both sets of impacts were estimated. In all of the tables and in the cost-benefit analysis, we use unconditional means. However, the conditional mean impacts are available from the authors on request.

The longer-term employment and earnings impacts that are shown in table 3.5 are positive and, for the most part, significant. The program results in more employment, a slightly higher average hourly wage, and more hours of work per quarter. Thus the overall earnings impact is positive and significant. The longer-term earnings impact is approximately 10 percent. The longer-term estimates in the table suggest an increase in the percent of individuals receiving UI benefits, and an increase in those benefits. Both of these estimates are significant. This longer-term outcome may result from more employment and higher levels of earnings. The longer-term impacts on public assistance have positive signs, but are not significant.

The short-term impacts on employment and earnings displayed in table 3.6 are also positive, and in fact, are larger than the longer-term impacts. The earnings impact of \$725 per quarter is approximately 15 percent of average earnings for the matched comparison group. The table also shows a short-term increase in UI take-up that is statistically significant, although somewhat smaller than the longer-term estimates. The major difference between the longer-term and short-term net

impacts is in the public assistance and Medicaid results. The short-term impacts, especially for Food Stamps and Medicaid, show a significant increase in the usage of these programs.

The results in these two tables suggest that in the short term, the WIA Title I-B Adult programs have large and significant positive effects on employment and earnings, but also large and significant effects on the take-up of food stamps and Medicaid. Both of these get attenuated in the longer-term. The comparison group closes some of the gap in employment and earnings, although it is still at a significant disadvantage, and the treatment group reduces somewhat its receipt of public assistance.

Subgroup Analyses

To test the effect of providing training to WIA Title I-B adult program participants, we estimated the net impact outcomes for the subgroup of individuals who received training. On the one hand, we might hypothesize that training will result in more positive outcomes. But on the other hand, one reason why participants don't get training is because they have been successful in finding employment. Tables 3.7 and 3.8 display the estimated net impacts for the preferred estimated outcomes (those highlighted in Tables 3.5 and 3.6) for individuals who did and did not receive "training services," as opposed to job search assistance or other "non-training" services only.

Interestingly, the longer term net impacts for individuals who received training are better than the impacts for those individual who did not receive training services. But the short term employment impacts are slightly worse. In other words, for the 2001/2002 cohort, the longer term employment, wage rate, and earnings net impacts for individuals who received training are greater in magnitude, on average, than those who did not receive training services. However, the entries in Table 3.8 tell the opposite story. Here the impacts for the participants who received training services

were smaller than for nonparticipants. These results can be interpreted as a positive result for training as an intervention because even though the short-term impacts of training are not as robust, over time, the impacts for individuals who received training become larger. Training seems to have a value that grows with time.

Table 3.7 Selected Longer-Term Net Impact Estimates for Subgroups of WIA Adult Participants: 2001/2002 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Participants who did not receive training	Participants with training	
Employment	4.2%**	8.1%**	51.0%
Hourly Wage	\$0.07	\$0.96**	\$6.85
Hours Worked	20.8**	46.9**	190.4
Earnings	\$181	\$567**	\$2,389
UI Receipt	3.1%**	5.3%**	10.5%
TANF Receipt	1.0%	0.5%	9.1%
Food Stamps Recipient	3.5%	2.6%	29.5%
Medicaid Eligibility	2.6%	1.5%	27.0%
Subgroup Sample Size	1,011	1,284	—

NOTE: Monetary data in '00 \$.

**Significant at 0.05 level (two-tailed test).

Table 3.8 Selected Short-Term Net Impact Estimates for Subgroups of WIA Adult Participants: 2003/3004 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Participants who did not receive training	Participants with training	
Employment	9.5%**	8.6%**	58.5%
Hourly Wage	\$2.04**	\$1.75**	\$7.23
Hours Worked	61.0**	57.2**	223.6
Earnings	\$613**	\$792**	\$2,691
UI Receipt	3.2%**	0.3%	5.0%
TANF Receipt	1.1%**	0.0%	5.5%
Food Stamps Receipt	6.3%**	4.1%**	20.9%
Medicaid Eligibility	6.4%**	6.1%**	20.5%
Subgroup Sample Size	2,087	2,237	—

NOTE: Monetary data in '00 \$.

**Significant at 0.05 level (two-tailed test).

4 WIA TITLE I-B DISLOCATED WORKERS

Over the period of analysis in this study, the Workforce Investment Act (WIA) Title I-B had a funding stream to serve dislocated workers, defined as individuals who lost jobs due to plant closures, company downsizing, or other significant change in the market such that they are unlikely to return to their occupation. The services that were provided to clients were identical to those provided to the Title I-B adult services described in the previous section. That is, they included, “core services:” skill assessment, labor market information, training program consumer reports, and job search and placement assistance. Dislocated workers unable to get jobs with core services are eligible for individualized attention through intensive and training services. In addition to the services for dislocated workers, this funding mechanism also established early intervention programs for workers and firms facing substantial layoffs. Although the services were similar, the clients who participated in this program were quite different from those who participated in the adult programs. Dislocated workers tended to have had substantial labor market attachment and much higher earnings levels and skill levels prior to their participation.

Participant Characteristics

Table 4.1 provides descriptive data that compare the individuals in the treatment group to those in the comparison group pool. The first two columns of numbers in the table compare the WIA dislocated worker clients who exited in 2001/2002 to individuals who exited from the Labor Exchange in the same year (except that individuals who were served by Washington’s education and training programs were removed from the data). The final two columns compare the WIA dislocated worker exiters in 2003/2004 to LE exiters in the same year. The comparison group pool for the WIA

Table 4.1 Descriptive Statistics for WIA Dislocated Worker Treatment Group and Comparison Group Universe

Characteristics	2001/2002		2003/2004	
	WIA Dislocated Workers	Labor Exchange	WIA Dislocated Workers	Labor Exchange
<u>Demographics and Education</u>				
Female	36.6%	38.8%	42.6% ^{††}	41.9% ^{††}
Minority	14.0%	26.0%	23.6%	28.6%
Mean, age at registration	41.2	36.0	41.4	36.5
Disability	7.7%	2.7%	3.2% ^{††}	2.8% ^{††}
Mean, years of education, at registration	12.8	12.0	13.2	12.3
In school at registration	0.5% ^{††}	0.5% ^{††}	—	—
Veteran	21.2%	8.6%	15.0%	10.2%
Limited English proficiency	4.2%	5.8%	5.9%	2.7%
On public assistance at registration	1.5%	3.7%	0.4%	12.1%
West WA	62.9%	76.6%	72.4%	69.9%
Urban county	44.6%	59.5%	55.2%	51.9%
<u>Employment and Earnings (prior to registration)</u>				
Employed at registration	8.7%	1.2%	4.1% ^{††}	4.5% ^{††}
Ave. percentage of (prior) quarters with employment ^a	89.3%	74.7%	87.4%	73.6%
Average quarterly earnings ^{a, b}	\$6,745	\$5,044	\$7,194	\$4,758
Mean, earnings trend ^c	\$71.8	\$157.6	\$61.3	\$112.3
Mean, earnings variance ^c (in 10 ⁶ \$)	\$12.5 ^{††}	\$12.8 ^{††}	\$16.7	\$10.7
Mean, number of quarters with job change ^b	2.1	2.5	2.9	2.7
Had earnings dip	50.4%	29.4%	54.6%	28.6%
Mean, number of quarters since dip at registration ^b	1.1	1.0	1.3	0.8
Ave. earnings dip ^b	35.5	19.2%	40.6%	19.2%
Sample size	3,001	174,958	5,616	147,600

NOTE: Monetary data in '00 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.

^bAverages include observations with values of zero.

^cTrend and variance calculations include quarters with zero earnings, if any.

^{††}Differences in means are not statistically significant at 0.05 level (t-test).

dislocated workers is not quite identical to the pool for the WIA Title I-B adults because we included individuals aged 18–21 at the time of exit in addition the observations over the age of 21.¹⁹

The populations had a few differences in their demographic and educational characteristics. Not surprisingly, the dislocated workers were older than the labor exchange participants. They were less likely to be a minority, slightly more likely to have a disability, and had higher average education levels. In terms of their labor market histories, the dislocated workers had higher levels of prior employment and average quarterly earnings. They were much likely to have experienced a dip in earnings, and the size of their earnings dip was significantly greater.

¹⁹We included individuals aged 18–20 because dislocated workers can be in this age range.

Participation Model

Table 4.2 provides the results from the logit estimation of participation. More precisely, the individuals who had exited from the Labor Exchange (but who had not received employment and training services in the Washington workforce development system) were pooled with the WIA Title I-B dislocated worker clients who had exited, and participation was a dummy variable equal to 1 for the latter group (and 0 for the former). The independent variables used in the model were identical to those used in the model of WIA Title I-B adult program participation as described in the preceding chapter. The table provides the logit coefficient estimates and standard errors.

Table 4.2 Coefficient Estimates from a Logit Model of Participation in WIA Dislocated Worker Analyses

Characteristics	2001/2002		2003/2004	
	Coefficient	Std. Error	Coefficient	Std. Error
<u>Demographics and Education</u>				
Female	0.326***	0.045	0.283***	0.033
Minority	-0.623***	0.061	-0.133***	0.037
Age at registration	0.017***	0.002	0.018***	0.001
Disability	0.877***	0.078	-0.169**	0.084
Years of education, at registration	0.196***	0.011	0.191***	0.008
In school at registration	0.008	0.264	—	—
Veteran	0.712***	0.054	0.284***	0.044
Limited English proficiency	0.577***	0.109	1.745***	0.078
On public assistance at registration	-0.078	0.160	-3.999***	0.213
West WA	-0.659***	0.043	-0.081**	0.036
Urban county	-0.559***	0.041	-0.124***	0.032
<u>Employment and Earnings (prior to registration)</u>				
Employed at registration	1.855***	0.078	-0.274***	0.075
Percentage of quarters with employment	0.020***	0.001	0.013***	0.001
Average quarterly earnings ^a	-0.002***	0.001	0.002***	0.000
Earnings trend ^a	-0.002	0.002	-0.004	0.002
Earnings variance ^b	-0.003	0.005	-0.176***	0.038
Number of quarters with job change	-0.051***	0.009	0.047***	0.005
Had earnings dip	0.827***	0.091	0.166**	0.071
Number of quarters since dip at registration	-0.256***	0.017	-0.071***	0.012
Percent of earnings dip	1.356***	0.103	1.802***	0.076

NOTE: Model included last industry of employment prior to registration and an intercept term. Samples sizes were 177,959 and 153,216 for 2001/2002 and 2003/2004, respectively.

^aScaled in \$100 ('00 \$).

^bScaled in \$10⁸ ('00 \$)

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

As we noted in chapter 3, the model is not really a formal model of participation, and the magnitudes of the coefficients are not particularly meaningful, but their signs and statistical significance are. If the coefficient is positive, then a change in that independent variable will increase the likelihood of being a WIA Title I-B dislocated worker. If the coefficient is negative, then a (positive) change in that variable will decrease the likelihood of being a WIA dislocated worker participant.

The coefficient estimates seem quite reasonable. The following variables are significantly correlated with being in the treatment group (i.e., a dislocated worker) in both years of data: Female, age at registration, years of education, veteran status, limited English proficiency, percent employed, having experience an earnings dip, and the magnitude of the earnings dip. The following variables are significantly correlated with being in the Labor Exchange group: being a minority, being on public assistance at the time of registration (not significant in 2001/2002), being from Western Washington, residing in an urban county, earnings variance (not significant in 2001/2002), and number of quarters between the earnings dip and registration.

Propensity Score Statistics

The propensity score for an observation is the predicted probability using the estimated coefficients and the observation's actual data. If the logit model has substantial predictive capability, then the mean propensity score for the comparison group should be small (near zero) and should be much less than the mean score for the treatment. As argued earlier, a measure of how well the logit model discriminates between comparison group members and treatment group members is the cumulative percentile for the comparison group at the propensity score that is the 20th percentile; a value of approximately 80 indicates a "good model." Table 4.3 provides these indicators for the

WIA Title I-B dislocated worker analyses. There is a considerable difference in the means. The mean propensity scores for the treatment groups are between 0.10 and 0.15, whereas they are 0.015 and 0.032 for the comparison pool in 2001/2002 and 2003/2004, respectively. The 20th percentile indicators are reasonably large, although they do not achieve the 80 percent threshold—only 75 percent in 2001/2002 and 68 percent in 2003/2004. These statistics suggest that the participation model does not discriminate quite as well as the model for WIA Title I-B adults.

Table 4.3 Indicators of Propensity Score Model Quality for WIA Dislocated Worker Analyses

Statistic	2001/2002	2003/2004
Mean p-score, WIA Dislocated Worker	0.104	0.148
Mean p-score, Labor Exchange	0.015	0.032
Percentile Labor Exchange, at 20th percentile WIA Dislocated Worker	75.2%	68.0%

Statistical Match

The statistical matching that was done used a “nearest neighbor” approach with the propensity score. For every observation j in T , we found the observation k in U that minimized the absolute value of the difference between the propensity score for j and k . We then added k to the comparison group sample. The statistical match was done with a caliper, but also with replacement, so some observations in U were the “matches” for more than one observation in the treatment group and were duplicated in the match comparison set. Table 4.4 provides data about the sample sizes, number of matched observations that were duplicates, and a comparison of descriptive statistics between the treatment group and constructed comparison group. Again, we had around 10 percent of the matches with multiple copies of the comparison group record—just under 200 in the 2001/2002 analysis and 500 in the 2003/2004 analysis, which had a larger treatment group. Notice

that means for the comparison group are quite close to the treatment group as would be expected. Only a few variables have differences in means that are significant. Sample exclusions that account for the differences between the first two rows of the table were for observations that had missing data for any of the variables used in the participation logit estimation.

Table 4.4 Matching Algorithm Statistics and Post-Match Comparison of Characteristics for WIA Dislocated Worker Analyses

Statistic/Characteristic	2001/2002		2003/2004	
	WIA Dislocated Workers	Labor Exchange	WIA Dislocated Workers	Labor Exchange
Sample size	3,001	174,958	5,616	147,600
Sample size used in match	3,001	169,334	5,616	145,951
Matched sample size	2,989	2,753	5,608	4,894
Number of observations used once	—	2,556	—	4,394
Number of observations used multiple times	—	197	—	500
Maximum number of repeats	—	4	—	11
<u>Demographics and Education</u>				
Female	36.7%	36.3%	42.5%	40.9%
Minority	14.1%	15.0%	23.6%	23.1%
Mean, age at registration	41.2	41.4	41.4	41.5
Disability	7.6%	7.7%	3.2%	3.0%
Mean, years of education, at registration	12.8	12.8	13.2	13.2
In school at registration	0.5%	0.6%	—	—
Veteran	21.0%	22.6%	15.0%	16.1%
Limited English proficiency	4.2%	4.0%	5.8%	5.8%
On public assistance at registration	1.5%	1.2%	0.4%	0.7%
West WA	62.9%**	60.4%**	72.5%	72.0%
Urban county	44.7%	43.4%	55.2%	53.5%
<u>Employment and Earnings (prior to registration)</u>				
Employed at registration	8.4%	8.5%	4.1%	4.5%
Percentage employed prior to registration	89.2%	89.0%	87.3%**	86.5%**
Average quarterly earnings ^a	\$6,735	\$6,666	\$7,192	\$7,036
Mean, earnings trend ^b	\$72.0	\$85.6	\$61.3	\$44.0
Mean, earnings variance ^b (in 10 ⁶ \$)	\$12.5	\$13.0	\$16.7	\$15.8
Mean, number of quarters with job change ^a	2.1	2.1	2.9	3.0
Had earnings dip	50.3%	51.0%	54.5%**	56.4%**
Mean, number of quarters since dip at registration ^a	1.1	1.2	1.3	1.3
Ave. earnings dip ^a	35.3%	35.8%	40.5%**	42.7%**
Sample size	2,989	2,989	5,608	5,608

NOTES: Monetary data in '00 \$.

^aAverages include observations with values of zero.

^bTrend and variance calculations include quarters with zero earnings, if any.

** Difference in means is statistically significant at the 0.05 level (t-test).

Net Impacts

One of the major purposes of the study was to estimate the net impacts of the education and training programs on clients. Tables 4.5 and 4.6 provide the estimated net impacts for the WIA Title I-B dislocated workers. The first table displays the short-term (3 quarters after exit) and the longer-term (9-12 quarters after exit) outcomes for the 2001/2002 cohort of program exiters. The second table is limited to the short-term net impacts for the 2003/2004 cohort. The first column in each of the tables presents the estimates from the block matching technique, which uses the full comparison set (i.e., *U*) and the treatment group. The second column presents a comparison of means between the treatment group and the matched comparison group. The third column presents an estimate from a regression adjustment of that mean. This column represents the preferred specification, and note for this program we use the levels of the outcome variables as the dependent variable because the base for the difference-in-difference estimators would involve a period of time when these workers were likely to have lost their jobs. The coefficient estimates that are in “boxes” represent the final, “official” estimates using the preferred specification as chosen by WTECB staff. The final columns of the tables provide the means of the comparison group, both the full comparison group pool and the matched comparison group. These columns are provided so that the net impacts can be estimated on a percentage basis.

The results in Table 4.6 show that in the short term, the WIA dislocated worker clients increase their employment rates, average hourly wages, and hours of work. The significant increases in employment, wage rates, and hours worked combine to yield a large increase in quarterly earnings. The net impact is almost \$1,000, which represents an impact of 15 to 20 percent. Note that the short-term net impact estimators suggest a decrease in the take-up of public assistance benefits and Medicaid enrollment.

Table 4.5 Net Impact Estimates for WIA Title I-B Dislocated Worker Program for 2001/2002 Cohort

Outcome	Block	Matched Sample	Comparison Group				
	Matching	Estimator	Means				
	Estimator	Estimator	Regr.	Full Sample		Matched Sample	
	Wtd. Diff. in	Diff. in	Adj.	With 0	W/O 0	With 0	W/O 0
	Means	Means					
Employment							
Short term (%)	9.7***	8.6***	8.7***	61.3	--	65.3	--
Ever-employed, longer term (%)	6.3***	5.3***	5.0***	68.6	--	73.7	--
Percent of quarters, longer term	8.1***	6.7***	6.4***	59.5	--	64.7	--
Percent of quarters, longer term, diff-in-diff	2.1**	0.2	0.1	-8.4	--	-19.2	--
Average hourly wage							
Short term (\$)	1.19***	0.98***	0.90***	10.09	16.28	10.85	16.47
Short term, diff-in-diff (\$)	0.35	-0.10	-0.04	-2.18	-0.16	-4.71	-0.92
Longer term (\$)	1.09***	1.01***	0.86***	10.37	16.90	10.88	16.39
Longer term, diff-in-diff (\$)	0.25	-0.07	-0.09	-1.90	-0.04	-4.68	-1.45
Average quarterly hours							
Short term	65.6***	59.0***	58.4***	242.4	391.1	270.9	411.1
Short term, diff-in-diff	16.5***	5.5	6.8	-47.7	-14.2	-109.2	-29.6
Longer term	54.7***	50.4***	48.8***	254.2	396.8	283.2	405.9
Longer term, diff-in-diff	5.7	-3.1	-2.7	-35.9	-7.9	-97.0	-33.4
Average quarterly earnings							
Short term (\$)	819***	714***	677***	3855	6221	4315	6547
Short term, diff-in-diff (\$)	312***	118	150	-1327	-438	-2606	-993
Longer term (\$)	715***	744***	684***	4361	6747	4626	6590
Longer term, diff-in-diff (\$)	208*	149	155	-821	-156	-2295	-1149
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-14.4***	-13.5***	-13.2***	25.3	--	28.8	--
Benefits - short term (\$)	-472.3***	-450***	-457.0**	690.3	2730.6	781.9	2711.2
			*				
Percent receiving, longer term	1.2*	1.2	1.3	12.6	--	14.1	--
Benefits - longer term (\$)	33.8***	30.5***	29.8***	84.4	1357.2	89.8	1276.0
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	-0.2	-0.2	-0.01	2.2	--	1.1	--
TANF benefits - short term (\$)	-3.4*	-0.6	-0.9	22.8	1020.6	9.0	816.4
Percent receiving TANF, longer term	-0.2	-0.4	-0.1	2.6	--	1.8	--
TANF benefits - longer term (\$)	-0.4	-0.3	-0.8	16.0	894.9	10.0	910.6
Percent receiving FS, short term	-1.3***	-2.0***	-0.8**	7.4	--	6.1	--
FS benefits - short term (\$)	-6.7***	-10.6***	-10.6***	36.6	497.3	29.4	480.1
Percent receiving FS, longer term	-1.9***	-2.0***	-0.6	10.7	--	8.3	--
FS benefits - longer term (\$)	-6.3***	-7.5**	-7.8**	38.2	462.8	29.2	444.5
Percent enrolled, Medicaid, short term	-2.2***	-2.5***	-0.9***	9.8	--	7.1	--
Percent enrolled, Medicaid, longer term	-2.1***	-2.3***	-0.8*	10.3	--	7.8	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 4.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 4.6 Net Impact Estimates for WIA Title I-B Dislocated Worker Program for 2003/2004 Cohort

Outcome	Block Matching Estimator	Matched Sample Estimator		Comparison Group Means			
	Wtd. Diff in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	11.3***	11.6***	11.6***	62.7	--	63.4	--
Average hourly wage							
Short term (\$)	1.74***	1.88***	1.75***	9.33	14.71	10.57	16.49
Short term, diff-in-diff (\$)	1.65***	1.40***	1.57***	-3.19	-1.49	-7.30	-3.19
Average quarterly hours							
Short term	71.1***	72.1***	70.1***	253.2	399.0	260.1	406.0
Short term, diff-in-diff	39.1***	33.6***	36.7***	-47.6	-5.2	-115.1	-20.0
Average quarterly earnings							
Short term (\$)	997***	1050***	990***	3696	5825	4248	6633
Short term, diff-in-diff (\$)	923***	742***	860***	-1629	-829	-3533	-1737
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	2.0***	2.2***	2.1***	6.1	--	6.7	--
Benefits, short term (\$)	38.1***	41.1***	39.7***	61.2	1005	78.7	1177.3
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	-0.5***	-0.5**	-0.2**	3.4	--	1.2	--
TANF benefits, short term (\$)	-4.3***	-6.4***	-6.4***	34.3	998.1	13.5	1133.9
Percent receiving FS, short term	-2.8***	-3.0***	-1.2***	13.7	--	8.2	--
FS benefits, short term (\$)	-11.3***	-10.5***	-9.9***	75.6	553.5	37.0	450.5
Percent enrolled Medicaid, short term	-1.6***	-1.5***	-0.4	14.2	--	7.5	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 4.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

The longer-term impacts displayed in Table 4.5 are similar to the short-term net impacts, although they are smaller in size. The short-term employment impact is 11.6 percentage points, whereas the longer-term net impact is only 6.4 percentage points. The short-term net impacts for the average hourly wage and average quarterly hours of employment are \$1.75 and 70.1 hours, whereas the longer-term impacts are \$0.86 and 48.8 hours. The longer-term net impact for average quarterly earnings turns out to be a little under \$700, or about 10 to 12 percent. Finally, as with the short-term net impacts, the longer-term estimates show reductions in TANF and Food Stamp reciprocity and in Medicaid enrollment.

Subgroup Analyses

About two-thirds of the WIA dislocated worker participants were coded in the administrative data as having received training. Tables 4.7 and 4.8 display the net impact estimates for that subgroup along with the estimates for the subgroup that did not receive training. In the subgroup analyses for WIA Title I-B adults presented in chapter 3, we showed that the short-term net impacts for individuals with training were not as positive as the impact for nonparticipants, but then the longer-term impacts were more positive. This suggested that the payoff to training takes a few quarters to be realized. A quite different pattern is displayed in the tables presented here. In table 4.8, there is very little difference in short term impacts between those with training, and those without training. But table 4.7 shows that the longer-term net impacts for participants with training are positive, but much smaller in magnitude than for nonparticipants. So unlike the analyses in chapter 3, the subgroup estimates show that dislocated workers with training start out on par those that don't receive training, but in the longer-term, the former end up with smaller (positive) net impacts.

Table 4.7 Selected Longer-Term Net Impact Estimates for Subgroups of WIA Dislocated Worker Participants: 2001/2002 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Participants who did not receive training	Participants with training	
Employment	9.9% **	4.2% **	64.7%
Hourly Wage	\$1.79	\$0.36	\$10.88
Hours Worked	74.3**	33.2**	283.2
Earnings	\$1,300**	\$313**	\$4,626
UI Receipt	2.1%	0.8%	14.1%
TANF Receipt	-0.2%	0.0%	1.8%
Food Stamps Recipient	-1.2%	-0.2%	8.3%
Medicaid Enrollment	-1.4%**	-0.2%	7.8%
Subgroup Sample Size	1,139	1,850	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

Table 4.8 Selected Short-Term Net Impact Estimates for Subgroups of WIA Dislocated Worker
Participants: 2003/2004 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Participants who did not receive training	Participants with training	
Employment	11.0% **	11.6% **	63.4%
Hourly Wage	\$1.67**	\$1.72**	\$10.57
Hours Worked	69.4**	69.3**	260.1
Earnings	\$1,021**	\$958**	\$4,248
UI Receipt	3.5% **	1.0%	6.7%
TANF Receipt	-0.1%	-0.1%	1.2%
Food Stamps Receipt	-0.6%	-1.4% **	8.2%
Medicaid Enrollment	0.1%	-0.6%	7.5%
Subgroup Sample Size	1,807	3,801	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

5 WIA TITLE I-B YOUTH PROGRAMS

The Workforce Investment Act (WIA) Title I-B youth programs prepare low-income youth ages 14 to 21 for academic and employment success. Youth are assessed to determine academic, skill level, and support service needs. Staff members work with each young person to develop a plan that may encompass counseling, tutoring, job training, mentoring, or work experience. Other strategies include summer employment, study skills training, or basic skills instruction in preparation for obtaining a GED. Youth ages 18 to 21 may be co-enrolled in WIA Title I-B adult programs. At least 30 percent of the funding must be used to provide activities for out-of-school youth.

To participate, youth must be low income (TANF or Food Stamp recipient, homeless, or family income below 70 percent of the lower living standard income level) and must have an educational deficiency.

Participant Characteristics

Table 5.1 provides descriptive data that compare the individuals in the treatment group to those in the comparison group pool. The first two columns of numbers compare the WIA youth clients who exited in 2001/2002 to individuals under 22 who exited from the Labor Exchange in the same year (except that individuals who were served by Washington's education and training programs were removed from the data). The final two columns compare the WIA youth program exiters in 2003/2004 to LE exiters in the same year.

The populations were dissimilar. In particular, the WIA youth were quite a bit younger (by almost two years on average) than the LE exiters. Consequently, they were more likely to be in school at the time of program registration – about 60 percent as opposed to less than 10 percent– and

Table 5.1 Descriptive Statistics for WIA Youth Treatment Group and Comparison Group Universe

Characteristics	2001/2002		2003/2004	
	WIA Youth	Labor Exchange	WIA Youth	Labor Exchange
<u>Demographics and Education</u>				
Female	49.3%	41.8%	52.8%	46.7%
Minority	44.9%	33.8%	42.4%	62.4%
Mean, age at registration	17.0	19.0	17.2	18.8
Disability	19.9%	1.1%	16.0%	1.2%
Mean, years of education, at registration	9.6	11.1	9.9	11.3
In school at registration	59.6%	4.9%	57.6%	8.7%
Limited English proficiency	9.1% ^{††}	9.7% ^{††}	5.8%	2.4%
On public assistance at registration	31.5%	6.9%	14.8%	24.2%
West WA	60.2%	67.5%	53.5% ^{††}	55.3% ^{††}
Urban county	49.4% ^{††}	47.3% ^{††}	40.7%	35.1%
<u>Employment and Earnings (prior to registration)</u>				
Employed at registration	7.4%	1.5%	6.7%	5.5%
Ave. percentage of (prior) quarters with employment ^a	28.3%	56.0%	25.7%	51.5%
Average quarterly earnings ^{a, b}	\$301	\$1,269	\$311	\$1,075
Mean, earnings trend ^c	-\$19.0	\$119.6	-\$9.8	\$80.0
Mean, earnings variance ^c (in 10 ⁶ \$)	\$0.3	\$1.9	\$0.4	\$1.7
Mean, number of quarters with job change ^b	0.8	2.0	0.8	1.8
Had earnings dip	32.6%	29.1%	29.9%	31.9%
Mean, number of quarters since dip at registration ^b	1.0 ^{††}	0.9 ^{††}	0.9 ^{††}	1.0 ^{††}
Ave. earnings dip ^b	28.8%	22.2%	26.4% ^{††}	25.9% ^{††}
Sample size	2,168	24,203	3,435	22,143

NOTE: Monetary data in '00 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.

^bAverages include observations with values of zero.

^cTrend and variance calculations include quarters with zero earnings, if any.

^{††}Differences in means are not statistically significant at 0.05 level (t-test).

they had less prior employment and earnings. They averaged fewer years of education, and a larger share of them were females. In 2001/2002, about 50 percent of the WIA youth program exiters were females as compared to 42 percent of the Labor Exchange leavers, and in 2003/2004, the difference was about 53 percent to 47 percent. Interestingly, between one-sixth and one-fifth of the WIA participants were reported to have a disability compared to only 1 percent of the comparison group pool.

In 2001/2002, about 45 percent of the WIA youth were minorities, whereas only about one-third of the Labor Exchange exiters were minorities. Furthermore, over 30 percent of the treatment group were in public assistance units at the time of registration compared to less than seven percent. However, these characteristics were substantially different for the 2003/2004 populations. In this

later cohort, there were more minorities and individuals in public assistance units in the labor exchange group than in the WIA youth programs group.

The data on employment and earnings prior to registration showed the largest differences between the two populations. The individuals who had encountered the labor exchange had been employed in over half of their quarters prior to registration, whereas the WIA youth had around 25 percent of their prior quarters with employment. The average quarterly earnings for the labor exchange groups were \$1,269 and \$1,075 ('00\$) in 2001/2002 and 2003/2004 respectively as compared to \$301 and \$311 for the WIA youth. Furthermore, the turnover statistic was quite a bit higher for the labor exchange group.

Participation Model

Table 5.2 provides the results from the logit estimation of participation. Again, the individuals who had exited from the Labor Exchange (but who had not received employment and training services in Washington) were pooled with the WIA Title I-B youth clients who had exited and participation was a dummy variable equal to 1 for the latter group (and 0 for the former). The table provides the logit coefficient estimates and standard errors. The magnitudes of the coefficients are not particularly meaningful, but the sign and statistical significance are. If the coefficient is negative, then a (positive) change in that variable will decrease the likelihood of being a WIA II-C participant.

The coefficient estimates seem quite reasonable. The following variables are significantly correlated with being in the treatment group (i.e., a WIA participant) in both years of data: Having a disability, being enrolled in school when registered, limited English proficiency (not significant in

Table 5.2 Coefficient Estimates from a Logit Model of Participation in WIA Youth

Characteristics	2001/2002		2003/2004	
	Coefficient	Std. Error	Coefficient	Std. Error
<u>Demographics and Education</u>				
Female	-0.034	0.062	0.229***	0.048
Minority	0.417***	0.064	-0.017	0.048
Age at registration	-0.249***	0.020	-0.248***	0.017
Disability	2.987***	0.118	2.028***	0.101
Years of education, at registration	-0.095***	0.010	-0.212***	0.010
In school at registration	2.626***	0.070	1.880***	0.052
Limited English proficiency	0.037	0.111	0.611***	0.113
On public assistance at registration	1.779***	0.075	-1.183***	0.064
West WA	-0.240***	0.066	-0.016	0.051
Urban county	0.333***	0.066	0.597***	0.053
<u>Employment and Earnings (prior to registration)</u>				
Employed at registration	1.915***	0.134	0.431***	0.093
Percentage of quarters with employment	-0.0004	0.002	-0.004***	0.001
Average quarterly earnings ^a	-0.060***	0.009	-0.036***	0.005
Earnings trend ^a	-0.029**	0.000	-0.016*	0.009
Earnings variance ^b	-1.690	3.050	0.360	0.980
Number of quarters with job change	-0.014	0.021	0.013	0.016
Had earnings dip	0.717***	0.243	0.395**	0.192
Number of quarters since dip at registration	-0.082***	0.028	-0.015	0.022
Percent of earnings dip	0.127	0.243	-0.015	0.193

NOTE: Model included last industry of employment prior to registration and an intercept term. Samples sizes were 26,371 and 25,578 for 2001/2002 and 2003/2004, respectively.

^aScaled in \$100 ('00 \$).

^bScaled in \$10⁸ ('00 \$)

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

2001/2002), residing in an urban county, being employed at registration, and having experienced an earnings dip. The following variables are significantly correlated with being in the Labor Exchange group: age at registration, years of education, residing in western Washington (not significant in 2003/2004), average earnings prior to registration, and trend in earnings prior to registration.

Propensity Score Statistics

The propensity score for an observation is the predicted probability using the estimated coefficients and the observation's actual data. If the logit model has substantial predictive capability, then the mean propensity score for the comparison group should be small (near zero) and should be much less than the mean score for the treatment. The mean p-score for the treatment group is 0.47 in 2001/2002, which is over nine times larger than the mean for the comparison pool—0.05. For the

2003/2004 data, the difference is also substantial although not as dramatic, 0.44 to 0.09. As argued earlier, a measure of how well the logit model discriminates between comparison group members and treatment group members is the cumulative percentile for the comparison group at the propensity score that is the 20th percentile. Table 5.3 provides these data for the WIA I-B youth analyses. These indicators are reasonably exceed 80 percent suggesting a good model; it discriminates well between treatment and control.

Table 5.3 Indicators of Propensity Score Model Quality for WIA Youth Analyses

Statistic	2001/2002	2003/2004
Mean p-score, WIA Youth	0.47	0.439
Mean p-score, Labor Exchange	0.047	0.087
Percentile Labor Exchange, at 20th percentile WIA Youth	84.80%	80.21%

Statistical Match

The statistical matching algorithm used a nearest neighbor approach with the propensity score. For every observation j in T , we found the observation k in U that minimized the absolute value of the difference between the propensity score for j and k . We then added k to the comparison group sample as long as it was within the length of the caliper. The statistical match was done with replacement, so some observations in U were the “matches” for more than one observation in the treatment group and were duplicated. Table 5.4 provides data about the sample sizes, number of matched observations that were duplicates, and a comparison of descriptive statistics between the treatment group and constructed comparison group. Duplication occurred quite a bit in the statistical matches for this program. In 2001/2002, over a quarter of the records used in the match had multiple

Table 5.4 Matching Algorithm Statistics and Post-Match Comparison of Characteristics for WIA Youth

Statistic/Characteristic	2001/2002		2003/2004	
	WIA Youth	Labor Exchange	WIA Youth	Labor Exchange
Sample size	2,168	24,203	3,435	22,143
Sample size used in match	2,168	23,982	3,435	22,077
Matched sample size	1,974	1,050	3,424	1,737
Number of observations used once	—	782	—	1,179
Number of observations used multiple times	—	268	—	558
Maximum number of repeats	—	203	—	29
Demographics and Education				
Female	50.8%**	47.4%**	52.7%**	50.1%**
Minority	43.9%**	62.4%**	42.3%	49.9%
Mean, age at registration	17.1	17.2	17.2	17.3
Disability	13.4%	12.4%	15.9%	14.6%
Mean, years of education, at registration	9.7	9.8	9.9**	9.7**
In school at registration	55.7%	56.1%	57.4%	57.7%
Limited English proficiency	9.3%**	4.7%**	5.8%**	4.1%**
On public assistance at registration	30.4%**	22.1%**	14.8%	16.2%
West WA	60.0%**	56.0%**	53.4%	52.3%
Urban county	47.4%**	42.0%**	40.6%	39.4%
Employment and Earnings (prior to registration)				
Employed at registration	7.1%**	15.6%**	6.7%**	8.1%**
Percentage employed prior to registration	29.3%**	33.7%**	25.8%	25.4%
Average quarterly earnings ^a	\$318**	\$360**	\$311	\$290
Mean, earnings trend ^b	-\$15.1**	-\$48.7**	-\$9.7	-\$13.4
Mean, earnings variance ^b (in 10 ⁶ \$)	\$0.4	\$0.4	\$0.4	\$0.4
Mean, number of quarters with job change ^a	0.8**	1.0**	0.8	0.8
Had earnings dip	32.5%**	40.1%**	29.9%	30.3%
Mean, number of quarters since dip at registration ^a	1.0**	1.1**	0.9	0.9
Ave. earnings dip ^a	28.5%**	34.9%**	26.3%	26.2
Sample size	1,974	1,974	3,424	3,424

NOTES: Monetary data in '00 \$.

^aAverages include observations with values of zero.

^bTrend and variance calculations include quarters with zero earnings, if any.

** Difference in means is statistically significant at the 0.05 level (t-test).

observations, including one record that was used 203 times! In the 2003/2004 match, about one-third of the matched comparison group records had multiple observations.

In general, the statistical matches for this program were not as close in terms of characteristics as most of the other matches. In the 2001/2002 analysis, only five of the characteristics displayed in the data have means that are statistically indistinguishable. The 2003/2004 match does much better—in this case, only four variables in the table have means that are different. It appears as though the strength of the disability variable in the logit caused a lot of “weight” to be placed on that variable, so the relatively few observations in the comparison group

pool with a disability were probably used multiple times. Again, missing data caused the sample size used for matching purposes to be slightly smaller than the overall sample size.

Net Impacts

Tables 5.5 and 5.6 provide the estimated net impacts of the WIA Title I-B youth programs on clients. As with comparable tables in the prior chapters, the first table displays the short-term (3 quarters after exit) and the longer-term (9-12 quarters after exit) outcomes for the 2001/2002 cohort of program exiters. The second table is limited to the short-term net impacts for the 2003/2004 cohort. The first column in each of the tables presents the estimates from the block matching technique, which uses the full comparison set (i.e., U) and the treatment group. The second column presents a comparison of means between the treatment group and the matched comparison group. The third column presents an estimate from a regression adjustment of that mean. This column represents the preferred specification, and for this program, we use the levels of the outcome variables as the dependent variable. The coefficient estimates that are in “boxes” represent the final, “official” estimates using the preferred specification as chosen by WTECB staff. The final four columns of the tables provide the means of the comparison group, both the full comparison group pool and the matched comparison group. These columns are provided so that the net impacts can be estimated on a percentage basis.

The estimated net impacts of the WIA Youth programs in the short term given in Table 5.6 are negative for the most part. Employment, hourly wages, and hours of employment net impacts are all negative, which combine to produce reductions in quarterly earnings of almost \$235 ('00\$).

Table 5.5 Net Impact Estimates for WIA Youth Program for 2001/2002 Cohort

Outcome	Block Matching Estimator	Matched Sample Estimator		Comparison Group Means			
	Wtd. Diff in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	0.1	0.4	4.2**	60.8	--	44.6	--
Ever-employed, longer term (%)	9.0***	9.7***	12.0***	69.8	--	59.9	--
Percent of quarters, longer term	6.0***	7.4***	10.3***	57.7	--	44.2	--
Percent of quarters, longer term, diff-in-diff	11.4***	14.4***	12.9***	11.0	--	17.4	--
Average hourly wage							
Short term (\$)	-0.42	-0.18	0.17	6.91	11.13	4.27	9.33
Short term, diff-in-diff (\$)	0.09	0.50**	0.52**	2.25	1.96	1.97	1.97
Longer term (\$)	0.08	0.24	0.68***	7.07	11.76	4.81	9.97
Longer term, diff-in-diff (\$)	0.60**	0.92***	1.03***	2.41	2.78	2.51	2.98
Average quarterly hours							
Short term	1.2	-6.2	4.7	208.8	336.3	126.7	276.9
Short term, diff-in-diff	10.3	6.0	9.2	70.5	79.8	77.8	124.6
Longer term	12.0	18.2***	31.1***	222.4	349.6	143.0	279.3
Longer term, diff-in-diff	21.0***	30.4***	35.6***	84.1	100.2	94.2	148.8
Average quarterly earnings							
Short term (\$)	-55	-55	57	2237	3602	1091	2385
Short term, diff-in-diff (\$)	14	36	91*	945	1347	728	1338
Longer term (\$)	65	144**	288***	2642	4099	1385	2649
Longer term, diff-in-diff (\$)	135*	234**	321***	1350	1978	1022	1832
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-0.4	-0.5	-0.2	9.2	--	2.2	--
Benefits - short term (\$)	-6.9*	-8.0	-5.7	134.4	1466.1	23.4	1048.3
Percent receiving, longer term	1.0	0.1	1.0*	9.0	--	6.1	--
Benefits - longer term (\$)	0.2	-2.9	0.6	43.5	1012.8	22.5	678.4
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	2.4	1.8*	-1.1	4.6	--	11.0	--
TANF benefits - short term (\$)	47.9***	40.2***	4.1	43.6	945.2	104.7	948.0
Percent receiving TANF, longer term	1.6	8.1	-0.1	5.6	--	12.8	--
TANF benefits - longer term (\$)	22.9**	29.4***	16.6**	32.8	850.7	63.0	855.8
Percent receiving FS, short term	6.5***	6.9***	4.3***	10.1	--	19.8	--
FS benefits - short term (\$)	53.0***	52.5***	29.1***	50.7	499.8	109.2	551.3
Percent receiving FS, longer term	10.7***	10.0***	9.0***	15.6	--	24.3	--
FS benefits - longer term (\$)	47.7***	51.4***	37.5***	55.6	476.7	86.9	472.6
Percent enrolled Medicaid, short term	9.0***	10.0***	8.7***	21.9	--	39.8	--
Percent enrolled Medicaid, longer term	6.8***	7.0***	6.5***	22.2	--	36.6	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 5.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 5.6 Net Impact Estimates for WIA Youth Program for 2003/2004 Cohort

Outcome	Block Matching Estimator	Matched Sample Estimator	Regr. Adj.	Comparison Group Means			
	Wtd. Diff in Means	Diff. in Means		Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	-1.0	0.1	-0.4	60.2	--	48.7	--
Average hourly wage							
Short term (\$)	-0.31**	-0.21	-0.26*	6.32	10.27	4.60	9.22
Short term, diff-in-diff (\$)	-0.17	-0.16	-0.18	2.09	1.29	2.95	1.42
Average quarterly hours							
Short term	-18.7***	-10.7**	-13.0***	213.7	347.4	147.2	295.3
Short term, diff-in-diff	-14.9***	-6.9	-7.9*	92.5	108.8	108.7	145.5
Average quarterly earnings							
Short term (\$)	-255***	-222***	-235***	2172	3530	1389	2787
Short term, diff-in-diff (\$)	-239***	-204***	-205***	1045	1470	1092	1765
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-0.3	-0.2	-0.1	3.6	--	1.8	--
Benefits - short term (\$)	-2.8	-3.6	-2.2	22.3	626.3	12.1	667.8
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	3.8***	3.0***	2.2***	7.5	--	8.1	--
TANF benefits - short term (\$)	38.1***	31.8***	26.8***	70.7	947.4	80.1	983.1
Percent receiving FS, short term	7.8***	7.8***	8.3***	21.2	--	22.7	--
FS benefits - short term (\$)	40.2***	39.5***	38.1***	123.6	584.7	135.9	599.8
Percent enrolled Medicaid, short term	11.9***	12.1***	14.0***	29.8	--	34.6	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 5.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Furthermore, the estimates show a significant increase in public assistance participation. The longer-term impacts that are displayed in table 5.5 are a bit more sanguine. They show substantial and significant increases in employment, wage rates, and hours. This combination leads to a conditional earnings estimate that is almost \$300, which is on the order of 7 to 10 percent. The increase in public assistance (food stamps and Medicaid) take-up seems to continue in the longer-term estimates.

No subgroup analysis was undertaken for this program.

6 COMMUNITY AND TECHNICAL COLLEGE JOB PREPARATORY TRAINING

Job preparation programs represent the applied (non-transfer) training mission of community and technical colleges. For the most part, they provide training for individuals to enter a variety of technical occupations that usually don't require a baccalaureate degree. These programs are open to all high school graduates or persons over the age of 18. (Persons under 18 who have not completed high school may be admitted with the permission of their local school district.) Training is offered in every county of the state. In fact, the public community and technical college system offers training at over 600 sites operated by the 34 primary campuses and multiple extension sites.

Participant Characteristics

Table 6.1 provides descriptive data that compare the individuals in the treatment group to those in the comparison group pool. The comparison group consists of Labor Exchange clients who were 16 to 60 at the time of registration. The individuals who had participated in the workforce development programs were removed from the data. The first two columns of numbers compare the community college job preparatory training students who exited in 2001/2002 to individuals in the comparison group. The final two columns compare the community college job preparation students in 2003/2004 to LE exiters in the same year.

The populations were dissimilar. The job prep students tend to be younger and slightly better educated.²⁰ The average age of the job prep students when they entered the community and technical college system was just over 30, whereas the average age of the LE exiters when they registered was

²⁰The community college and LE administrative data contain information on degrees and certifications, which was absent from the WIA administrative data.

Table 6.1 Descriptive Statistics for Job Prep Treatment Group and Comparison Group Universe

Characteristics	2001/2002		2003/2004	
	Job Prep	Labor Exchange	Job Prep	Labor Exchange
<u>Demographics and Education</u>				
Female	55.5%	38.9%	57.6%	42.1%
Minority	26.8% ^{††}	26.6% ^{††}	26.4%	29.1%
Mean, age at registration	31.9	35.5	30.9	35.9
Disability	6.7%	2.6%	7.1%	2.8%
Less than high school	8.4%	17.2%	7.8%	15.7%
GED	—	—	10.4% ^{††}	10.5% ^{††}
High school graduate	44.9%	38.7%	33.5% ^{††}	33.7% ^{††}
Some college, no degree	25.0%	32.4%	25.6%	22.8%
College certificate or associate degree	12.9%	3.2%	13.3%	5.2%
Bachelor degree or higher	8.9%	8.5%	9.5%	12.1%
Limited English proficiency	3.7%	6.4%	3.2%	2.7%
West WA	78.5%	76.3%	78.6%	69.3%
Urban county	61.9%	59.1%	61.2%	51.3%
<u>Employment and Earnings (prior to registration)</u>				
Ave. percentage of (prior) quarters with employment ^a	68.4%	73.9%	68.2%	72.4%
Average quarterly earnings ^{a, b}	\$2,808	\$4,944	\$2,962	\$4,645
Mean, earnings trend ^c	\$54.6	\$154.8	\$46.1	\$109.2
Mean, earnings variance ^c (in 10 ⁶ \$)	\$4.8	\$12.5	\$5.8	\$10.4
Mean, number of quarters with job change ^b	2.3	2.5	2.9	2.6
Had earnings dip	39.6%	29.2%	42.7%	28.4%
Mean, number of quarters since dip at registration ^b	1.3	1.0	1.4	0.8
Ave. earnings dip ^b	30.2%	19.2%	33.2%	19.2%
Sample size	25,473	179,583	25,043	151,842

NOTE: Monetary data in 2000 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.^bAverages include observations with values of zero.^cTrend and variance calculations include quarters with zero earnings, if any.^{††}Differences in means are not statistically significant at 0.05 level (t-test).

over 35. About twice as many of the individuals comprising the comparison pool had less than a high school diploma than job prep students. Furthermore, a much larger share of the job prep students reported having a college certificate or associate degree. There were more females in the job prep population. Over 55 percent of the community and technical college job preparation clients were females as compared to about 40 percent of the Labor Exchange leavers.

An examination of the employment and earnings data displayed in the lower panel of the table shows that the job prep group had less “robust” labor market histories than the LE comparison pool. The job prep leavers had a smaller percentage of (prior) quarters with employment and their average quarterly earnings were about 60 percent of the average quarterly earnings of the LE exiters.

The average quarterly earnings for the job prep treatment groups were less than \$3,000 ('00\$), whereas the averages for the LE groups were between \$4,500 and \$5,000. Furthermore, the job prep earnings histories had grown more slowly (reflected in the earnings trend), and the job prep students had been more likely to experience an earnings dip, and for those with an earnings dip, the average magnitude was larger.

Participation Model

Table 6.2 provides the results from the logit estimation of participation in job preparatory training. The dependent variable in this econometric model, which was estimated with a sample that pooled the individuals who had exited from the Labor Exchange (but who had not received employment and training services in Washington) with the community and technical college job preparation students who had exited, was a dummy variable equal to 1 for the students (and 0 for the LE clients). The table provides the logit coefficient estimates and standard errors. While the magnitude of the coefficients is not particularly meaningful, the sign and statistical significance are. If the coefficient is negative, then a (positive) change in that variable will decrease the likelihood of being a community college job preparation student.

The coefficient estimates seem quite reasonable. The following variables are significantly correlated with being in the treatment group (i.e., a community and technical college job preparation participant) in both years of data: Female, having a disability, all the education attainment variables (with high school dropout as the omitted category), being from Western Washington, residing in an urban county, percent of quarters in the labor market prior to enrollment with employment, and size of an earnings dip. The following variables are significantly correlated with being in the Labor Exchange group: age at registration, average earnings prior to registration, trend in earnings prior

Table 6.2 Coefficient Estimates from a Logit Model of Participation in Job Prep

Characteristics	2001/2002		2003/2004	
	Coefficient	Std. Error	Coefficient	Std. Error
Demographics and Education				
Female	0.426***	0.015	0.452***	0.015
Minority	0.036**	0.017	-0.213***	0.017
Age at registration	-0.021***	0.001	-0.037***	0.001
Disability	0.969***	0.032	1.009***	0.032
GED	—	—	0.788***	0.033
High school graduate	0.918***	0.026	0.865***	0.028
Some college, no degree	0.732***	0.028	1.185***	0.030
College certificate or associate degree	2.302***	0.034	2.042***	0.035
Bachelor degree or higher	1.112***	0.034	1.075***	0.036
Limited English proficiency	-0.249***	0.038	1.022***	0.046
West WA	0.121***	0.018	0.446***	0.018
Urban county	0.220***	0.016	0.410***	0.016
Employment and Earnings (prior to registration)				
Percentage of quarters with employment	0.004***	0.0003	0.003***	0.0004
Average quarterly earnings ^a	-0.016***	0.0003	-0.011***	0.0004
Earnings trend ^a	-0.007***	0.001	-0.013***	0.002
Earnings variance ^b	0.060	0.042	0.148***	0.032
Number of quarters with job change	-0.078***	0.003	-0.010***	0.003
Had earnings dip	0.010	0.042	-0.366***	0.043
Number of quarters since dip at registration	-0.021***	0.006	0.077***	0.006
Percent of earnings dip	0.735***	0.045	0.926***	0.045

NOTE: Model included last industry of employment prior to registration and an intercept term. Samples sizes were 205,056 and 176,885 for 2001/2002 and 2003/2004, respectively.

^aScaled in \$100 (2000 \$).

^bScaled in \$10⁸ (2000 \$)

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

to registration, and turnover. The results are consistent with the story that prior education is strongly positively correlated with being a community college student, and prior labor market success is negatively correlated, although the latter may be attenuated by the fact that the job prep students are younger.

Propensity Score Statistics

The propensity score for an observation is the predicted probability using the estimated coefficients and the observation's actual data. If the logit model has substantial predictive capability, then the mean propensity score for the comparison group should be small (near zero) and should be much less than the mean score for the treatment. As argued earlier, a measure of how well the logit

model discriminates between comparison group members and treatment group members is the cumulative percentile for the comparison group at the propensity score that is the 20th percentile. Table 6.3 provides these data for the community college job preparation analyses. The mean propensity scores for the treatment groups are roughly 0.22 and 0.24 whereas they are just over 0.10 for the comparison group. The 20th percentile indicators are under 60 percent, which suggests that the participation model does not discriminate well between students and non-students.

Table 6.3 Indicators of Propensity Score Model Quality for Job Prep Analyses

Statistic	2001/2002	2003/2004
Mean p-score, Job Prep	0.215	0.241
Mean p-score, Labor Exchange	0.111	0.125
Percentile Labor Exchange, at 20th percentile Job Prep	56.93%	56.72%

Statistical Match

The statistical matching used a nearest neighbor approach with the propensity score. For every observation j in T , we found the observation k in U that minimized the absolute value of the difference between the propensity score for j and k . We then added k to the comparison group sample as long as the difference between the propensity scores did not exceed the caliper. The statistical match was done with replacement, so some observations in U were the “matches” for more than one observation in the treatment group. Table 6.4 provides data about the sample sizes, number of matched observations that were duplicates, and a comparison of descriptive statistics between the treatment group, comparison group, and pool of observations from which the comparison group was chosen.

Table 6.4 Matching Algorithm Statistics and Post-Match Comparison of Characteristics for Job Prep

Statistic/Characteristic	2001/2002		2003/2004		
	Job Prep	Labor		Job Prep	Labor Exchange
		Exchange	Job Prep		
Sample size	25,473	179,583	25,043	151,842	
Sample size used in match	25,473	179,546	25,043	151,841	
Matched sample size	25,463	20,642	25,023	19,305	
Number of observations used once	—	16,973	—	15,407	
Number of observations used multiple times	—	3,669	—	3,898	
Maximum number of repeats	—	11	—	23	
<u>Demographics and Education</u>					
Female	55.5%	55.0%	57.6%**	56.7%**	
Minority	26.8%**	25.3%**	26.4%	25.9%	
Mean, age at registration	31.9	31.9	30.9	30.9	
Disability	6.7%	6.6%	7.0%	6.7%	
Less than high school	8.4%**	7.7%**	7.8%	7.4%	
GED	—	—	10.4%**	9.7%**	
High school graduate	44.9%	44.6%	33.5%	33.8%	
Some college, no degree	25.0%**	26.3%**	25.6%	25.9%	
College certificate or associate degree	12.8%**	11.6%**	13.3%	13.3%	
Bachelor degree or higher	8.9%**	9.7%**	9.5%	9.9%	
Limited English proficiency	3.7%	3.5%	3.2%**	2.4%**	
West WA	78.5%	78.7%	78.6%	78.8%	
Urban county	61.9%	62.3%	61.1%	61.2%	
<u>Employment and Earnings (prior to registration)</u>					
Percentage employed prior to registration	68.4%**	73.3%**	68.3%**	66.9%**	
Average quarterly earnings ^a	\$2,809**	\$3,056**	\$2,964	\$2,923	
Mean, earnings trend ^b	\$54.8	\$60.1	\$46.2**	\$33.6**	
Mean, earnings variance ^b (in 10 ⁶ \$)	\$4.8**	\$5.4**	\$5.8	\$5.9	
Mean, number of quarters with job change ^a	2.3**	2.5**	2.9	2.9	
Had earnings dip	39.6%**	42.3%**	42.6%	42.6%	
Mean, number of quarters since dip at registration ^a	1.3**	1.4**	1.4	1.4	
Ave. earnings dip ^a	30.2%**	32.2**	33.2%	33.2%	
Sample size	25,463	25,463	25,023	25,023	

NOTES: Monetary data in 2000 \$.

^aAverages include observations with values of zero.^bTrend and variance calculations include quarters with zero earnings, if any.

** Difference in means is statistically significant at the 0.05 level (t-test).

As would be expected, the differences between the treatment group and the match comparison group means are much smaller than in Table 6.1. However, because the logit model has relatively low discriminatory power, a number of the mean differences are significant. For example, all of the employment and earnings variables (prior to registration) except for the earnings trend, still have significantly different averages in the 2001/2002 match as do five of the demographic and education variables. The match for 2003/2004 is somewhat better, but all in all, it appears as though

the education and prior earnings experience were so different using the full comparison group pool that the matching was not able to get any closer along these dimensions.

Net Impacts

The major purpose of the study was to estimate the net impacts of the education and training programs on clients. Tables 6.5 and 6.6 provide the estimated net impacts for community college job preparatory training. As with comparable tables in the prior chapters, the first table displays the short-term (3 quarters after exit) and the longer-term (9-12 quarters after exit) outcomes for the 2001/2002 cohort of program exiters. The second table is limited to the short-term net impacts for the 2003/2004 cohort. The first column in each of the tables presents the estimates from the block matching technique, which uses the full comparison set (i.e., *U*) and the treatment group. The second column presents a comparison of means between the treatment group and the matched comparison group. The third column presents an estimate from a regression adjustment of that mean. This column represents the preferred specification, although for some programs we use the levels of the outcome variables as the dependent variable and, for others, we use difference-in differences. The coefficient estimates that are in “boxes” represent the final, “official” estimates using the preferred specification as chosen by WTECB staff. The final columns of the tables provide the means of the comparison group, both the full comparison group pool and the matched comparison group. These columns are provided so that the net impacts can be estimated on a percentage basis.

Short-term and longer-term impacts for the job preparatory training students are quite positive. In the short term, average quarterly earnings increased by over \$1,400, or about 25 percent. These earnings gains came from increased employment impacts of 9.2 percentage points, hourly

Table 6.5 Net Impact Estimates for CTC Job Prep Programs for 2001/2002 Cohort

Outcome	Block	Matched Sample		Comparison Group			
	Matching	Estimator		Means			
	Estimator	Diff. in	Regr.	Full		Matched	
	Wtd. Diff.	Means	Adj.	With 0	W/O 0	With 0	W/O 0
	in Means						
Employment							
Short term (%)	8.7***	7.8***	10.3***	61.1	--	61.3	--
Ever employed - longer term (%)	7.0***	5.8***	7.3***	68.6	--	68.1	--
Percent of quarters, longer term	8.1***	6.7***	8.2***	59.4	--	58.5	--
Percent of quarters, longer term, diff-in-diff	6.6***	9.8***	6.7***	-7.5	--	-5.0	--
Average hourly wage							
Short term (\$)	1.77***	1.67***	1.97***	9.99	16.15	8.48	13.63
Short term diff-in-diff (\$)	1.81***	2.39***	2.02***	-2.05	-0.12	-0.12	0.85
Longer term (\$)	1.75***	1.50***	1.81***	10.28	16.76	8.63	14.30
Longer term, diff-in-diff (\$)	1.79***	2.23***	1.87***	-1.77	-0.004	0.04	1.44
Average quarterly hours							
Short term	53.9***	50.1***	57.8***	240.7	389.1	226.3	363.8
Short term, diff-in-diff	49.5***	62.2***	51.8***	-44.0	-12.4	-7.3	24.7
Longer term	43.5***	38.1***	45.7***	252.9	395.0	236.4	373.3
Longer term, diff-in-diff	39.1***	50.2***	39.7***	-31.8	-5.8	2.8	36.7
Average quarterly earnings							
Short term (\$)	1133***	1073***	1210***	3806	6151	2966	4768
Short term, diff-in-diff (\$)	1046***	1226***	1101***	-1269	-413	-85	514
Longer term (\$)	966***	879***	1025***	4310	6668	3384	5292
Longer term, diff-in-diff (\$)	881***	1033**	917***	-765	-127	333	1002
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-13.7***	-15.2***	-13.6***	24.8	--	20.4	--
Benefits - short term (\$)	-328.9***	-367.1***	-355***	675.1	2724.3	462.9	2267.2
Percent receiving, longer term	-2.3***	-3.0***	-2.7***	12.5	--	10.7	--
Benefits - longer term (\$)	-14.1***	-18.2***	-15.7***	83.2	1351.1	65.7	1237.7
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	1.0***	1.3***	0.3***	2.3	--	3.2	--
TANF benefits - short term (\$)	15.8***	18.4***	16.1***	23.4	1015.6	31.3	985.1
Percent receiving TANF, longer term	1.5***	1.6***	0.6***	2.7	--	3.7	--
TANF benefits - longer term (\$)	13.8***	15.1***	13.6***	16.5	892.5	22.4	872.0
Percent receiving FS, short term	1.1***	1.2***	0.2	7.4	--	9.8	--
FS benefits - short term (\$)	12.9***	12.3***	10.1***	37.1	498.1	49.0	502.1
Percent receiving FS, longer term	0.4*	0.4	-0.4*	10.8	--	13.6	--
FS benefits - longer term (\$)	13.8***	14.4***	12.3***	38.8	463.2	48.6	459.3
Percent enrolled Medicaid, short term	1.8***	2.1***	0.5**	10.2	--	15.9	--
Percent enrolled Medicaid, longer term	1.0***	1.2***	-0.2	10.6	--	16.0	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 6.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 6.6 Net Impact Estimates for Job Prep Programs for 2003/2004 Cohort

Outcome	Block Matching Estimator		Matched Sample Estimator	Comparison Group Means			
	Wtd. Diff. in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	8.3***	8.9***	9.2***	62.5	--	61.2	--
Average hourly wage							
Short term (\$)	1.98***	2.10***	2.07***	9.23	14.59	7.97	12.83
Short term diff-in-diff (\$)	2.93***	2.85***	2.95***	-2.99	-1.46	-1.06	-0.40
Average quarterly hours							
Short term	43.6***	46.1***	44.6***	251.2	397.1	234.1	376.7
Short term, diff-in-diff	68.5***	68.2***	71.3***	-42.5	-3.4	-6.3	27.6
Average quarterly earnings							
Short term (\$)	998***	1042***	1030***	3645	5760	2973	4786
Short term, diff-in-diff (\$)	1406***	1385***	1423***	-1547	-801	-415	66
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-1.3***	-1.3***	-1.2***	6.0	--	4.4	--
Benefits - short term (\$)	-1.6	0.9	0.5	59.9	1001.2	38.4	865.7
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	-1.0***	-1.0***	-0.5***	3.6	--	5.4	--
TANF benefits - short term (\$)	-9.7***	-10.7***	-11.3***	35.6	997.4	53.9	999.7
Percent receiving FS, short term	-4.9***	-5.0***	-4.1***	13.9	--	17.7	--
FS benefits - short term (\$)	-26.9***	-28.0***	-28.2***	77.4	555.7	100.6	567.8
Percent enrolled Medicaid, short term	-3.3***	-3.0***	-3.0***	14.7	--	22.1	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 6.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

wage increases of \$2.95, and increased hours per quarter of over 70 hours. The increased earnings gains were accompanied with a decrease in TANF receipt, Food Stamps, and Medicaid eligibility.

The longer-term earnings impacts were somewhat smaller, but still quite strong. The students earned, on average, just over \$900 per quarter more than their comparison group counterparts. This arose because of an employment net impact of 6.7 percentage points, an hourly wage impact of \$1.87, and an hours of employment impact of about 40 hours. In the longer-term results shown in table 6.5, net impacts on transfer income showed an increase in TANF, but a decrease in Food Stamps and Medicaid eligibility (these decreases were not significant, however.)

Subgroup Analyses

We examined two subgroups of the community and technical college job preparatory training students. First, we examined completers versus all students. That is, all of the treatment groups are defined by individuals who “exited” during the fiscal year. Some of the exits may be because the individuals completed their participation in the program, and some of the exits may be because the individuals decided to leave without completing the program. As seen in tables 6.7 and 6.8, a little bit less than half of the job prep treatment group actually completed their schooling, defined as receiving a certificate or degree.²¹ As would be expected, the results show that completers had better net impacts than the average. Employment rates, wages, average quarterly hours worked, and earnings were all much higher for the completers than for the entire treatment group. In both the short term and longer-term, the net impacts for employment and earnings for completers were roughly 30 to 50 percent greater.

A second subgroup that was examined was individuals who had participated in adult basic education at a community college prior to entering a job preparatory program. The reason for looking at this group was to investigate the hypothesis that one of the major payoffs to investing in an ABE program was the opportunity to pursue occupational training at the community college level. If this hypothesis were true, then the economic payoffs to the ABE training may be modest, but those payoffs would be understated for the individuals who followed-up with job preparatory training. Indeed, the estimates in tables 6.9 and 6.10 suggest that there is merit to this hypothesis. In the short term, the net impact estimates suggest that the individuals in this subgroup have lower

²¹The definition is slightly broader. The exact specification was $\text{GradDrop} > 0$, which in addition to certificate or degree includes (1) individuals who completed 45 quarter credits or more with at least a 2.0 gpa but didn't receive a degree, and (2) all other completers (high school or GED completer, apprentice completer, or completer of a non-credit vocational program that results in certification, e.g. A+, CISCO, etc.)

Table 6.7 Selected Longer-Term Net Impact Estimates for Job Prep Completers and Noncompleters:
2001/2002 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Noncompleters	Completers	
Employment	4.7%**	9.5%**	58.5%
Hourly Wage	\$1.17**	\$2.89**	\$8.63
Hours Worked	27.9**	56.6**	236.4
Earnings	\$597**	\$1,391**	\$3,384
UI Receipt	-2.9%**	-2.3%**	10.7%
TANF Receipt	0.4%**	0.8%**	3.7%
Food Stamps Recipient	-0.1%	-0.9%**	13.6%
Medicaid Enrollment	-0.6%	-1.3%**	16.0%
Subgroup Sample Size	15,281	10,182	—

NOTE: Monetary data in '00\$.

**Significant at the 0.05 level (two-tailed test).

Table 6.8 Selected Short-Term Net Impact Estimates for Job Prep Completers and Noncompleters:
2003/2004 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Noncompleters	Completers	
Employment	6.2%**	12.9%**	61.2%
Hourly Wage	\$2.34**	\$3.70**	\$7.97
Hours Worked	57.1**	89.2**	234.1
Earnings	\$1,158	\$1,750**	\$2,973
UI Receipt	-1.1%**	-1.4%**	4.4%
TANF Receipt	-0.7%**	-0.3%**	5.4%
Food Stamps Receipt	-3.9%**	-4.4%**	17.7%
Medicaid Enrollment	-2.8%**	-3.1%**	22.1%
Subgroup Sample Size	13,973	11,050	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

Table 6.9 Selected Longer-Term Net Impact Estimates for Job Prep Participants Who Had Prior ABE
Participation: 2001/2002 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	No ABE	With Prior ABE	
Employment	6.2%**	12.0%**	58.5%
Hourly Wage	\$1.86**	\$1.70**	\$8.63
Hours Worked	38.1**	60.0**	236.4
Earnings	\$924**	\$810**	\$3,384
UI Receipt	-2.8%**	-1.5%	10.7%
TANF Receipt	0.4%**	2.4%**	3.7%
Food Stamps Receipt	-1.0%**	7.4%**	13.6%
Medicaid Enrollment	-0.8%**	9.6%**	16.0%
Subgroup Sample Size	23,440	2,023	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

Table 6.10 Selected Longer-Term Net Impact Estimates for Job Prep Participants Who Had Prior ABE Participation: 2003/2004 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	No ABE	With Prior ABE	
Employment	9.4%**	6.6%**	61.2%
Hourly Wage	\$3.03**	\$1.58**	\$7.97
Hours Worked	72.7**	55.2**	234.1
Earnings	\$1,475**	\$661**	\$2,973
UI Receipt	-1.2%**	-0.5%	4.4%
TANF Receipt	-0.9%**	4.0%**	5.4%
Food Stamps Receipt	-5.1%**	8.4%**	17.7%
Medicaid Enrollment	-4.2%**	14.0%**	22.1%
Subgroup Sample Size	23,007	2,016	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

labor market returns than other job prep participants, and they have higher public assistance reciprocity rates. However, the earnings impact in the short term is still over \$660, which is over 20 percent. In the longer term, the net impacts for employment and earnings are quite comparable across subgroups. In short, there does seem to be a substantial labor market payoff for ABE participants who enter job preparatory occupational training.

7 COMMUNITY AND TECHNICAL COLLEGE WORKER RETRAINING PROGRAM

The Worker Retraining (WR) program provides long-term unemployed and dislocated workers with skill training at community and technical colleges.²² Workers must be unemployed or on notice that they are about to be laid off and must be eligible for or have exhausted their unemployment compensation benefits within the last 24 months. The training programs are similar to community and technical college job preparation, i.e., technical training geared to sub-baccalaureate occupations, although funds may also be used for training in basic skills and literacy and related or supplemental instruction for apprentices. Students receive financial assistance to help with tuition and may receive assistance to offset costs of child care and transportation. The trainees are similar in economic circumstances to individuals served by the WIA Title I-B dislocated worker program. In fact, dislocated workers and the long-term unemployed have priority access to the program's training and supportive services.

Participant Characteristics

Table 7.1 provides descriptive data that compare the individuals in the treatment group to those in the comparison group pool. The comparison group consists of Labor Exchange clients who were 16 to 60 at the time of registration and last received services in 2001/2002 or 2003/2004. The individuals who were served by Washington's workforce development programs were removed from the comparison group pool data. The first two columns of numbers compare the community and technical college worker retraining clients who exited in 2001/2002 to individuals in the comparison

²²A small percentage of Worker Retraining participants attended private career schools, but this project excluded those individuals from the analyses and focused on community and technical college students only.

Table 7.1 Descriptive Statistics for Worker Retraining Treatment Group and Comparison Group Universe

Characteristics	2001/2002		2003/2004	
	Worker Retraining	Labor Exchange	Worker Retraining	Labor Exchange
<u>Demographics and Education</u>				
Female	49.0%	38.9%	48.9%	42.1%
Minority	28.5%	26.6%	28.2% ^{††}	29.1% ^{††}
Mean, age at registration	38.1	35.5	39.2	35.9
Disability	8.5%	2.6%	8.5%	2.8%
Less than high school	8.8%	17.2%	6.6%	15.7%
GED	—	—	10.1% ^{††}	10.5% ^{††}
High school graduate	39.2% ^{††}	38.7% ^{††}	28.1%	33.7%
Some college, no degree	25.9%	32.4%	27.5%	22.8%
College certificate or associate degree	15.9%	3.2%	17.3%	5.2%
Bachelor degree or higher	10.2%	8.5%	10.4%	12.1%
Limited English proficiency	6.6% ^{††}	6.4% ^{††}	4.3%	2.7%
West WA	81.0%	76.3%	83.7%	69.3%
Urban county	60.4%	59.1%	63.5%	51.3%
<u>Employment and Earnings (prior to registration)</u>				
Ave. percentage of (prior) quarters with employment ^a	82.9%	73.9%	83.9%	72.4%
Average quarterly earnings ^{a, b}	\$5,168	\$4,944	\$6,170	\$4,645
Mean, earnings trend ^c	-\$4.8	\$154.8	\$8.9	\$109.2
Mean, earnings variance ^c (in 10 ⁶ \$)	\$10.9	\$12.5	\$12.3	\$10.4
Mean, number of quarters with job change ^b	2.8	2.5	3.1	2.6
Had earnings dip	69.8%	29.2%	71.2%	28.4%
Mean, number of quarters since dip at registration ^b	1.6	1.0	1.7	0.8
Ave. earnings dip ^b	55.6%	19.2%	57.6%	19.2%
Sample size	6,048	179,583	7,538	151,842

NOTE: Monetary data in 2000 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.^bAverages include observations with values of zero.^cTrend and variance calculations include quarters with zero earnings, if any.^{††}Differences in means are not statistically significant at 0.05 level (t-test).

group. The final two columns compare the community and technical college worker retraining exiters in 2003/2004 to LE exiters in the same year.

The populations were somewhat different. On average, the worker retraining participants are about three years older than the LE exiters. Just under half of the worker retraining clients were females as compared to about 40 percent of the Labor Exchange leavers. Just as was the case with job preparatory training, the worker retraining clients were better educated: a much lower percentage of individuals without a high school diploma (9 percent as compared to over 17 percent for LE registrants in 2001/2002; and 6.6 percent compared to 16 percent in 2003/2004) and higher percentage of individuals with college and with certificates or associate degrees.

The Worker Retraining exiters' work histories showed more employment and higher average quarterly earnings (percentage of quarters worked were about 83 percent versus about 73 for the worker retraining and Labor Exchange clients, respectively). The quarterly earnings difference was over \$1,500 in the 2003/2004 data.

Participation Model

Table 7.2 provides the results from the logit estimation of participation. The individuals who had exited from the Labor Exchange were pooled with the community and technical college worker retraining clients, and the dependent variable, participation, was a dummy variable equal to 1 for the latter group (and 0 for the former). The independent variables in the participation model were identical to those used in the job prep participation model documented in Chapter 6. The table provides the logit coefficient estimates and standard errors. While the magnitude of the coefficients is not particularly meaningful, the sign and statistical significance are. If the coefficient is negative, then a (positive) change in that variable will decrease the likelihood of being a community and technical college worker retraining client.

The coefficient estimates seem quite reasonable. The following variables are significantly correlated with being in the treatment group (i.e., a community and technical college worker retraining client) in both years of data: Female, minority, age at registration, having a disability, all the education attainment variables relative to being a high school dropout, being from Western Washington, percentage of quarters employed, turnover (not significant in 2001/2002), having experienced an earnings dip, and magnitude of the earnings dip. The following variables are significantly correlated with being in the comparison group pool: average earnings prior to

Table 7.2 Coefficient Estimates from a Logit Model of Participation in Worker Retraining Program

Characteristics	2001/2002		2003/2004	
	Coefficient	Std. Error	Coefficient	Std. Error
<u>Demographics and Education</u>				
Female	0.513***	0.030	0.572***	0.028
Minority	0.160***	0.034	0.066**	0.030
Age at registration	0.012***	0.001	0.009***	0.001
Disability	1.131***	0.054	0.928***	0.050
GED	—	—	0.897***	0.064
High school graduate	0.751***	0.053	0.573***	0.056
Some college, no degree	0.606***	0.057	0.908***	0.057
College certificate or associate degree	2.289***	0.064	1.919***	0.062
Bachelor degree or higher	1.047***	0.068	0.615***	0.067
Limited English proficiency	0.453***	0.063	1.305***	0.076
West WA	0.290***	0.038	0.596***	0.037
Urban county	-0.083***	0.031	0.140***	0.029
<u>Employment and Earnings (prior to registration)</u>				
Percentage of quarters with employment	0.012***	0.001	0.011***	0.001
Average quarterly earnings ^a	-0.001***	0.0005	0.004***	0.0004
Earnings trend ^a	-0.002	0.002	-0.001	0.003
Earnings variance ^b	-0.157***	0.048	-0.415***	0.053
Number of quarters with job change	0.003	0.005	0.057***	0.004
Had earnings dip	0.802***	0.068	0.267***	0.062
Number of quarters since dip at registration	-0.230***	0.010	-0.067***	0.009
Percent of earnings dip	2.285***	0.071	2.550***	0.065

NOTE: Model included last industry of employment prior to registration and an intercept term. Samples sizes were 185,631 and 159,380 for 2001/2002 and 2003/2004, respectively.

^aScaled in \$100 (2000 \$).

^bScaled in \$10⁸ (2000 \$)

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

registration, variance in earnings prior to registration, and length of time since experiencing an earnings dip.

Propensity Score Statistics

If the participation model had substantial predictive capability, then the mean propensity score for the comparison group should be small (near zero) and should be much less than the mean score for the treatment. As argued earlier, a measure of how well the logit model discriminates between comparison group members and treatment group members is the cumulative percentile for the comparison group at the propensity score that is the 20th percentile. Table 7.3 provides these data for the community college worker retraining analyses. The mean propensity scores for the

treatment groups are roughly 0.14 and 0.20, whereas they are 0.03 and 0.04 for the comparison group for 2001/2002 and 2003/2004 respectively. The 20th percentile indicator is approximately 70 percent. The relatively large difference in p-score means is good, but the 20th percentile indicators did not reach the 80th percentile standard.

Table 7.3 Indicators of Propensity Score Model Quality for Worker Retraining Analyses

Statistic	2001/2002	2003/2004
Mean p-score, Worker Retraining	0.140	0.195
Mean p-score, Labor Exchange	0.029	0.040
Percentile Labor Exchange, at 20th percentile Worker Retraining	66.71%	73.83%

Statistical Match

Table 7.4 provides data about the sample sizes, number of matched observations that were duplicates, and a comparison of descriptive statistics between the treatment group, comparison group, and pool of observations from which the comparison group was chosen. The quality of the match seemed relatively high. Only 10 to 20 percent of the matched comparison group records had multiple copies, and virtually all of the demographic and education as well as employment and earnings means were not significantly different. Relative to the community and technical college job preparatory training, the statistical match for worker retraining did much better on the previous earnings and employment and approximately as well on the educational attainment variables.

Net Impacts

Tables 7.5 and 7.6 provide the estimated net impacts for Worker Retraining. As with comparable tables in the prior chapters, the first table displays the short-term (3 quarters after exit)

Table 7.4 Matching Algorithm Statistics and Post-Match Comparison of Characteristics for Worker Retraining

Statistic/Characteristic	2001/2002		2003/2004	
	Worker Retraining	Labor Exchange	Worker Retraining	Labor Exchange
Sample size	6,048	179,583	7,538	151,842
Sample size used in match	6,048	179,549	7,538	151,841
Matched sample size	6,031	5,313	7,519	6,260
Number of observations used once	—	4,795	—	5,386
Number of observations used multiple times	—	518	—	874
Maximum number of repeats	—	12	—	12
<u>Demographics and Education</u>				
Female	49.0%	48.9%	48.9%	50.0%
Minority	28.5%	27.0%	28.1%	26.9%
Mean, age at registration	38.1	38.3	39.2	39.2
Disability	8.3%	8.4%	8.5%**	9.6%**
Less than high school	8.8%	9.2%	6.6%	6.8%
GED	—	—	10.2%	10.8%
High school graduate	39.3%	37.8%	28.1%	27.5%
Some college, no degree	26.0%	25.7%	27.5%	27.8%
College certificate or associate degree	15.7%	16.5%	17.1%	16.6%
Bachelor degree or higher	10.2%	10.8%	10.4%	10.6%
Limited English proficiency	6.6%	6.4%	4.1%	4.3%
West WA	81.0%	80.4%	83.6%	82.7%
Urban county	60.4%	58.7%	63.4%**	61.6%**
<u>Employment and Earnings (prior to registration)</u>				
Percentage employed prior to registration	82.8%**	81.4%**	83.9%**	82.4%**
Average quarterly earnings ^a	\$5,165	\$5,044	\$6,164**	\$6,005**
Mean, earnings trend ^b	-\$3.9	-\$4.0	\$8.7	\$0.1
Mean, earnings variance ^b (in 10 ⁶ \$)	\$10.9	\$10.9	\$12.3	\$12.7
Mean, number of quarters with job change ^a	2.8	2.9	3.1	3.2
Had earnings dip	69.7%	69.7%	71.2%	71.4%
Mean, number of quarters since dip at registration ^a	1.6	1.6	1.7	1.7
Ave. earnings dip ^a	55.5%	55.5%	57.5%	58.2%
Sample size	6,031	6,031	7,519	7,519

NOTES: Monetary data in 2000 \$.

^aAverages include observations with values of zero.

^bTrend and variance calculations include quarters with zero earnings, if any.

** Difference in means is statistically significant at the 0.05 level (t-test).

and the longer-term (9-12 quarters after exit) outcomes for the 2001/2002 cohort of program exiters.

The second table is limited to the short-term net impacts for the 2003/2004 cohort. The first column in each of the tables presents the estimates from the block matching technique, which uses the full comparison set (i.e., U) and the treatment group. The second column presents a comparison of means between the treatment group and the matched comparison group. The third column presents

Table 7.5 Net Impact Estimates for Worker Retraining Program for 2001/2002 Cohort

Outcome	Block	Matched Sample		Comparison Group			
	Matching	Estimator		Means			
	Estimator	Wtd. Diff. in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	5.5***	5.7***	5.6***	61.1	--	60.3	--
Ever employed, longer term (%)	5.5***	4.9***	4.4***	68.6	--	69.7	--
Percent of quarters, longer term	6.1***	5.1***	4.6***	59.4	--	59.7	--
Percent of quarters, longer term, diff-in-diff	2.2***	1.4	1.7*	-7.5	--	-18.1	--
Average hourly wage							
Short term (\$)	0.50***	0.19	0.08	9.99	16.15	9.95	16.27
Short term diff-in-diff (\$)	-0.10	-0.37	-0.26	-2.05	-0.12	-3.43	0.21
Longer term (\$)	0.56***	0.26	0.16	10.28	16.76	9.90	16.08
Longer term, diff-in-diff (\$)	-0.02	-0.28	-0.18	-1.77	-0.004	-3.48	-0.46
Average quarterly hours							
Short term	29.6***	33.1***	30.7***	240.7	389.1	225.7	369.1
Short term, diff-in-diff	-13.4***	-8.8*	-6.8	-44.0	-12.4	-96.3	-27.5
Longer term	35.8***	32.9***	29.8***	252.9	395.0	246.6	381.0
Longer term, diff-in-diff	-7.0*	-8.9*	-7.5*	-31.8	-5.8	-75.5	-15.6
Average quarterly earnings							
Short term (\$)	284***	251***	210***	3806	6151	3483	5695
Short term, diff-in-diff (\$)	-231***	-244**	-192**	-1269	-413	-1878	-591
Longer term (\$)	408***	327***	271***	4310	6668	3947	6043
Longer term, diff-in-diff (\$)	-104	-165	-129	-765	-127	-1414	-494
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-5.6***	-5.2***	-5.2***	24.8	--	25.5	--
Benefits - short term (\$)	-170.2***	-162.5***	-172.6***	675.1	2724.3	637.4	2498.0
Percent receiving, longer term	1.7***	1.5**	1.5**	12.5	--	13.4	--
Benefits - longer term (\$)	19.0***	20.3***	20.0***	83.2	1351.1	84.8	1254.5
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	0.3	0.2	0.3**	2.3	--	2.6	--
TANF benefits - short term (\$)	4.8*	3.2	3.9	23.4	1015.6	26.2	1012.
Percent receiving TANF, longer term	0.4*	0.5*	0.4***	2.7	--	2.8	--
TANF benefits - longer term (\$)	4.0*	5.5**	5.7**	16.5	892.5	17.1	885.1
Percent receiving FS, short term	1.3***	1.1**	1.6***	7.4	--	8.7	--
FS benefits - short term (\$)	10.6***	10.4***	12.1***	37.1	498.1	40.6	469.1
Percent receiving FS, longer term	0.4	1.1*	1.7***	10.8	--	11.2	--
FS benefits - longer term (\$)	3.6	7.5***	8.4***	38.8	463.2	38.2	444.8
Percent enrolled Medicaid, short term	0.5	0.6	1.1***	10.2	--	11.3	--
Percent enrolled Medicaid, longer term	0.0	0.7	1.2***	10.6	--	11.2	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 7.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 7.6 Net Impact Estimates for Worker Retraining Program for 2003/2004 Cohort

Outcome	Block Matching Estimator	Matched Sample Estimator		Comparison Group Means			
	Wtd. Diff. in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	8.7***	8.2***	7.8***	62.5	--	61.7	--
Average hourly wage							
Short term (\$)	0.93***	0.85***	0.70***	9.23	14.59	9.46	15.10
Short term diff-in-diff (\$)	0.86***	0.92***	1.10***	-2.99	-1.46	-6.58	-3.35
Average quarterly hours							
Short term	43.6***	43.3***	39.5***	251.2	397.1	241.9	386.2
Short term, diff-in-diff	21.3***	18.7***	22.3***	-42.5	-3.4	-101.7	-22.4
Average quarterly earnings							
Short term (\$)	443***	416***	342***	3645	5760	3664	5851
Short term, diff-in-diff (\$)	253***	228**	322***	-1547	-801	-2999	-1669
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-1.0***	-1.1***	-1.0***	6.0	--	6.2	--
Benefits - short term (\$)	-8.9	-11.3	99.0	59.9	1001.2	76.4	1232.9
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	-0.7***	-0.9***	-0.2	3.6	--	3.6	--
TANF benefits - short term (\$)	-7.3***	-10.8***	-8.7***	35.6	997.4	37.2	1025.9
Percent receiving FS, short term	-2.1***	-2.5***	-0.8**	13.9	--	13.9	--
FS benefits - short term (\$)	-12.1***	-16.8***	-13.2***	77.4	555.7	75.7	545.1
Percent enrolled Medicaid, short term	-0.9***	-1.4**	0.1	14.7	--	14.4	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 7.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

an estimate from a regression adjustment of that mean. This column represents the preferred specification. For this program we use the levels of the outcome variables as the dependent variable. The coefficient estimates that are in “boxes” represent the final, “official” estimates using the preferred specification as chosen by WTECB staff. The final columns of the tables provide the means of the comparison group, both the full comparison group pool and the matched comparison group. These columns are provided so that the net impacts can be estimated on a percentage basis.

Short-term impacts for the worker retraining participants, shown in table 7.6, reflect a very strong positive, employment rate gain of 7.8 percentage points and positive net impacts in hourly wages and hours. All together, the estimate of the average change in earnings is about \$340. In the short term, the Worker Retraining participants had no significant change in TANF nor Medicaid, and slight reductions in the incidence of unemployment compensation and food stamps.

The longer-term earnings impacts were similar, although smaller in magnitude. The employment rate and hours of employment increased at levels that were statistically significant (4.4 percentage points and 29.8 hours, respectively), but the increase in the average hourly wage rate (0.16) was not significant. All together, the earnings impact was about \$270. In addition, the net impacts on public assistance and unemployment compensation showed increases that were statistically significant.

Subgroup Analyses

About half of the 2003/2004 treatment group and about 40 percent of the 2001/2002 Worker Retraining treatment group actually completed their community and technical college course of study. Selected net impact estimates for these subgroups are provided in tables 7.7 and 7.8. As with the job prep students analyzed in the previous chapter, in both the short term and longer term, the completers have more positive outcomes. All of the employment and earnings impacts for completers are positive, significant, and larger than the impacts for noncompleters. In fact, table 7.7 shows that the hourly wage impact for noncompleters is negative (although not significant); and consequently, the earnings impact is virtually 0. The public assistance and UI impacts tend to be negative (i.e., reductions in take-up) for completers as compared to less negative or positive impacts for the noncompleters.

Table 7.7 Selected Longer Term Net Impact Estimates for Subgroups of Worker Retraining Participants:
2001/2002 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Noncompleters	Completers	
Employment	2.6% **	8.2% **	59.7%
Hourly Wage	-\$0.29	\$0.99**	\$9.90
Hours Worked	15.6**	53.7**	246.6
Earnings	\$12	\$712**	\$3,947
UI Receipt	1.0%	2.3% **	13.4%
TANF Receipt	0.7% **	-0.1%	2.8%
Food Stamps Recipient	3.1% **	-0.6%	11.2%
Medicaid Enrollment	2.7% **	-1.3% **	11.2%
Subgroup Sample Size	3,711	2,320	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

Table 7.8 Selected Short-Term Net Impact Estimates for Subgroups of Worker Retraining Participants:
2003/2004 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Noncompleters	Completers	
Employment	4.6% **	10.8%**	61.7%
Hourly Wage	\$0.59**	\$0.83**	\$9.46
Hours Worked	20.5**	57.8**	241.9
Earnings	\$174	\$520**	\$3,664
UI Receipt	-0.2%	-1.7% **	6.2%
TANF Receipt	-0.1%	-0.5% **	3.6%
Food Stamps Receipt	-0.0%	-1.7% **	13.9%
Medicaid Enrollment	1.2% **	-0.9%	14.4%
Subgroup Sample Size	3,646	3,873	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

8 ADULT BASIC EDUCATION PROGRAMS ON COMMUNITY AND TECHNICAL COLLEGE CAMPUSES

Adults with deficits in basic academic skills are supported in adult basic skills education (ABE) across the state. The purposes of the instruction that is provided are to:

- assist adults to become literate and obtain the knowledge and skills necessary for employment and self-sufficiency,
- assist adults who are parents to obtain the educational skills necessary to become full partners in the educational development of their children, or
- assist adults in the completion of a secondary school (high school) education.

The types of programs include adult literacy, family learning, workplace skills enhancement, English language instruction, citizenship classes, basic skills education, high school equivalency preparation, or alternative high school diploma program. A substantial share of the instruction is for individuals with limited English proficiency who participate in English language instruction. Programs are offered at community and technical colleges or at community-based organizations. The analyses in this study were limited to programs delivered at community and technical colleges because of the availability of administrative data.

Participant Characteristics

Table 8.1 provides descriptive data that compare the individuals in the treatment group to those in the comparison group pool. As with the other community and technical college programs, the comparison group consists of Labor Exchange clients who were 16 to 60 at the time of LE registration, and as with all other programs in this study, individuals who were served by Washington's education and training programs were removed from the data. The first two columns of numbers compare the community college ABE participants who exited in 2001/2002 to

Table 8.1 Descriptive Statistics for ABE Treatment Group and Comparison Group Universe

Characteristics	2001/2002		2003/2004	
	ABE	Labor Exchange	ABE	Labor Exchange
<u>Demographics and Education</u>				
Female	57.0%	38.8%	59.3%	42.1%
Minority	58.0%	26.5%	57.6%	29.8%
Mean, age at registration	31.3	35.4	31.2	35.7
Disability	5.5%	2.6%	1.6%	2.6%
On public assistance at registration	26.0%	4.1%	—	—
West WA	76.1% ^{††}	75.8% ^{††}	—	—
Urban county	74.6%	58.5%	—	—
<u>Employment and Earnings (prior to registration)</u>				
Ave. percentage of (prior) quarters with employment ^a	54.2%	73.3%	53.9%	70.3%
Average quarterly earnings ^{a, b}	\$1,853	\$4,834	\$1,800	\$4,435
Mean, earnings trend ^c	\$104.7	\$150.3	\$58.6	\$101.2
Mean, earnings variance ^c (in 10 ⁶ \$)	\$2.3	\$12.1	\$2.5	\$9.9
Mean, number of quarters with job change ^b	1.8	2.5	2.7	2.6
Had earnings dip	32.4%	29.5%	34.0%	28.4%
Mean, number of quarters since dip at registration ^b	1.0	1.0	1.2	0.8
Ave. earnings dip ^b	25.4%	19.6%	27.2%	19.5%
Sample size	13,494	188,172	7,815	164,811

NOTE: Monetary data in 2000 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.

^bAverages include observations with values of zero.

^cTrend and variance calculations include quarters with zero earnings, if any.

^{††}Differences in means are not statistically significant at 0.05 level (t-test).

individuals in the comparison group. The final two columns compare the exiters in 2003/2004 to LE exiters in the same year.

The populations were quite different. The ABE participants were younger—averaging about 31 as compared to 35 for the Labor Exchange population—and were more likely to be female and to be a minority. In both cohorts, about 60 percent of the treatment group were females, whereas about 40 percent of the Labor Exchange exiters were female. In 2001/2002, about 60 percent of the community and technical college ABE clients were minorities as compared to just over 25 percent of the Labor Exchange leavers. In 2003/2004, the differential was over 55 percent to about 30 percent. The 2003/2004 treatment sample was missing some demographic data, but in 2001/2002, the ABE participants were much more likely to be on public assistance at the time of registration—26 percent to 4 percent—and more likely to reside in an urban county—75 percent to 59 percent.

The pre-program labor market experiences of the ABE students were quite different from the LE exiters. Their percentage of quarters with employment was just over 50 percent, whereas the comparison group pool was over 70 percent. The average quarterly earnings were significantly lower. The average quarterly earnings for the ABE population was only about \$1,800 to \$1,850; whereas it was just over \$4,800 in 2001/2002 and almost \$4,450 in 2003/2004 for the LE exiters.

Participation Model

Table 8.2 provides the results from the logit estimation of participation in ABE. The independent variables in the participation model were exactly the same as those used in the other community and technical college programs as documented in the two previous chapters. The table provides the logit coefficient estimates and standard errors. While the magnitude of the coefficients is not particularly meaningful, the sign and statistical significance are. If the coefficient is negative,

Table 8.2 Coefficient Estimates from a Logit Model of Participation in ABE

Characteristics	2001/2002		2003/2004	
	Coefficient	Std. Error	Coefficient	Std. Error
<u>Demographics and Education</u>				
Female	0.379***	0.020	0.538***	0.025
Minority	1.241***	0.020	0.991***	0.025
Age at registration	-0.008***	0.001	-0.007***	0.001
Disability	0.931***	0.046	-0.177*	0.092
On public assistance at registration	1.624***	0.027	—	—
West WA	-0.017***	0.025	—	—
Urban county	1.102***	0.024	—	—
<u>Employment and Earnings (prior to registration)</u>				
Percentage of quarters with employment	0.007***	0.001	-0.0002	0.0006
Average quarterly earnings ^a	-0.021***	0.001	-0.015***	0.001
Earnings trend ^a	0.020***	0.002	0.011***	0.003
Earnings variance ^b	-2.620***	0.262	-1.900***	0.305
Number of quarters with job change	-0.094***	0.004	0.029***	0.004
Had earnings dip	0.014	0.064	-0.564***	0.080
Number of quarters since dip at registration	-0.032***	0.009	0.081***	0.011
Percent of earnings dip	0.692***	0.067	0.697***	0.082

NOTE: Model included last industry of employment prior to registration and an intercept term. Samples sizes were 201,666 and 172,626 for 2001/2002 and 2003/2004, respectively.

^aScaled in \$100 (2000 \$).

^bScaled in \$10⁸ (2000 \$)

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

then a (positive) change in that variable will decrease the likelihood of being a community and technical college ABE exiter.

The coefficient estimates seem quite reasonable. The following variables are significantly correlated with being in the treatment group (i.e., ABE participant) in both years of data: female, minority, having a disability, being on public assistance at registration, residing in an urban county, earnings trend, and size of earnings dip. The following variables are significantly correlated with being in the comparison group (ES registrants): age at registration, average quarterly earnings, and variance in earnings.

Propensity Score Statistics

Table 8.3 provides the mean propensity scores and 20th percentile indicator for the community and technical college ABE analyses. The mean propensity scores for the treatment groups are roughly 0.20 and 0.08 whereas they are 0.06 and 0.04 for the comparison group for the 2001/2002 and 2003/2004 cohorts, respectively. The 20th percentile indicator is approximately 74 percent for 2001/2002 and 59 percent for 2003/2004. The drastic drop in the statistics between the early and later cohorts reflects the fact that a number of variates were missing from the 2003/2004 administrative data for the treatment group. As a consequence, the mean p-score for the treatment group is relatively low (0.08) and close to the mean for the comparison group (0.04). Furthermore

Table 8.3 Indicators of Propensity Score Model Quality for ABE Analyses

Statistic	2001/2002	2003/2004
Mean p-score, ABE	0.199	0.081
Mean p-score, Labor Exchange	0.057	0.044
Percentile Labor Exchange, at 20th percentile ABE	74.03%	58.81%

the 20th percentile statistic is not near the 80th percentile benchmark and is smaller than for the 2001/2002 match.

Statistical Match

Table 8.4 provides data about the sample sizes, number of matched observations that were duplicates, and a comparison of descriptive statistics between the treatment group, comparison group, and pool of observations from which the comparison group was chosen. Notice that a number of the differences in means are still significant, although the magnitudes of the differences are considerably smaller than in Table 8.1. The relatively low quality of the match resulted from having

Table 8.4 Matching Algorithm Statistics and Post-Match Comparison of Characteristics for ABE

Statistic/Characteristic	2001/2002		2003/2004	
	ABE	Labor Exchange	ABE	Labor Exchange
Sample size	13,494	188,172	7,815	164,811
Sample size used in match	13,494	187,803	7,815	164,085
Matched sample size	13,478	9,043	7,815	5,852
Number of observations used once	—	7,269	—	5,350
Number of observations used multiple times	—	1,774	—	502
Maximum number of repeats	—	41	—	73
<u>Demographics and Education</u>				
Female	57.0%	57.5%	59.3%	59.7%
Minority	57.9%	57.1%	57.6%**	54.7%**
Mean, age at registration	31.3	31.3	31.2	31.0
Disability	5.4%**	4.6%**	1.6%	1.7%
On public assistance at registration	26.0%**	24.1%**	—	—
West WA	76.1%**	78.1%**	—	—
Urban county	74.6%**	77.1%**	—	—
<u>Employment and Earnings (prior to registration)</u>				
Percentage employed prior to registration	54.3%**	52.7%**	53.9%	52.9%
Average quarterly earnings ^a	\$1,855**	\$1,749**	\$1,800**	1,648**
Mean, earnings trend ^b	\$104.9	\$105.6	\$58.6	\$57.4
Mean, earnings variance ^b	\$2.3	\$2.3	\$2.5	\$2.4
Mean, number of quarters with job change ^a	1.8**	1.8**	2.7	2.6
Had earnings dip	32.3%	31.3%	34.0%	33.1%
Mean, number of quarters since dip at registration ^a	1.0**	1.0**	1.2	1.1
Ave. earnings dip ^a	25.3%**	24.3%**	27.2%	26.5%
Sample size	13,478	13,478	7,815	7,815

NOTES: Monetary data in 2000 \$.

^aAverages include observations with values of zero.

^bTrend and variance calculations include quarters with zero earnings, if any.

** Difference in means is statistically significant at the 0.05 level (t-test).

a small number of demographic and education variables available for the logit estimation and the considerable differences between the treatment and comparison group members in employment and earnings background characteristics.

Net Impacts

The major purpose of the study was to estimate the net impacts of the education and training programs on clients and Tables 8.5 and 8.6 provide the estimated net impacts for ABE programs. As with comparable tables in the prior chapters, the first table displays the short-term (3 quarters after exit) and the longer-term (9-12 quarters after exit) outcomes for the 2001/2002 cohort of program exiters. The second table is limited to the short-term net impacts for the 2003/2004 cohort. The first column in each of the tables presents the estimates from the block matching technique, which uses the full comparison set (i.e., U) and the treatment group. The second column presents a comparison of means between the treatment group and the matched comparison group. The third column presents an estimate from a regression adjustment of that mean. This column represents the preferred specification, although for some programs we use the levels of the outcome variables as the dependent variable and, for others, we use difference-in differences. The coefficient estimates that are in “boxes” represent the final, “official” estimates using the preferred specification as chosen by WTECB staff. The final four columns of the tables provide the means of the comparison group, both the full comparison group pool and the matched comparison group. These columns are provided so that the net impacts can be estimated on a percentage basis.

The short-term net impacts for the community and technical college Adult Basic Education participants are shown in table 8.6. The employment rate dropped by 1.3 percentage points (not

Table 8.5 Net Impact Estimates for ABE Program for 2001/2002 Cohort

Outcome	Block	Matched Sample		Comparison Group				
	Matching	Estimator		Means				
	Estimator	Wtd. Diff.	Diff. in	Regr.	Full Sample		Matched Sample	
		in Means	Means	Adj.	With 0	W/O 0	With 0	W/O 0
Employment								
Short term (%)		1.3***	2.4***	2.1***	60.9	--	52.2	--
Ever employed, longer term (%)		4.0***	4.8***	4.3***	68.3	--	58.1	--
Percent of quarters, longer term		3.9***	4.7***	4.1***	59.0	--	48.0	--
Percent of quarters, longer term, diff-in-diff		5.5***	4.9***	5.9***	-7.3	--	4.7	--
Average hourly wage								
Short term (\$)		-0.49***	-0.38***	-0.48***	9.86	16.00	6.59	12.30
Short term, diff-in-diff (\$)		0.01	-0.04	0.09	-1.95	-0.09	1.44	1.15
Longer term (\$)		-0.32***	-0.53***	-0.59***	10.12	16.59	6.62	13.24
Longer term, diff-in-diff (\$)		0.18**	-0.18	-0.02	-1.70	0.03	1.47	1.62
Average quarterly hours								
Short term		13.0***	15.7***	12.3***	238.8	387.3	187.5	350.3
Short term, diff-in-diff		7.5***	5.6*	9.9***	-42.3	-11.9	33.1	23.0
Longer term		20.8***	24.2***	20.9***	250.6	393.2	189.7	356.8
Longer term, diff-in-diff		15.3***	14.1***	18.5***	-30.5	-5.1	35.4	34.1
Average quarterly earnings								
Short term (\$)		-28	-10	-62*	3744	6073	2206	4120
Short term, diff-in-diff (\$)		-9	-45	6	-1219	-393	471	567
Longer term (\$)		-42	-45	-92***	4233	6578	2446	4545
Longer term, diff-in-diff (\$)		-22	-80**	-24	-729	-108	712	962
Unemployment Insurance Benefits (average quarterly)								
Percent receiving, short term		-8.0***	-8.4***	-6.8***	24.4	--	14.8	--
Benefits - short term (\$)		-177.5***	-188.0***	-194.9***	659.2	2698.0	292.8	1979.2
Percent receiving, longer term		-1.7***	-1.1***	-1.3***	12.4	--	8.5	--
Benefits - longer term (\$)		-16.6***	-9.9***	-10.7***	82.1	1339.1	42.7	1019.1
Public Assistance and Medicaid (average quarterly)								
Percent receiving TANF, short term		3.6***	2.9***	1.5***	2.5	--	9.7	--
TANF benefits - short term (\$)		58.8***	42.7***	36.8***	25.0	1014.8	113.0	1059.1
Percent receiving TANF, longer term		4.0***	4.2***	2.5***	2.9	--	7.6	--
TANF benefits - longer term (\$)		41.7***	40.5***	38.3***	17.8	896.3	54.7	988.3
Percent receiving FS, short term		7.3***	6.7***	5.7***	7.9	--	18.8	--
FS benefits - short term (\$)		77.8***	67.8***	62.4***	39.3	496.9	112.5	599.7
Percent receiving FS, longer term		7.2***	7.2***	6.4***	11.4	--	20.6	--
FS benefits - longer term (\$)		72.3***	70.8***	66.8***	40.9	463.1	88.4	532.1
Percent enrolled Medicaid, short term		5.3***	4.9***	5.0***	10.7	--	26.4	--
Percent enrolled Medicaid, longer term		6.4***	6.5***	6.0***	11.0	--	22.1	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 8.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 8.6 Net Impact Estimates for ABE Program for 2003/2004 Cohort

Outcome	Block Matching Estimator	Matched Sample Estimator		Comparison Group Means			
	Wtd. Diff. in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	-1.7***	-0.5	-1.3	61.6	--	55.3	--
Average hourly wage							
Short term (\$)	-0.62***	-0.37***	-0.53***	9.01	14.45	6.16	10.99
Short term, diff-in-diff (\$)	0.27***	0.42***	0.56***	-2.65	-1.42	0.63	0.02
Average quarterly hours							
Short term	-3.4	6.7*	1.8	246.7	395.6	200.0	356.5
Short term, diff-in-diff	1.4	7.3*	11.8***	-33.7	-0.5	40.0	54.7
Average quarterly earnings							
Short term (\$)	-122***	15	-79*	3550	5691	2159	3847
Short term, diff-in-diff (\$)	36	116**	182***	-1377	-742	350	587
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-1.1***	-0.9***	-0.8***	5.7	--	4.44	--
Benefits - short term (\$)	0.4	4.0	2.6	57.0	997.7	29.4	662.4
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	3.8***	3.6***	2.6***	3.5	--	6.9	--
TANF benefits - short term (\$)	45.8***	39.5***	41.2***	34.8	994.9	73.4	1069.8
Percent receiving FS, short term	5.3***	4.0***	4.3***	13.9	--	22.9	--
FS benefits - short term (\$)	48.3***	39.5***	43.2***	76.5	551.3	134.5	588.1
Percent enrolled Medicaid, short term	6.7***	4.6***	5.3***	14.8	--	26.5	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 8.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

statistically significant), but the hourly wage and average hours of work per quarter exhibited statistically significant increases. Combined, these impacts result in a small, but statistically significant, increase in average quarterly earnings of about \$180. However, bringing the ABE participants into training apparently introduces them to public assistance, because the net impacts on participation in TANF, Food Stamps, and Medicaid are all positive and significant.

The longer-term net impacts, shown in table 8.5, are more negative than the short-term impacts. On the positive side, the employment rate goes up by almost 6 percentage points and average quarterly hours increase by about 18. However, the average hourly wage drops slightly by \$0.02 (not statistically significant). The drop in wages causes the longer-term average quarterly

earnings impacts to be slightly negative, although not significant. The longer-term estimates on the receipt of TANF and Food Stamps, and the enrollment in Medicaid were virtually the same as the short-term estimates, positive and significant.

No separate subgroup analysis was conducted with this treatment group. The reader would be referred to the subgroup analyses in chapter 6 that suggested that a positive outcome for community and technical college ABE training occurs for that share of students who go on to pursue occupational training.

9 PRIVATE CAREER SCHOOL PROGRAMS

Private career (proprietary) school programs train individuals who have completed high school or its equivalency for specific occupations. The institutions are privately operated, but they are monitored by the WTECB. The occupations that are being trained run the gamut from cosmetology to truck driving to computer programming and many others. The administrative data come from a voluntary data collection effort administered by the WTECB. Because of its voluntary nature, the representativeness or generalizability of the data is uncertain, but thought to be reasonable.

Participant Characteristics

Table 9.1 provides descriptive data that compare the individuals in the treatment group to those in the comparison group pool. As with many of the other programs including those at community colleges, the comparison group consists of Labor Exchange clients who were 16 to 60 at the time of registration with individuals who were served by Washington's education and training programs removed from the data who exited from the LE in 2001/2002 or 2003/2004. The first two columns of numbers compare the private career school students who exited in 2001/2002 to individuals in the comparison group. The final two columns compare the exiters in 2003/2004 to LE exiters in the same year.

The populations were somewhat different. Between 50 to 60 percent of the private career school participants were females compared to about 40 percent of the LE registrants. The private career school students were also about five years younger than the LE comparison group, on average. The educational differences between the two groups were interesting. The private career school treatment group had much smaller percentages of individuals with less than a high school

Table 9.1 Descriptive Statistics for Private Career School Treatment Group and Comparison Group Universe

Characteristics	2001/2002		2003/2004	
	Private Career School	Labor Exchange	Private Career School	Labor Exchange
<u>Demographics and Education</u>				
Female	53.6%	38.9%	59.3%	42.1%
Minority	28.9%	26.6%	29.3% ^{††}	29.1% ^{††}
Mean, age at registration	30.3	35.5	31.5	35.9
Disability	—	—	1.3%	2.8%
Less than high school	5.6%	17.2%	5.6%	15.7%
GED	—	—	14.7%	10.5%
High school graduate	67.2%	38.7%	51.5%	33.7%
Some college, no degree	15.3%	32.4%	14.4%	22.8%
College certificate or associate degree	5.8%	3.2%	7.4%	5.2%
Bachelor degree	5.6%	6.6%	5.9%	9.3%
Master degree	0.4%	1.4%	0.5%	2.2%
Doctoral degree	0.0%	0.1%	0.1%	0.6%
West WA	80.5%	76.3%	80.6%	69.3%
Urban county	68.0%	59.1%	63.0%	51.3%
<u>Employment and Earnings (prior to registration)</u>				
Ave. percentage of (prior) quarters with employment ^a	67.4%	73.9%	66.0%	72.4%
Average quarterly earnings ^{a, b}	\$2,836	\$4,943	\$3,008	\$4,645
Mean, earnings trend ^c	\$77.9	\$154.6	\$43.2	\$109.2
Mean, earnings variance ^c (in 10 ⁶ \$)	\$5.1	\$12.5	\$6.1	\$10.4
Mean, number of quarters with job change ^b	2.9	2.5	3.2	2.6
Had earnings dip	41.5%	29.2%	45.4%	28.4%
Mean, number of quarters since dip at registration ^b	1.3	1.0	1.5	0.8
Ave. earnings dip ^b	31.1%	19.2%	35.5%	19.2%
Sample size	10,365	179,691	11,606	151,842

NOTE: Monetary data in 2000 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.

^bAverages include observations with values of zero.

^cTrend and variance calculations include quarters with zero earnings, if any.

^{††}Differences in means are not statistically significant at 0.05 level (t-test).

diploma than did the LE comparison group—roughly 6 percent to 17 percent—but the private career school students were also less likely to have educational attainment beyond high school. About 20 to 30 percent of private career school students had some education beyond high school compared to 40 to 45 percent of the LE comparison group.

In terms of labor market experience prior to schooling, the private career school students had lower levels of average quarterly earnings—about \$2,800 to \$3,000 compared to over \$4,500—and had slightly lower prior employment rates and slightly higher rates of turnover. The lower earnings

may be explained by younger ages, lower incidence of college education, and a higher percentage of females.

Participation Model

Table 9.2 provides the results from the logit estimation of participation in private career schools. The table provides the logit coefficient estimates and standard errors. While the magnitude of the coefficients is not particularly meaningful, the sign and statistical significance are. If the coefficient is negative, then a (positive) change in that variable will decrease the likelihood of being an exiter from a private career school.

Table 9.2 Coefficient Estimates from a Logit Model of being a Private Career School Student

Characteristics	2001/2002		2003/2004	
	Coefficient	Std. Error	Coefficient	Std. Error
<u>Demographics and Education</u>				
Female	0.486***	0.022	0.582***	0.021
Minority	0.072***	0.024	-0.066***	0.023
Age at registration	-0.029***	0.001	-0.024***	0.001
Disability	—	—	-0.695***	0.085
GED	—	—	1.370***	0.048
High school graduate	1.762***	0.045	1.565***	0.043
Some college, no degree	0.656***	0.051	0.801***	0.049
College certificate or associate degree	1.934***	0.062	1.639***	0.056
Bachelor degree	1.237***	0.062	0.889***	0.059
Master degree	0.476***	0.158	0.080	0.141
Doctoral degree	-1.229**	0.581	-0.533	0.359
West WA	0.136***	0.028	0.529***	0.026
Urban county	0.492***	0.024	0.497***	0.022
<u>Employment and Earnings (prior to registration)</u>				
Percentage of quarters with employment	-0.001**	0.001	-0.0003	0.001
Average quarterly earnings ^a	-0.008***	0.001	-0.005***	0.0004
Earnings trend ^a	-0.002	0.002	-0.007***	0.002
Earnings variance ^b	0.017	0.058	0.071*	0.041
Number of quarters with job change	0.021***	0.004	0.042***	0.003
Had earnings dip	0.225***	0.060	-0.296***	0.058
Number of quarters since dip at registration	-0.069***	0.009	0.066***	0.008
Percent of earnings dip	0.698***	0.064	1.097***	0.060

NOTE: Model included last industry of employment prior to registration and an intercept term. Samples sizes were 190,056 and 163,448 for 2001/2002 and 2003/2004, respectively.

^aScaled in \$100 (2000 \$).

^bScaled in \$10⁸ (2000 \$)

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

The coefficient estimates seem quite reasonable. The following variables are significantly correlated with being in the treatment group (i.e., student at a private career school): Female, high school graduate, having some college, residing in western Washington, residing in an urban county, prior job turnover, and size of earnings dip. The following variables are significantly correlated with being in treatment group: Age at registration, percent employment prior to registration (not significant in 2003/2004), average earnings prior to registration, and earnings trend (not significant in 2001/2002).

Propensity Score Statistics

The propensity score for an observation is the predicted probability using the estimated coefficients and the observation's actual data. If the logit model has substantial predictive capability, then the mean propensity score for the comparison group should be small (near zero) and should be much less than the mean score for the treatment. Table 9.3 provides these means as well as the 20th percentile indicator for the private career school exiters. The mean propensity scores for the treatment group are approximately 0.11 and 0.13; whereas they are 0.05 and 0.07 for the comparison group. The 20th percentile indicators are under 60 percent. The means and the 20th percentile statistic indicate that the logit model of participation did not discriminate all that well between treatment and comparison group observations.

Table 9.3 Indicators of Propensity Score Model Quality for Private Career Schools

Statistic	2001/2002	2003/2004
Mean p-score, WIA Adult	0.110	0.133
Mean p-score, Labor Exchange	0.051	0.066
Percentile Labor Exchange, at 20th percentile WIA Adult	58.68%	57.38%

Statistical Match

The statistical matching that was done was to use a nearest neighbor approach with the propensity score. For every observation j in T , we found the observation k in U that minimized the absolute value of the difference between the propensity score for j and k . We then added k to the comparison group sample as long as the difference between the two p-scores did not exceed the caliper. The statistical match was done with replacement, so some observations in U were the “matches” for more than one observation in the treatment group and were duplicated in the comparison sample. Table 9.4 provides data about the sample sizes, number of matched observations that were duplicates, and a comparison of descriptive statistics between the treatment group, comparison group, and pool of observations from which the comparison group was chosen. Notice that means for the comparison group are quite close to the treatment group as would be expected. Only a few of the differences in means were statistically significant despite the match quality statistics that were not very promising.

Net Impacts

Tables 9.5 and 9.6 provide the estimated net impacts of attending private career schools on clients. As with comparable tables in the prior chapters, the first table displays the short-term (3 quarters after exit) and the longer-term (9-12 quarters after exit) outcomes for the 2001/2002 cohort of program exiters. The second table is limited to the short-term net impacts for the 2003/2004 cohort. The first column in each of the tables presents the estimates from the block matching technique, which uses the full comparison set (i.e., U) and the treatment group. The second column presents a comparison of means between the treatment group and the matched comparison group.

Table 9.4 Matching Algorithm Statistics and Post-Match Comparison of Characteristics for Private Career Schools

Statistic/Characteristic	2001/2002		2003/2004	
	Private Career School	Labor Exchange	Private Career School	Labor Exchange
Sample size	10,365	179,691	11,606	151,842
Sample size used in match	10,365	179,310	11,606	151,237
Matched sample size	10,363	8,958	11,603	9,951
Number of observations used once	—	8,003	—	8,732
Number of observations used multiple times	—	955	—	1,219
Maximum number of repeats	—	16	—	18
<u>Demographics and Education</u>				
Female	53.5%	52.7%	59.3%	58.8%
Minority	28.9%	27.7%	29.3%	29.1%
Mean, age at registration	30.3**	30.6**	31.5	31.6
Disability	—	—	1.3%	1.2%
Less than high school	5.6%	5.0%	5.6%	5.6%
GED	—	—	14.7%**	13.7%**
High school graduate	67.2%	66.3%	51.5%	51.1%
Some college, no degree	15.3%	16.1%	14.4%	14.9%
College certificate or associate degree	5.8%	6.2%	7.4%	7.7%
Bachelor degree	5.6%	5.9%	5.9%	6.4%
Master degree	0.4%	0.5%	0.5%	0.5%
Doctoral degree	0.0%	0.0%	0.1%	0.1%
West WA	80.5%	80.6%	80.6%	81.6%
Urban county	68.0%	68.5%	63.0%	64.1%
<u>Employment and Earnings (prior to registration)</u>				
Percentage employed prior to registration	67.4%**	65.9%**	66.0%**	64.4%**
Average quarterly earnings ^a	\$2,836	\$2,753	\$3,009**	\$2,861**
Mean, earnings trend ^b	\$77.9	\$77.5	\$43.3	\$36.2
Mean, earnings variance ^b	\$5.1	\$4.8	\$6.1	\$5.7
Mean, number of quarters with job change ^a	2.9	2.9	3.2	3.1
Had earnings dip	41.5%	42.2%	45.4%	44.3%
Mean, number of quarters since dip at registration ^a	1.3	1.3	1.5	1.4
Ave. earnings dip ^a	31.1%	31.6%	35.5%	34.4%
Sample size	10,363	10,363	11,603	11,603

NOTES: Monetary data in 2000 \$.

^aAverages include observations with values of zero.

^bTrend and variance calculations include quarters with zero earnings, if any.

** Difference in means is statistically significant at the 0.05 level (t-test).

The third column presents an estimate from a regression adjustment of that mean. This column represents the preferred specification, although for some programs we use the levels of the outcome variables as the dependent variable and, for others, we use difference-in differences. The coefficient estimates that are in “boxes” represent the final, “official” estimates using the preferred specification

Table 9.5 Net Impact Estimates for Private Career School Program for 2001/2002 Cohort

Outcome	Block	Matched Sample		Comparison Group			
	Matching	Estimator		Means			
	Estimator	Wtd. Diff.	Diff. in	Regr.	Full Sample		Matched Sample
	in Means	Means	Adj.	With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	4.9***	5.7***	5.4***	61.1	--	60.7	--
Ever employed, longer term (%)	3.6***	5.0***	4.3***	68.6	--	66.9	--
Percent of quarters, longer term	3.5***	4.7***	4.0***	59.4	--	57.0	--
Percent of quarters, longer term, diff-in-diff	3.4***	3.7***	4.3***	-7.5	--	-3.7	--
Average hourly wage							
Short term (\$)	0.75***	0.65***	0.57***	9.99	16.15	8.56	13.86
Short term diff-in-diff (\$)	0.98***	0.72***	0.82***	-2.05	-0.12	0.29	0.87
Longer term (\$)	0.61***	0.80***	0.69***	10.28	16.76	8.28	14.08
Longer term, diff-in-diff (\$)	0.83***	0.87***	0.94***	-1.76	-0.003	0.01	1.13
Average quarterly hours							
Short term	24.2***	29.1***	26.1***	240.7	389.1	223.0	361.3
Short term, diff-in-diff	25.4***	25.3***	27.6***	-44.0	-12.4	-3.2	17.2
Longer term	16.9***	22.7***	19.6***	252.9	395.0	231.0	373.0
Longer term, diff-in-diff	18.1***	18.7***	21.0***	-31.8	-5.8	4.8	31.7
Average quarterly earnings							
Short term (\$)	341***	391***	344***	3806	6151	2916	4724
Short term, diff-in-diff (\$)	380***	359***	397***	-1268	-412	-65	392
Longer term (\$)	236**	310***	261***	4310	6669	3272	5240
Longer term, diff-in-diff (\$)	275***	278***	312***	-764	-126	291	825
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-11.7***	-11.3***	-10.3***	24.8	--	18.4	--
Benefits - short term (\$)	-277.5***	-264.8***	-268.7***	674.9	2724.3	408.8	2223.7
Percent receiving, longer term	-2.3***	-2.1***	-2.1***	12.5	--	10.7	--
Benefits - longer term (\$)	-15.8***	-17.1***	-17.7***	83.2	1351.2	67.5	1279.2
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	0.5**	0.6**	0.2	2.3	--	3.9	--
TANF benefits - short term (\$)	7.8***	9.0***	8.5***	23.3	1015.6	38.2	985.8
Percent receiving TANF, longer term	1.3***	1.6***	0.7***	2.7	--	4.1	--
TANF benefits - longer term (\$)	11.1***	12.4***	11.9***	16.5	892.5	26.0	912.5
Percent receiving FS, short term	0.2	0.5	0.3	7.4	--	10.4	--
FS benefits - short term (\$)	5.8***	5.9**	5.7**	37.1	498.1	52.7	508.3
Percent receiving FS, longer term	0.7*	0.9*	0.6	10.8	--	14.7	--
FS benefits - longer term (\$)	5.9***	8.1***	7.6***	38.8	463.2	52.1	463.8
Percent enrolled Medicaid, short term	0.7	0.7	-0.2	10.2	--	17.4	--
Percent enrolled Medicaid, longer term	1.7***	1.5***	0.4	10.6	--	17.7	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 9.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 9.6 Net Impact Estimates for Private Career School Programs for 2003/2004 Cohort

Outcome	Block Matching Estimator		Matched Sample Estimator	Comparison Group Means			
	Wtd. Diff. in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	5.8***	5.0***	4.8***	62.5	--	62.1	--
Average hourly wage							
Short term (\$)	0.77***	0.73***	0.62***	9.23	14.59	7.99	12.64
Short term diff-in-diff (\$)	1.77***	1.47***	1.69***	-2.99	-1.46	-0.91	-0.73
Average quarterly hours							
Short term	23.7***	20.4***	17.7***	251.2	397.1	237.5	376.0
Short term, diff-in-diff	48.0***	36.7***	40.7***	-42.5	-3.4	6.6	26.4
Average quarterly earnings							
Short term (\$)	253***	254***	200***	3645	5760	2952	4674
Short term, diff-in-diff (\$)	684***	529***	624***	-1547	-801	-326	-70
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-1.3***	-1.0***	-0.9***	6.0	--	4.2	--
Benefits - short term (\$)	-3.6	0.1	-1.3	59.9	1001.2	38.7	911.4
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	-1.9***	-1.9***	-0.9***	3.6	--	5.9	--
TANF benefits - short term (\$)	-21.0***	-23.0***	-22.9***	35.6	997.4	61.0	1026.5
Percent receiving FS receipt, short term	-5.5***	-5.9***	-4.8***	13.9	--	19.6	--
FS benefits - short term (\$)	-34.7***	-41.8***	-41.7***	77.4	555.7	116.0	593.0
Percent enrolled Medicaid, short term	-2.8***	-3.2***	-3.3***	14.7	--	23.5	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 9.4. * significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

as chosen by WTECB staff. The rightmost columns of the tables provide the means of the comparison group, both the full comparison group pool and the matched comparison group. These columns are provided so that the net impacts can be estimated on a percentage basis.

The short-term impacts displayed in table 9.6 are quite positive. The employment rate net impact goes up by 4.8 percentage points; the hourly wage net impact shows an increase of about \$1.70 per hour; and hours worked increases by over 40 hours, which is statistically significant. These positives re-enforce each other so that average quarterly earnings rise by about \$624, which is

approximately a 12 to 15 percent increase. Also, in the short-term, reciprocity of public assistance benefits and eligibility for Medicaid decrease significantly.

The longer-term net impacts closely mirror the short-term impacts. Employment, wages, and hours all increase, which results in an increase in quarterly earnings. The magnitudes of these impacts are slightly smaller than those estimated in the short-term, so the earnings impact is also smaller—about \$312 in average quarterly earnings.

Subgroup Analysis

Tables 9.7 and 9.8 provide net impact estimates for the subgroup of the private career school participants who were reported to complete their programs. Almost 75 to 80 percent of the sample were reported to be completers, so that subsample consists of a large share of the total treatment sample. Nevertheless, the results are different and much stronger than for the whole treatment group. The short-term employment rate impact was 7.3 percentage points and the hourly wage went up by \$2.00 an hour. Similarly, hours worked went up by over 52 hours and overall earnings increased by about \$800, or about 15 percent. The entries in the first column of table 9.8 show rather bleak outcomes for noncompleters—a negative employment effect and earnings impact, although the latter is not significant. Furthermore, the decreases in public assistance and Medicaid receipt were larger for the completers than for the noncompleters, who in fact had increases in food stamps. In table 9.7, we find similar results for the longer-term net impacts. Completers had large employment, wage rate, and hours net impacts and therefore large average quarterly earnings impacts. Noncompleters have lower employment, wage rates, hours, and earnings in the long-term. Completers tend to reduce their longer-term reciprocity of public assistance whereas noncompleters actually increase their take-up rates.

Table 9.7 Selected Long Term Net Impact Estimates for Subgroups of Private Career School
Participants: 2001/2002 Cohort

	Subgroup		Matched Comparison Group Mean
	Noncompleters	Completers	
Employment	-1.1%	6.4%**	57.0%
Hourly Wage	-\$0.37	\$1.46**	\$8.28
Hours Worked	-15.1**	34.9**	231.0
Earnings	-\$288**	\$558**	\$3,272
UI Receipt	-2.0%**	-2.0%**	10.7%
TANF Receipt	2.4%**	0.1%	4.1%
Food Stamps Recipient	7.6%**	-1.8%**	14.7%
Medicaid Enrollment	5.6%**	-1.3%**	17.7%
Subgroup Sample Size	2,880	7,483	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

Table 9.8 Selected Short Term Net Impact Estimates for Subgroups of Private Career School
Participants: 2003/2004 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Noncompleters	Completers	
Employment	-6.0%**	7.3%**	62.1%
Hourly Wage	\$0.21	\$2.06**	\$7.99
Hours Worked	-8.5	52.5**	237.5
Earnings	-\$52	\$796**	\$2,952
UI Receipt	-0.2%	-1.1%**	4.2%
TANF Receipt	-0.6%	-1.4%**	5.9%
Food Stamps Receipt	2.7%**	-6.7%**	19.6%
Medicaid Enrollment	1.4%	-4.3%**	23.5%
Subgroup Sample Size	2,255	9,348	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

10 APPRENTICESHIP PROGRAMS

The workforce development program that is the “treatment” in this chapter is apprenticeship programs. Apprenticeships are formal arrangements between employed individuals, employers, and the state in which classroom instruction and formal on-the-job training are combined. They are typically multi-year efforts, and are supervised by journey-level craftpersons or other trade professionals. Completion standards typically include 2000 total work hours and at least 144 hours of related and supplemental formal instruction. Apprenticeships are administered in Washington by the Department of Labor and Industries.

Participant Characteristics

Table 10.1 provides descriptive data that compare the individuals in the treatment group to those in the comparison group pool. As with the community college programs, the comparison group consists of Labor Exchange clients who were 16 to 60 at the time of LE registration. The individuals who were served by Washington’s education and training programs were removed from the data. The first two columns of numbers compare the apprenticeship participants who exited in 2001/2002 to individuals in the comparison group. The final two columns compare the exiters in 2003/2004 to LE exiters in the same year.

One major data limitation in our analyses of apprenticeship programs is the paucity of information about the individuals’ characteristics. The only administrative data available were gender, age, and minority status. We had no data on education background, disability, limited English proficiency status, or employment or public assistance status at the time of registration for the apprenticeship. This data deficiency limited severely the quality of the participation model estimation and the statistical match as documented below.

Table 10.1 Descriptive Statistics for Apprenticeship Treatment Group and Comparison Group Universe

Characteristics	2001/2002		2003/2004	
	Apprentice-ship	Labor Exchange	Apprentice-ship	Labor Exchange
<u>Demographics and Education</u>				
Female	13.1%	38.8%	9.3%	42.1%
Minority	26.3% ^{††}	26.5% ^{††}	26.9%	29.8%
Mean, age at registration	28.4	35.4	28.7	35.7
West WA	87.2%	75.8%	81.4%	69.8%
Urban county	69.0%	58.5%	68.2%	50.5%
<u>Employment and Earnings (prior to registration)</u>				
Ave. percentage of (prior) quarters with employment ^a	77.5%	73.3%	77.1%	70.3%
Average quarterly earnings ^{a, b}	\$3,546	\$4,834	\$3,834	\$4,435
Mean, earnings trend ^c	\$143.3 ^{††}	\$150.1 ^{††}	\$127.2	\$101.2
Mean, earnings variance ^c (in 10 ⁶ \$)	\$4.9	\$12.1	\$7.1	\$9.9
Mean, number of quarters with job change ^b	2.9	2.5	3.9	2.6
Had earnings dip	37.7%	29.6%	40.7%	28.4%
Mean, number of quarters since dip at registration ^b	1.2	1.0	1.4	0.8
Ave. earnings dip ^b	25.0%	19.6%	28.3%	19.5%
Sample size	2,896	188,282	2,410	164,811

NOTE: Monetary data in 2000 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.

^bAverages include observations with values of zero.

^cTrend and variance calculations include quarters with zero earnings, if any.

^{††}Differences in means are not statistically significant at 0.05 level (t-test).

Even with the few characteristics that were available, we see that the populations were different. In 2001/2002, only about 13 percent of apprenticeship participants were females compared to just under 40 percent of the LE registrants. In 2003/2004, the gender difference was even greater—9 percent to 42 percent female. The apprentices were considerably younger; they averaged 7 years younger in both cohorts. The employment rates of the apprentices and the LE comparison group pool prior to registration were comparable; but the apprentices had lower average quarterly earnings, higher job turnover, and more incidences of earnings dips. The share of the populations that were minorities was similar for the two groups.

Participation Model

Table 10.2 provides the results from the logit estimation of apprenticeship participation. The independent variables included the few demographic variables available plus prior earnings and

public assistance. The table provides the logit coefficient estimates and standard errors. While the magnitude of the coefficients is not particularly meaningful, the sign and statistical significance are. If the coefficient is negative, then a (positive) change in that variable will decrease the likelihood of being an apprentice.

Table 10.2 Coefficient Estimates from a Logit Model of Participation in Apprenticeships

Characteristics	2001/2002		2003/2004	
	Coefficient	Std. Error	Coefficient	Std. Error
<u>Demographics and Education</u>				
Female	-1.207***	0.058	-1.594***	0.073
Minority	0.026	0.044	-0.086*	0.049
Age at registration	-0.054***	0.002	-0.067***	0.003
West WA	0.688***	0.060	0.493***	0.058
Urban county	0.429***	0.044	0.732***	0.049
<u>Employment and Earnings (prior to registration)</u>				
Percentage of quarters with employment	0.014***	0.001	0.011***	0.001
Average quarterly earnings ^a	-0.012***	0.001	-0.005***	0.001
Earnings trend ^a	-0.003	0.003	-0.004	0.005
Earnings variance ^b	-1.720***	0.324	-0.252	0.171
Number of quarters with job change	-0.058***	0.007	0.027***	0.006
Had earnings dip	0.436***	0.104	-0.149	0.117
Number of quarters since dip at registration	-0.009	0.016	0.111***	0.017
Percent of earnings dip	-0.115	0.117	0.360***	0.126

NOTE: Model included last industry of employment prior to registration and an intercept term. Samples sizes were 191,178 and 167,221 for 2001/2002 and 2003/2004, respectively.

^aScaled in \$100 (2000 \$).

^bScaled in \$10⁸ (2000 \$)

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

The coefficient estimates seem quite reasonable. The following variables are significantly correlated with being in the treatment group (i.e., apprenticeship participant) in both years of data: Being from Western Washington, residing in an urban county, and percentage of quarters employed. The following variables are significantly correlated with being in treatment group: Female, age at registration, average quarterly earnings prior to registration, and variance in earnings prior to registration (not significant in 2003/2004).

Propensity Score Statistics

The propensity score for an observation is the predicted probability using the estimated coefficients and the observation's actual data. If the logit model has substantial predictive capability, then the mean propensity score for the comparison group should be small (near zero) and should be much less than the mean score for the treatment. As argued earlier, a measure of how well the logit model discriminates between comparison group members and treatment group members is the cumulative percentile for the comparison group at the propensity score that is the 20th percentile. Table 10.3 provides these data for the apprenticeship group. The mean propensity scores for the treatment groups are roughly 0.05 and 0.075 whereas they are 0.015 and 0.014 for the comparison group for 2001/2002 and 2003/2004 respectively. The 20th percentile indicator is approximately 66 percent for 2001/2002 and 74 percent for 2003/2004. The means and the 20th percentile statistics indicate that the logit model of participation did not discriminate all that well between treatment and comparison group observations. This is likely because of the lack of personal characteristics data in the administrative database.

Table 10.3 Indicators of Propensity Score Model Quality for Apprenticeships

Statistic	2001/2002	2003/2004
Mean p-score, apprenticeship	0.054	0.075
Mean p-score, Labor Exchange	0.015	0.014
Percentile Labor Exchange, at 20th percentile apprenticeship	66.10%	73.50%

Statistical Match

Table 10.4 provides data about the sample sizes, number of matched observations that were duplicates, and a comparison of descriptive statistics between the treatment group, comparison group, and pool of observations from which the comparison group was chosen. Notice that means

for the comparison group are quite close to the treatment group as would be expected and that only about five percent of the matched comparison group have multiple records. Only one of the differences in means is statistically significant.

Table 10.4 Matching Algorithm Statistics and Post-Match Comparison of Characteristics for Apprenticeships

Statistic/Characteristic	2001/2002		2003/2004	
	Apprentice-ship	Labor Exchange	Apprentice-ship	Labor Exchange
Sample size	2,896	188,282	2,410	164,811
Sample size used in match	2,896	184,795	2,410	161,834
Matched sample size	2,895	2,701	2,409	2,222
Number of observations used once	—	2,552	—	2,074
Number of observations used multiple times	—	149	—	148
Maximum number of repeats	—	8	—	5
<u>Demographics and Education</u>				
Female	13.1%	11.9%	9.3%	9.7%
Minority	26.3%	25.9%	26.9%	26.4%
Mean, age at registration	28.4	28.8	28.7	28.9
West WA	87.2%	87.6%	81.4%	82.5%
Urban county	69.0%	69.4%	68.2%	68.1%
<u>Employment and Earnings (prior to registration)</u>				
Percentage employed prior to registration	77.5%	77.5%	77.1%	76.8%
Average quarterly earnings ^a	\$3,546	\$3,563	\$3,834**	\$3,638**
Mean, earnings trend ^b	\$143.3	\$149.1	\$127.4	\$116.6
Mean, earnings variance ^b (in 10 ⁶ \$)	\$4.9	\$5.1	\$7.1	\$6.6
Mean, number of quarters with job change ^a	2.9	2.9	3.9	3.8
Had earnings dip	37.7%	37.2%	40.7%	39.6%
Mean, number of quarters since dip at registration ^a	1.2	1.1	1.4	1.3
Ave. earnings dip ^a	25.0%	24.7%	28.3%	27.7%
Sample size	2,895	2,895	2,409	2,409

NOTES: Monetary data in 2000 \$.

^aAverages include observations with values of zero.

^bTrend and variance calculations include quarters with zero earnings, if any.

** Difference in means is statistically significant at the 0.05 level (t-test).

Net Impacts

Tables 10.5 and 10.6 provide the estimated net impacts of participating in apprenticeships. Short-term and longer-term impacts for apprenticeship participants are quite positive. In the short term, average quarterly earnings increased by over \$2,700, which is almost 50 percent. These earnings gains came from increased employment impacts of 7.4 percentage points, hourly wage increases of \$6.60, and increased hours per quarter of about 33 hours. The increased earnings gains

Table 10.5 Net Impact Estimates for Apprenticeships for 2001/2002 Cohort

Outcome	Block Matching Estimator		Matched Sample Estimator	Comparison Group Means			
	Wtd. Diff. in Means	Diff. in Means		Regr. Adj.	Full Sample		Matched Sample
			With 0		W/O 0	With 0	W/O 0
Employment							
Short term (%)	6.3***	6.1***	6.5***	60.9	--	65.5	--
Ever employed, longer term (%)	6.7***	7.4***	7.3***	68.3	--	71.3	--
Percent of quarters, longer term	7.7***	8.8***	8.7***	59.0	--	60.4	--
Percent of quarters, longer term, diff-in-diff	5.5***	6.9***	6.8***	-7.3	--	-7.2	--
Average hourly wage							
Short term (\$)	4.83***	4.98***	5.00***	9.86	16.00	9.82	14.82
Short term diff-in-diff (\$)	4.92***	5.19***	5.17***	-1.95	-0.09	-0.06	1.11
Longer term (\$)	4.56***	4.88***	4.89***	10.12	16.60	9.60	15.32
Longer term, diff-in-diff (\$)	4.68***	5.11***	5.08***	-1.69	0.03	-0.28	1.49
Average quarterly hours							
Short term	29.7***	28.2***	28.6***	238.8	387.3	251.6	379.6
Short term, diff-in-diff	14.4***	14.8**	14.5**	-42.3	-11.9	-10.1	11.2
Longer term	29.7***	34.5***	34.2***	250.5	393.2	252.2	384.0
Longer term, diff-in-diff	14.5**	21.3***	20.3***	-30.5	-5.1	-9.5	18.2
Average quarterly earnings							
Short term (\$)	2128***	2144***	2157***	3743	6073	3658	5518
Short term, diff-in-diff (\$)	2125***	2181***	2168***	-1218	-392	-42	551
Longer term (\$)	1942***	2049***	2057***	4233	6578	3932	5908
Longer term, diff-in-diff (\$)	1946***	2092***	2075***	-728	-107	232	871
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	3.5***	5.1***	5.3***	24.4	--	20.1	--
Benefits - short term (\$)	90.7***	129.9***	134.9***	659.0	2698.0	443.4	2201.7
Percent receiving, longer term	14.1***	14.1***	14.1***	12.4	--	14.7	--
Benefits - longer term (\$)	190.7***	192.8***	194.4***	82.1	1339.1	89.3	1261.8
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	-0.5**	-0.7**	-0.4*	2.5	--	2.0	--
TANF benefits - short term (\$)	-4.4	-7.4*	-7.4*	25.0	1014.8	21.6	1058.8
Percent receiving TANF, longer term	-0.6**	-0.8**	-0.5**	2.9	--	2.7	--
TANF benefits - longer term (\$)	-3.1	-8.0**	-8.4***	17.8	896.3	18.7	972.3
Percent receiving FS, short term	-2.0***	-2.4***	-1.7***	7.9	--	6.9	--
FS benefits - short term (\$)	-8.8***	-9.5**	-9.4**	39.3	496.8	32.5	473.3
Percent receiving FS, longer term	-2.6***	-2.5***	-2.2***	11.4	--	10.8	--
FS benefits - longer term (\$)	-9.9***	-10.7***	-11.4**	40.9	463.1	36.1	455.2
Percent enrolled Medicaid, short term	-3.0***	-2.7***	-1.9***	10.6	--	8.2	--
Percent enrolled Medicaid, longer term	-1.9***	-1.7**	-1.4**	11.0	--	9.2	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 10.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 10.6 Net Impact Estimates for Apprenticeship for 2003/2004 Cohort

Outcome	Block	Matched Sample		Comparison Group				
	Matching	Estimator		Means				
	Estimator	Wtd. Diff. in	Diff. in	Regr.	Full Sample		Matched Sample	
		Means	Means	Adj.	With 0	W/O 0	With 0	W/O 0
Employment								
Short term (%)		5.2***	7.3***	7.4***	61.6	--	64.3	--
Average hourly wage								
Short term (\$)		5.53***	5.92***	5.65***	9.01	14.45	9.63	14.66
Short term diff-in-diff (\$)		6.47***	6.44***	6.60***	-2.65	-1.42	-1.42	-0.36
Average quarterly hours								
Short term		26.9***	34.8***	32.8***	246.7	395.6	256.5	390.4
Short term, diff-in-diff		430.9***	28.6***	33.5***	-33.7	-0.5	-10.6	32.6
Average quarterly earnings								
Short term (\$)		2421***	2611***	2481***	3550	5691	3712	5649
Short term, diff-in-diff (\$)		2693***	2625***	2730***	-1377	-742	-371	329
Unemployment Insurance Benefits (average quarterly)								
Percent receiving, short term		11.1***	11.9***	11.3***	5.7	--	6.3	--
Benefits - short term (\$)		254.7***	268.8***	265.0***	57.0	997.7	60.7	961.3
Public Assistance and Medicaid (average quarterly)								
Percent receiving TANF, short term		-0.7***	-0.6	-0.4	3.5	--	2.2	--
TANF benefits - short term (\$)		-9.8***	-5.2	-5.0	34.8	994.9	17.4	807.6
Percent receiving FS, short term		-4.7***	-4.4***	-3.5***	13.9	--	11.0	--
FS benefits - short term (\$)		-26.2***	-22.7***	-21.3***	76.5	551.3	55.8	507.1
Percent enrolled Medicaid, short term		-4.7***	-4.8***	-3.8***	14.8	--	10.8	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 10.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

were complemented with the slight, but significant, decreases in Medicaid and Food Stamps. There is an estimated decrease in TANF reciprocity as well, but it is not statistically significant.

The longer-term earnings impacts were also very positive, but were slightly smaller than the short-term net impacts. The employment rate increased by 6.8 percentage points; and the hourly wage increase was estimated to be \$5.08. These are quite substantial, but they are still less than the short-term impacts. The hours per quarter net impacts of about 20 hours was also less than the short-term estimates. The quarterly earnings impact of apprenticeships was about \$2,075 per quarter. The longer-term impacts for public assistance and Medicaid were virtually identical to the short-term

ones. On the other hand, apprentices are projected to increase significantly their usage of unemployment compensation in the longer term.

Subgroup Analyses

About 40 percent of the apprenticeship treatment group actually completed their apprenticeships, which is comparable to historical, national data. Tables 10.7 and 10.8 display selected net impact estimates for the completers and for the noncompleters subgroup. The estimates for completers are very large and statistically significant. The positive net impacts for the entire treatment group may emanate just from the completers. In the short term, relative to the comparison group and the non-completers, the employment rates rise by 18.8 percentage points, wage rates by \$13.00, and quarterly earnings by over \$5,400. Furthermore, there are huge reductions in public assistance receipt. The longer-term net impact estimates are attenuated somewhat relative to the short-term estimates, but only slightly. The average quarterly earnings of apprenticeship completers rise by more than \$4,500.

Table 10.7 Selected Long Term Net Impact Estimates for Subgroups of Apprenticeships: 2001/2002 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Noncompleters	Completers	
Employment	0.3%	16.1% **	60.4%
Hourly Wage	\$1.00**	\$10.59**	\$9.60
Hours Worked	-7.5	59.5**	252.2
Earnings	\$236	\$4,516**	\$3,932
UI Receipt	4.1% **	28.6% **	14.7%
TANF Receipt	0.1%	-1.3% **	2.7%
Food Stamps Recipient	-0.1%	-5.3% **	10.8%
Medicaid Enrollment	0.6%	-3.7% **	9.2%
Subgroup Sample Size	1,649	1,246	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

Table 10.8 Selected Short Term Net Impact Estimates for Subgroups of Apprenticeships: 2003/2004 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Noncompleters	Completers	
Employment	-1.0%	18.8%**	64.3%
Hourly Wage	\$1.84**	\$13.00**	\$9.63
Hours Worked	13.7	61.8**	256.5
Earnings	\$699**	\$5,449**	\$3,712
UI Receipt	2.0%**	25.5%**	6.3%
TANF Receipt	-0.1%	-0.8%**	2.2%
Food Stamps Receipt	-1.6%	-6.5%**	11.0%
Medicaid Enrollment	-1.9%**	-5.3%**	10.8%
Subgroup Sample Size	1,361	1,048	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

11 HIGH SCHOOL CAREER AND TECHNICAL EDUCATION (CTE) PROGRAMS

Secondary career and technical education (vocational education) provides general workplace and, to some extent, specific occupational skills instruction to high school students. In other programs analyzed in this project, the participating population included completers as well as “non-completers.” However, with the high school career and technical education students, the “treatment” is full-time equivalent vocational completers only, defined as completing 360 hours of sequenced vocational classes. The Office of the Superintendent of Public Instruction (OSPI) provided the WTECB with individual-level data from general administrative information provided by public high schools in the state about their student enrollment (Form SPIP-210). The intent of the data collection was to have universal coverage, but some high schools did not provide the data. So the representativeness and generalizability of the data may be at question. A significant advantage to our analyses, however, was the ability to use the same data set for the comparison group pool as the treatment. That is, the observations in the high school data that were not classified as vocational completers (by the high school) comprised the comparison group pool.

CTE programs are designed to develop the skills, understanding, and attitudes needed by workers in their occupations. Instructional programs organized within career pathways include agriculture, family and consumer sciences, trade and industry, marketing, business, diversified occupations, technology education, cosmetology, health education, and others.

Participant Characteristics

Table 11.1 provides descriptive data that compare the students in the treatment group to those in the comparison group pool. The first two columns of numbers compare the high school career and

Table 11.1 Descriptive Statistics for High School Career and Technical Education Treatment Group and Comparison Group Pool

Characteristics	2001/2002		2003/2004	
	CTE Completers	Non-Completers	CTE Completers	Non-Completers
<u>Demographics and Education</u>				
Female	47.4%	51.8%	48.0%	52.6%
Minority	19.9%	21.6%	22.9%	21.6%
Disability	6.6%	4.9%	6.6%	5.7%
Limited English proficiency	2.0% ^{††}	1.8% ^{††}	2.1%	1.6%
GPA	2.86	2.72	2.79 ^{††}	2.79 ^{††}
Low Socioeconomic Status	11.7%	8.3%	22.3%	15.2%
Graduated	94.0%	81.5%	93.1%	87.0%
West WA	71.5%	77.5%	75.3%	78.6%
Urban county	46.4%	53.9%	50.5%	54.1%
<u>Employment and Earnings (prior to registration)^a</u>				
Ave. percentage of (prior) quarters with employment ^b	47.9%	44.0%	38.6%	34.5%
Average quarterly earnings ^{b, c}	\$504	\$478	\$421	\$379
Mean, earnings trend ^d	\$19.2	\$9.6	\$14.9 ^{††}	\$10.8 ^{††}
Mean, earnings variance ^d (in 10 ⁶ \$)	\$0.4 ^{††}	\$0.4 ^{††}	\$0.4 ^{††}	\$0.4 ^{††}
Mean, number of quarters with job change ^c	0.6 ^{††}	0.6 ^{††}	0.4 ^{††}	0.4 ^{††}
Had earnings dip	30.0% ^{††}	30.8% ^{††}	24.6% ^{††}	24.0% ^{††}
Mean, number of quarters since dip at registration ^c	0.9 ^{††}	0.9 ^{††}	0.8 ^{††}	0.8 ^{††}
Ave. earnings dip ^c	25.3% ^{††}	26.1% ^{††}	21.1% ^{††}	20.8% ^{††}
Sample size	12,150	35,470	13,394	30,570

NOTE: Monetary data in 2000 \$.

^aPrior to registration is defined as prior to September 1 of grade 12.

^bObservations with no quarters of prior earnings were excluded from analyses.

^cAverages include observations with values of zero.

^dTrend and variance calculations include quarters with zero earnings, if any.

^{††}Differences in means are not statistically significant at 0.05 level (t-test).

technical education completers who graduated in 2001/2002 to the remaining students in the sample. The final two columns compare the 2003/2004 career and technical education graduates to other graduates.²³

The two populations of high school graduates are closely aligned to each other. There appear to be slightly more males and low socio-economic status (SES) students in the career and technical education programs. Also there are fewer students from urban high schools. A higher percentage of the CTE completers graduated from high school, and in the 2001/2002 cohort, had a higher average grade point average. Prior to graduation, a higher percentage of career and technical education

²³We also matched the career and technical students from high schools to individuals on the ES file who were 16–19 years old. However, the participation model and the quality of the matches were not as believable or as statistically robust as the models using the high school data.

students had been employed, and their average quarterly earnings were slightly higher. Other than that, the employment and earnings histories of the two groups are statistically indistinguishable.

Participation Model

Table 11.2 provides the results from the logit estimation of participation. Using the high school data base, we estimated a model of being a vocational completer. That was the dependent variable, which took on a value of 1 for the treatment group, and 0 for the other students. The table provides the logit coefficient estimates and standard errors. As with the previous programs, the magnitude of the coefficients is not particularly meaningful, but the sign and statistical significance are. If the coefficient is negative, then a (positive) change in that variable will decrease the likelihood of being a career and technical education completer.

The coefficient estimates seem quite reasonable. The following variables are significantly correlated with being in the treatment group (i.e., career and technical education completer) in both years of data: having a disability, low SES, and percentage of quarters employed. The following variables are significantly correlated with being in treatment group: female, GPA, and residing in an urban county.

Propensity Score Statistics

The propensity score for an observation is the predicted probability using the estimated coefficients and the observation's actual data. If the logit model has substantial predictive capability, then the mean propensity score for the comparison group should be small (near zero) and should be much less than the mean score for the treatment. As argued earlier, a measure of how well the logit

Table 11.2 Coefficient Estimates from a Logit Model of being a High School CTE Completer

Characteristics	2001/2002		2003/2004	
	Coefficient	Std. Error	Coefficient	Std. Error
<u>Demographics and Education</u>				
Female	-0.205***	0.022	-0.0210***	0.021
Minority	-0.076***	0.028	0.026	0.027
Disability	0.326***	0.046	0.118***	0.044
Limited English proficiency	0.106	0.080	0.025	0.079
GPA	-0.047***	0.015	-0.079***	0.013
Low Social Economic Status	0.321***	0.037	0.477***	0.028
Graduated	1.405***	0.047	0.883***	0.042
West WA	-0.194***	0.026	-0.114***	0.026
Urban county	-0.268***	0.023	-0.107***	0.022
<u>Employment and Earnings (prior to registration)</u>				
Percentage of quarters with employment	0.002***	0.001	0.001**	0.0005
Average quarterly earnings ^a	-0.001	0.002	0.001	0.001
Earnings trend ^a	0.008*	0.005	0.001	0.001
Earnings variance ^b	-0.424	0.514	-0.273	0.313
Number of quarters with job change	-0.002	0.011	-0.015	0.011
Had earnings dip	-0.095	0.088	0.161*	0.097
Number of quarters since dip at registration	-0.001	0.012	-0.033***	0.013
Percent of earnings dip	0.055	0.090	-0.154	0.098

NOTE: Model included last industry of employment prior to registration and an intercept term. Samples sizes were 47,620 and 43,964 for 2001/2002 and 2003/2004, respectively.

^aScaled in \$100 (2000 \$).

^bScaled in \$10⁸ (2000 \$)

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

model discriminates between comparison group members and treatment group members is the cumulative percentile for the comparison group at the propensity score that is the 20th percentile.

Table 11.3 provides these data for the secondary CTE completer group. The mean propensity scores for the treatment groups are roughly 0.28 and 0.32 whereas they are 0.25 and 0.30 for the comparison group for 2001/2002 and 2003/2004 respectively. The 20th percentile indicator is approximately 36 percent for 2001/2002 and 31 percent for 2003/2004. The means and the 20th percentile statistics indicate that the logit model of participation did not discriminate well between treatment and comparison group observations. We could have used the entire comparison group pool for the analyses.

Table 11.3 Indicators of Propensity Score Model Quality for High School CTE Completer Analyses

Statistic	2001/2002	2003/2004
Mean p-score, HS CTE Completers	0.284	0.322
Mean p-score, Non-completers	0.245	0.297
Percentile Non-completers, at 20th percentile HS CTE Completers	36.40%	31.47%

Statistical Match

Nevertheless, we performed a match. For every observation j in T , we found the observation k in U that minimized the absolute value of the difference between the propensity score for j and k . We then added k to the comparison group sample if the difference was less than the caliper. The statistical match was done with replacement, so some observations in U were the “matches” for more than one observation in the treatment group. Table 11.4 provides data about the sample sizes, number of matched observations that were duplicates, and a comparison of descriptive statistics between the treatment group, comparison group, and pool of observations from which the comparison group was chosen. Notice that means for the matched comparison group are quite close to the treatment group (none of the demographic and education or employment and earnings characteristics had means that differed from each other statistically), but we believe this was an artifact of the original distribution rather than the matching process because the logit model did not discriminate well between the comparison group pool or treatment group.

Net Impacts

The major purpose of the study was to estimate the net impacts of the education and training programs on clients. Tables 11.5 and 11.6 provide the estimated net impacts for secondary career

Table 11.4 Matching Algorithm Statistics and Post-Match Comparison of Characteristics for High School CTE

Statistic/Characteristic	2001/2002		2003/2004	
	CTE Completers	Non-Completers	CTE Completers	Non-Completers
Sample size	12,150	35,470	13,394	30,570
Sample size used in match	12,150	35,463	13,394	30,567
Matched sample size	12,146	9,086	13,392	9,446
Number of observations used once	—	6,809	—	6,586
Number of observations used multiple times	—	2,277	—	2,860
Maximum number of repeats	—	12	—	8
<u>Demographics and Education</u>				
Female	47.4%	47.3%	48.0%	47.0%
Minority	19.1%	20.1%	22.9%	22.5%
Disability	6.5%	6.6%	6.6%	6.8%
Limited English proficiency	2.0%	2.0%	2.1%	2.1%
GPA	2.86	2.87	2.78	2.80
Low SES	11.6%	12.3%	22.3%	22.0%
Graduated	94.0%	93.9%	93.1%	93.3%
West WA	71.5%	71.9%	75.3%	76.3%
Urban county	46.4%	46.1%	50.5%	50.7%
<u>Employment and Earnings (prior to registration)</u>				
Percentage employed prior to registration	47.9%	47.7%	38.6%	38.7%
Average quarterly earnings ^a	\$504	\$496	\$420	\$430
Mean, earnings trend ^b	\$19.2	\$21.1	\$14.9	\$16.5
Mean, earnings variance ^b (in 10 ⁶ \$)	\$0.4	\$0.4	\$0.4	\$0.4
Mean, number of quarters with job change ^a	0.6	0.6	0.4	0.4
Had earnings dip	30.0%	29.2%	24.6%	23.5%
Mean, number of quarters since dip at registration ^a	0.9	0.9	0.8	0.7
Ave. earnings dip ^a	25.3%	24.5%	21.1%	20.0%
Sample size	12,146	12,146	13,392	13,392

NOTES: Monetary data in 2000 \$. None of the differences in means are statistically significant at the 0.05 level (t-test).

^aAverages include observations with values of zero.

^bTrend and variance calculations include quarters with zero earnings, if any.

and technical education. As with comparable tables in the prior chapters, the first table displays the short-term (3 quarters after exit) and the longer-term (9-12 quarters after exit) outcomes for the 2001/2002 cohort of program exiters. The second table is limited to the short-term net impacts for the 2003/2004 cohort. The first column in each of the tables presents the estimates from the block matching technique, which uses the full comparison set (i.e., *U*) and the treatment group. The second column presents a comparison of means between the treatment group and the matched comparison group. The third column presents an estimate from a regression adjustment of that mean.

Table 11.5 Net Impact Estimates for High School CTE Completers for 2001/2002 Cohort

Outcome	Block	Matched Sample	Comparison Group				
	Matching	Estimator	Means				
	Estimator			Full Sample		Matched Sample	
	Wtd. Diff. in Means	Diff. in Means	Regr. Adj.	With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	6.0***	6.3***	6.8***	48.5	--	50.4	--
Ever employed - longer term (%)	3.8***	3.3***	3.2***	71.1	--	73.2	--
Percent of quarters, longer term	5.9***	5.5***	5.4***	53.7	--	55.7	--
Percent of quarters, longer term, diff-in-diff	4.7***	4.5***	4.7***	24.4	--	24.6	--
Average hourly wage							
Short term (\$)	0.51***	0.59***	0.58***	4.81	9.52	4.94	9.39
Short term diff-in-diff (\$)	0.42***	0.52***	0.54***	2.41	2.10	2.44	2.06
Longer term (\$)	0.63***	0.61***	0.59***	5.49	9.79	5.66	9.74
Longer term, diff-in-diff (\$)	0.54***	0.53***	0.55***	3.09	2.53	3.17	2.51
Average quarterly hours							
Short term	27.2***	28.1***	27.8***	120.6	238.9	126.3	240.5
Short term, diff-in-diff	25.3***	27.3***	27.6***	70.5	93.5	73.4	93.0
Longer term	36.8***	36.0***	35.5***	167.3	274.8	175.6	279.7
Longer term, diff-in-diff	35.0***	35.2***	35.3***	117.2	142.2	122.7	148.0
Average quarterly earnings							
Short term (\$)	224***	242***	237***	1111	2201	1142	2174
Short term, diff-in-diff (\$)	220***	236***	238***	726	1177	754	1163
Longer term (\$)	390***	385***	378***	1682	2720	1757	2765
Longer term, diff-in-diff (\$)	385***	379***	379***	1297	1873	1368	1933
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short-term	0.4***	0.3**	0.3***	1.1	--	1.1	--
Benefits - short term (\$)	3.2*	3.4*	3.1*	10.4	941.8	9.3	850.5
Percent receiving, longer term	1.0***	0.9***	0.8***	2.9	--	3.1	--
Benefits - longer term (\$)	2.7**	2.3*	2.2*	10.6	788.5	11.6	791.4
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	-0.4***	-0.5***	-0.1*	2.1	--	1.4	--
TANF benefits - short term (\$)	-3.7***	-5.2***	-5.4***	18.9	915.5	13.5	954.0
Percent receiving TANF, longer term	-0.5***	-0.5***	-0.1	3.6	--	2.4	--
TANF benefits - longer term (\$)	-3.1**	-3.7***	-3.8***	19.5	816.6	13.2	830.3
Percent receiving FS, short term	-1.1***	-1.4***	-0.7***	5.7	--	4.8	--
FS benefits - short term (\$)	-4.9***	-6.9***	-6.9***	29.5	514.0	25.3	523.1
Percent receiving FS, longer term	-1.9***	-2.4***	-1.4***	9.9	--	8.6	--
FS benefits - longer term (\$)	-8.0***	-10.6***	-10.7***	33.1	453.0	28.0	452.7
Percent enrolled Medicaid, short-term	-0.3	-0.4	-0.2	20.5	--	19.6	--
Percent enrolled Medicaid, longer term	-0.8*	-0.5	-0.4	22.2	--	20.1	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 11.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 11.6 Net Impact Estimates for High School CTE Completers for 2003/2004 Cohort

Outcome	Block Matching Estimator		Matched Sample Estimator	Comparison Group Means			
	Wtd. Diff. in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	6.9***	6.3***	6.7***	44.4	--	46.7	--
Average hourly wage							
Short term (\$)	0.56***	0.46***	0.47***	3.96	8.54	4.21	8.64
Short term diff-in-diff (\$)	0.53***	0.39***	0.39***	2.18	1.07	2.31	1.19
Average quarterly hours							
Short term	25.4***	22.6***	21.8***	108.9	234.8	117.9	241.9
Short term, diff-in-diff	24.2***	21.3***	20.5***	76.3	108.2	81.9	113.1
Average quarterly earnings							
Short term (\$)	222***	187***	191***	954	2058	1047	2148
Short term, diff-in-diff (\$)	222***	192***	189***	671	1112	734	1189
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	0.2**	0.1	0.0	0.5	--	0.7	--
Benefits - short term (\$)	2.0**	1.1	0.7	3.5	662.5	4.7	629.7
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	-0.2	0.1	0.03	1.4	--	1.0	--
TANF benefits - short term (\$)	-1.4	0.9	0.1	12.2	846.3	8.3	820.1
Percent receiving FS, short term	-1.2***	-0.2	-0.2	5.9	--	5.1	--
FS benefits - short term (\$)	-5.6***	-0.3	-2.0	32.0	539.0	28.1	549.4
Percent enrolled Medicaid, short term	0.4	0.8	0.4	17.4	--	17.4	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 11.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

This column represents the preferred specification, which in this case uses the levels of the outcome variables as the dependent variable. The coefficient estimates that are in “boxes” represent the final, “official” estimates using the preferred specification as chosen by WTECB staff. The final four columns of the tables provide the means of the comparison group, both the full comparison group pool and the matched comparison group. These columns are provided so that the net impacts can be estimated on a percentage basis.

Career and technical education pays off for secondary school students economically. The short-term impacts include increases in employment (6.7 percentage points), hourly wage (\$0.47 per hour), hours working (21.8 hours in a quarter), and quarterly earnings (\$191). The earnings impact is on the order of 9–10 percent. The economic advantages persist, and even grow, in the longer term. The employment net impact estimate is 5.4 percentage points; the hourly wage increases by \$0.59 per hour; the hours worked increase by 35.5 hours per quarter; and earnings increase by about \$378 or about 13 percent. There is little effect of high school career and technical education on public assistance or UI—perhaps a slight reduction in public assistance, especially food stamps in the longer-term.

Subgroup Analyses

Approximately 55 to 60 percent of the high school CTE completers went on to enroll in a public higher education institution in Washington. Tables 11.7 and 11.8 provide estimates of the net impacts of high school CTE completion for the students who went into higher education. The first column of estimates are for CTE completers who did not participate in higher education, whereas the second column provides net impact estimates for the treatment group individuals who did enroll in higher education. The short-term impacts may reflect part-time employment of students in higher education. Employment (7.7 percent), hourly wages (\$0.50), and hours worked (12.8) all have positive impacts that are significant. However, the combination of these increases quarterly earnings by only \$86, which is less than 4 percent. At the same time, CTE completers who do not pursue higher education have positive, but smaller, impacts on employment and wage rates than do the higher education attendees. On the other hand, their hours worked and earnings impacts are much larger.

Table 11.7 shows a different story. In longer-term estimates, CTE completers who go on to postsecondary schooling dominate all of the employment and earnings impacts. So the results indicate that CTE completers have better economic outcomes than other high school graduates. In the short-term, CTE completers who do not go on to higher education have relatively higher earnings impacts. But in the longer term, CTE completers who do enroll in higher education have better outcomes.

Table 11.7 Selected Longer-Term Net Impact Estimates for a Subgroup of High School CTE Completers, 2001/2002 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	No Higher Education	Participants with Higher Education	
Employment	-2.8%**	9.8%**	55.7%
Hourly Wage	-\$0.09	\$0.98**	\$5.66
Hours Worked	25.2**	43.0**	175.6
Earnings	\$319**	\$438**	\$1,757
UI Receipt	1.3%**	0.8%**	3.1%
TANF Receipt	-0.1%**	0.0%	2.4%
Food Stamps Recipient	-1.9%**	-1.3%**	8.6%
Medicaid Enrollment	-2.9%**	0.8%	20.1%
Subgroup Sample Size	4,298	7,848	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

Table 11.8 Selected Short-Term Net Impact Estimates for a Subgroup of High School CTE Completers, 2003/2004 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	No Higher Education	Participants with Higher Education	
Employment	5.3%**	7.7%**	46.7%
Hourly Wage	\$0.44**	\$0.50**	\$4.21
Hours Worked	35.4**	12.8**	117.9
Earnings	\$342**	\$86**	\$1,047
UI Receipt	0.3%	-0.1%	0.7%
TANF Receipt	0.1%	0.1%	1.0%
Food Stamps Receipt	0.4%	-0.2%	5.1%
Medicaid Enrollment	-0.1%	1.1%**	17.4%
Subgroup Sample Size	6,278	7,114	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.10 level (two-tailed test).

APPENDIX TO CHAPTER 11

In addition to the net impacts estimation for the CTE completers as well as the subgroup analysis of those attending higher education, we conducted two other types of analyses. First, we re-estimated the net impacts using slightly different matching variables than those documented in the main text of this chapter. Second, we estimated the impact of taking CTE classes at a skill center as opposed to one's home high school on the likelihood of dropping out of high school. Each of these analyses is described in turn in the following two sections of this appendix.

Using 10th Grade GPA and Test Scores in the Statistical Match

In the statistical match that is documented in the main text of this chapter, a student's overall high school grade point average (GPA) and high school graduation status were used in the logit estimation that generated the propensity score for the match. A potential criticism of those variables is that they may be endogenous with the treatment variable—being a CTE completer. That is, being a CTE completer may explain one's overall high school GPA and graduation status, and vice versa, one's overall GPA and graduation status may be explained by being a CTE student.

To determine whether this endogeneity caused a bias in our net impact estimates and to sharpen our analyses, we re-did the statistical match by replacing the overall high school GPA and graduation status variables with 10th grade GPA and WASL test scores. This was not a "pure" experiment, however, because we could only replace the variables for observations for which we had 10th grade GPA and WASL test scores. This condition reduced the size of the treatment sample by about 20 percent for the 2001/2002 cohort and 10 percent for the 2003/2004 cohort. It caused much more of a sample loss for the comparison group pool, which lost over 30 percent of the observations for the earlier cohort and 20 percent for the later cohort.

Tables 11A.1 through 11A.6 provide the tables that document each step of the statistical matching process. These tables parallel tables 11.1 through 11.6. The first table compares the distributions of characteristics found in the treatment and comparison pool samples. The second table displays the results from the logit estimation of being in the treatment sample, i.e., being a CTE completer. The third table provides a few statistics about the p-score distribution. The fourth table provides a comparison of the characteristics in the matched treatment and comparison files. The fifth and sixth tables provide the re-estimated net impacts for the two cohorts.

Results. Tables 11A.7 and 11A.8 provide a side-by-side comparison of the net impact results for the two matching approaches for the two cohorts. The estimates do differ. Using the 10th grade variables in lieu of the 12th grade GPA and graduation variables attenuates the net impacts. Note that the employment and earnings impacts are still positive and statistically significant; they are just smaller. This means that there is a positive return to being a CTE completer; however that return may be somewhat smaller than the estimates presented in the main part of the chapter. Unfortunately, the differences between the two results are due to two changes: different samples and different matching variables that potentially reduce endogeneity bias. Unfortunately, it is not possible to parse the impact of each change.

Table 11A.1 Descriptive Statistics for High School Career and Technical Education Treatment Group and Comparison Group Pool (10th Grade GPA and Test Score Sample)

Characteristics	2001/2002		2003/2004	
	CTE Completers	Non-Completers	CTE Completers	Non-Completers
<u>Demographics and Education</u>				
Female	48.5%	53.9%	49.6%	54.8%
Minority	18.0% ^{††}	18.7% ^{††}	21.7%	19.2%
Disability	4.9%	3.0%	5.0%	3.5%
Limited English proficiency	1.4% ^{††}	1.2% ^{††}	1.6%	1.1%
GPA (ending)	2.97	3.06	2.91	3.01
GPA (as of 10th grade)	2.91	3.06	2.91	3.09
Reading, scale score	411.2	418.8	411.5	420.5
Writing, scale score	7.6	8.2	8.8	9.4
Math, scale score	394.0	404.6	393.7	405.1
Low SES	9.9%	6.3%	19.6%	13.0%
Graduated	96.7%	93.3%	97.2%	94.8%
West WA	72.5%	79.1%	74.8%	78.1%
Urban county	47.5%	56.2%	51.8%	56.0%
<u>Employment and Earnings (prior to registration)</u>				
Ave. percentage of (prior) quarters with employment ^a	48.5%	45.4%	38.5%	35.3%
Average quarterly earnings ^{a, b}	\$497	\$461	\$402	\$364
Mean, earnings trend ^c	\$17.6	\$6.4	\$12.9 ^{††}	\$9.9 ^{††}
Mean, earnings variance ^c (in 10 ⁶ \$)	\$0.3 ^{††}	\$0.4 ^{††}	\$0.3 ^{††}	\$0.4 ^{††}
Mean, number of quarters with job change ^b	0.6	0.5	0.4	0.3
Had earnings dip	29.7% ^{††}	29.9% ^{††}	23.8% ^{††}	23.3% ^{††}
Mean, number of quarters since dip at registration ^b	0.9 ^{††}	0.9 ^{††}	0.7 ^{††}	0.7 ^{††}
Ave. earnings dip ^b	25.1% ^{††}	25.3% ^{††}	20.4% ^{††}	20.1% ^{††}
Sample size	9,619	23,190	11,964	23,902

NOTE: Monetary data in 2000 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.

^bAverages include observations with values of zero.

^cTrend and variance calculations include quarters with zero earnings, if any.

^{††}Differences in means are not statistically significant at 0.05 level (t-test).

Table 11A.2 Coefficient Estimates from a Logit Model of being a High School CTE Completer (10th Grade GPA and Test Score Sample)

Characteristics	2001/2002		2003/2004	
	Coefficient	Std. Error	Coefficient	Std. Error
<u>Demographics and Education</u>				
Female	-0.169***	0.027	-0.165***	0.025
Non-minority	0.156***	0.034	0.094***	0.030
Disability	-0.017	0.066	-0.228***	0.061
Limited English proficiency	-0.258***	0.112	-0.238***	0.102
GPA (as of 10th grade)	0.043***	0.021	-0.013	0.019
Reading, scale score	-0.247***	0.071	-0.419***	0.066
Writing, scale score	-7.026***	0.084	-4.242***	0.086
Math. scale score	-0.423***	0.053	-0.498***	0.052
Low SES	0.221***	0.046	0.344***	0.032
West WA	-0.221***	0.030	-0.084***	0.028
Urban county	-0.200***	0.026	-0.066***	0.024
<u>Employment and Earnings (prior to registration)</u>				
Ave. percentage of quarters with employment	0.002***	0.001	0.001	0.001
Average quarterly earnings ^a	-0.001	0.002	0.003	0.002
Earnings trend ^a	0.008	0.006	-0.002	0.006
Earnings variance ^b	-1.010	0.723	-0.253	0.355
Number of quarters with job change	-0.020	0.013	-0.006	0.013
Had earnings dip	-0.143	0.101	0.139	0.106
Number of quarters since dip at registration	0.001	0.014	-0.037***	0.014
Percent of earnings dip	0.069	0.104	-0.155	0.108

NOTE: Model included last industry of employment prior to registration and an intercept term. Samples sizes were 32,809 and 35,866 for 2001/2002 and 2003/2004, respectively.

^aScaled in \$100 (2000 \$).

^bScaled in \$10⁸ (2000 \$)

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

Table 11A.3 Indicators of Propensity Score Model Quality for High School CTE Completer Analyses (10th Grade GPA and Test Score Sample)

Statistic	2001/2002	2003/2004
Mean p-score, CTE Completers	0.317	0.357
Mean p-score, Non Completers	0.283	0.322
Percentile Non-Completers, at 20th percentile CTE Completers	34.66%	34.80%

Table 11A.4 Matching Algorithm Statistics and Post-Match Comparison of Characteristics for High School CTE Completer Analyses (10th Grade GPA and Test Score Sample)

Statistic/Characteristic	2001/2002		2003/2004	
	CTE Completers	Non-Completers	CTE Completers	Non-Completers
Sample size	9,619	23,190	11,964	23,902
Sample size used in match	9,616	23,187	11,962	23,897
Matched sample size	9,616	9,616	11,962	11,962
Number of observations used once	—	5,363	—	5,766
Number of observations used multiple times	—	1,824	—	2,520
Maximum number of repeats	—	8	—	9
Demographics and Education				
Female	48.5%	48.5%	49.6%	50.2%
Minority	17.9%	18.1%	21.7%	21.2%
Disability	4.9%	4.6%	5.0%	4.5%
Limited English proficiency	1.4%	1.5%	1.6%	1.7%
GPA (ending)	2.97**	2.91**	2.91	2.89
GPA (as of 10th grade)	2.91	2.90	2.91	2.90
Reading, scale score	411.2	411.2	411.5	411.5
Writing, scale score	7.6	7.6	8.8	8.9
Math, scale score	394.0	393.7	393.7	393.4
Low SES	9.8%	9.8%	19.6%	19.4%
Graduated	96.7%**	90.6%**	97.2%**	92.9%**
West WA	72.5%	72.4%	74.8%	75.8%
Urban county	47.5%	48.4%	51.8%	51.6%
Employment and Earnings (prior to registration)				
Ave. percentage of (prior) quarters with employment	48.5%	48.7%	38.4%	39.4%
Average quarterly earnings ^{a, b}	\$497	\$477	\$401	\$404
Mean, earnings trend ^c	\$17.6	\$18.8	\$13.0	\$14.6
Mean, earnings variance ^c (in 10 ⁶ \$)	\$0.3	\$0.3	\$0.3	\$0.3
Mean, number of quarters with job change ^b	0.6	0.6	0.4	0.4
Had earnings dip	29.7%	29.7%	23.8%	23.9%
Mean, number of quarters since dip at registration ^b	0.9	0.9	0.7	0.7
Ave. earnings dip ^b	25.1%	25.1%	20.4%	20.6%
Sample size	9,616	9,616	11,962	11,962

NOTES: Monetary data in 2000 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.

^bAverages include observations with values of zero.

^cTrend and variance calculations include quarters with zero earnings, if any.

** Difference in means is statistically significant at the 0.05 level (t-test).

Table 11A.5 Net Impact Estimates for High School CTE Completer Analyses (10th Grade GPA and Test Score Sample): 2001/2002 Cohort

Outcome	Block	Matched Sample		Comparison Group			
	Matching	Estimator		Means			
	Estimator	Diff. in	Regr.	Full Sample		Matched Sample	
	Wtd. Diff.	Means	Adj.	With 0	W/O 0	With 0	W/O 0
	in Means						
Employment							
Short term (%)	4.9***	4.2***	4.0***	48.7	--	52.6	--
Ever employed, longer term (%)	3.6***	1.4**	1.4***	73.8	--	75.5	--
Percent of quarters, longer term	3.5***	3.1***	3.0***	55.4	--	58.1	--
Percent of quarters, longer term, diff-in-diff	3.4***	2.2***	2.0***	25.6	--	26.9	--
Average hourly wage							
Short term (\$)	0.75***	0.25***	0.22**	4.80	9.46	5.26	9.60
Short term diff-in-diff (\$)	0.98***	0.17*	0.16	2.42	2.17	2.78	2.31
Longer term (\$)	0.61***	0.29***	0.26***	5.68	9.84	5.99	9.90
Longer term, diff-in-diff (\$)	0.83***	0.21***	0.20***	3.29	2.71	3.51	2.71
Average quarterly hours							
Short term	24.2***	21.4***	19.7***	116.0	228.5	132.1	241.2
Short term, diff-in-diff	25.4***	18.8***	18.1***	68.0	88.9	82.1	104.6
Longer term	16.9***	26.0***	24.5***	168.2	269.9	183.8	281.9
Longer term, diff-in-diff	18.1***	23.4***	23.0***	120.3	143.2	133.7	156.1
Average quarterly earnings							
Short term (\$)	341***	187***	166***	1054	2077	1187	2166
Short term, diff-in-diff (\$)	380***	165***	165***	696	1121	825	1235
Longer term (\$)	236**	282***	258***	1691	2671	1843	2791
Longer term, diff-in-diff (\$)	275***	261***	257***	1332	1893	1481	2016
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-11.7***	0.1	0.1	0.7	--	1.1	--
Benefits - short term (\$)	-277.5***	1.9	1.9	6.1	843.3	8.3	773.2
Percent receiving, longer term	-2.3***	0.6**	0.6***	2.2	--	2.9	--
Benefits - longer term (\$)	-15.8***	0.7	0.7	7.5	755.4	11.3	795.1
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	0.5**	-0.4**	0.0	0.7	--	1.0	--
TANF benefits - short term (\$)	7.8***	-3.8***	-0.9	6.7	914.2	9.0	862.7
Percent receiving TANF, longer term	1.3***	-0.7***	-0.0	1.6	--	2.0	--
TANF benefits - longer term (\$)	11.1***	-4.6***	-2.4**	8.1	783.4	11.1	828.6
Percent receiving FS, short term	0.2	-1.0	-0.1	2.6	--	3.6	--
FS benefits - short term (\$)	5.8***	-5.3***	-2.9***	14.0	528.5	18.9	529.1
Percent receiving FS, longer term	0.7*	-2.1***	-0.5**	5.1	--	6.7	--
FS benefits - longer term (\$)	5.9***	-7.3***	-4.4***	15.4	429.5	19.5	407.8
Percent enrolled Medicaid, short term	0.7	-0.9	-0.2	17.3	--	18.9	--
Percent enrolled Medicaid, longer term	1.7***	-1.9***	-1.0**	19.5	--	20.6	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 11A.4. * significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 11A.6 Net Impact Estimates for High School CTE Completer Analyses (10th Grade GPA and Test Score Sample): 2003/2004 Cohort

Outcome	Block Matching Estimator	Matched Sample Estimator		Comparison Group Means			
	Wtd. Diff. in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	5.8***	4.0***	4.1***	44.3	--	48.6	--
Average hourly wage							
Short term (\$)	0.77***	0.39***	0.38***	3.93	8.49	4.25	8.41
Short term diff-in-diff (\$)	1.77***	0.37***	0.35***	2.17	1.05	2.36	0.90
Average quarterly hours							
Short term	23.7***	15.3***	13.9***	104.4	225.5	121.3	240.4
Short term, diff-in-diff	48.0***	14.1***	12.0***	74.5	104.0	87.6	111.7
Average quarterly earnings							
Short term (\$)	253***	155***	136***	906	1957	1038	2057
Short term, diff-in-diff (\$)	684***	143***	128***	651	1045	760	1098
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	-1.3***	0.2*	0.1*	0.3	--	0.4	--
Benefits - short term (\$)	-3.6	1.4*	1.8**	1.8	565.9	2.3	535.8
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	-1.9***	-0.2**	-0.0	0.6	--	0.9	--
TANF benefits - short term (\$)	-21.0***	-1.0	-0.6	5.5	860.1	6.2	711.7
Percent receiving FS receipt, short term	-5.5***	-0.7**	-0.2	3.2	--	4.4	--
FS benefits - short term (\$)	-34.7***	-2.2	-1.8	17.4	541.5	23.8	536.9
Percent enrolled Medicaid, short term	-2.8***	0.3	0.7***	15.4	--	17.3	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 11A.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 11A.7 Selected Longer-Term Net Impact Estimates for the Two Statistical Matching Approaches for High School CTE Completers, 2001/2002 Cohort

	Statistical Matching Approach	
	Using 12th Grade Variables	Using 10th Grade Variables
Employment	5.4%**	3.0%**
Hourly Wage	\$0.59**	\$0.26**
Hours Worked	35.5**	24.5**
Earnings	\$378**	\$258**
UI Receipt	0.8%**	0.6%**
TANF Receipt	-0.1%	-0.0%
Food Stamps Recipient	-1.4%**	-0.5%**
Medicaid Enrollment	-0.4%	-1.0%**
Sample Size	12,146	9,616

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

Table 11A.8 Selected Short-Term Net Impact Estimates for the Two Statistical Matching Approaches for High School CTE Completers, 2003/2004 Cohort

	Statistical Matching Approach	
	Using 12th Grade Variables	Using 10th Grade Variables
Employment	6.7%**	4.1%**
Hourly Wage	\$0.47**	\$0.38**
Hours Worked	21.8**	13.9**
Earnings	\$191**	\$136**
UI Receipt	0.0%	0.1%**
TANF Receipt	0.0%	-0.0%
Food Stamps Recipient	-0.2%	-0.2%
Medicaid Enrollment	0.4%	-0.7%**
Sample Size	13,392	11,962

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

The Effect of Attending a Skill Center on High School Completion

The second type of analysis that we performed concerning secondary career and technical education data was to estimate whether taking a career and technical education (CTE) class at a skill center reduced the likelihood of a student dropping out of high school. Reasons to think that attending a skill center might increase the likelihood of dropping out include (1) the logistics of attending a skill center—transportation and time out of one’s home school, for example—might make it difficult for a student to complete classes and requirements at the home high school, and (2) there may be a social stigma attached to attending a skill center. On the other hand, the reasons that suggest that attending a skill center might decrease the likelihood of dropping out include (1) students are motivated enough by the (practical) subject matter enough to undertake the logistical cost of attending a skill center, and (2) the instruction and equipment may be superior to the student’s home high school so that more learning occurs. Thus, there are *a priori* arguments in both directions, so it is an empirical question.

Datasets. The data that we used for this analysis differ from the data used in the net impact and cost-benefit study. In this analysis, we were provided with statewide data for two cohorts of high school students: the first cohort was students who finished their 10th grade year in 1999/2000

and took at least one career and technical education class in high school, whereas the second cohort was students who finished their 10th grade year in 2001/2002 and took at least one career and technical education class. These cohorts were selected because if the students who comprised them completed high school in the two years following 10th grade, they would be in the two cohorts used in the net impact analyses. The datasets were limited to students who took at least one CTE class to control for any unobservable differences between students that might explain the choice of taking only academic classes and taking at least one career and technical education class.

Treatment and comparison groups. The treatment group in this analysis was any student who took at least one class at a skill center. In particular, the variables SkillCenter1 or SkillCenter2+ were non-zero. Note that students in the treatment group may have taken a CTE class in their home high school in addition to at least one at a skill center.

We used two comparison groups. The first was students who took only one CTE class at their home school (and none at a skill center); and the second was students who took more than one CTE class at their home high school (and none at a skill center).

Dependent variable. The dependent variables in the analysis came from a variable labeled Exit_Status.²⁴ We actually defined two variables to indicate dropout status. The first is a dummy variable coded as 1 if Exit_Status = D or U; and 0 if Exit_Status = G (graduated). Observations with Exit_Status = Z, S, or blank were dropped from the analysis. The second is identical to the first,

²⁴Exit_Status takes on six values:

G - is graduated

D - is known to have dropped out

U - is left, but no request for transcript at time of coding

Z - deceased

S - is failed to return after Summer break and (i) no transcript request at time of coding and (ii) not matched in later years in other Washington public high schools

Blank - is students who were still enrolled at the end of what should be their graduation year, but don't have the credits to graduate.

Note that D and U are both consistently treated as dropouts by OSPI and SESRC.

except that it codes Exit_Status = S as a 1. For short hand purposes, we refer to the first variable as Dropout1 and the second as Dropout2.²⁵

Table 11A.9 provides descriptive statistics for the two cohorts. Note that the more recent cohort has three WASL scale score variables and a limited English proficiency variable that were not available for the earlier cohort. The table shows demographic characteristics of the students, schooling characteristics, and dropout rates. The demographic characteristics are quite similar across the two cohorts, as would be expected. The overall unemployment rate (at the time of expected graduation) is higher for the earlier cohort.

The schooling and dropout rates are quite different, however. In both cohorts, about 5 percent of the students attended a skill center. The earlier cohort had a much lower average GPA (2.49 versus 2.72); had more students whose expected graduation year was either earlier than the “on

Table 11A.9 Descriptive Statistics, by Cohort

Characteristic/Outcome	99/00 Sophomore Cohort	01/02 Sophomore Cohort
Female	46.6%	49.4%
Eth_white	96.2%	77.7%
Disability	8.4%	7.2%
LEP	--	3.6%
Low SES	13.5%	15.0%
West	79.5%	76.5%
Urban	53.4%	55.0%
Unemployment rate	7.6%	6.3%
Skill Center	4.8%	4.9%
GPA Soph.	2.49	2.72
Reading, scale score	--	408
Writing, scale score	--	8.6
Math, scale score	--	389
Expected to graduate early	9.0%	3.9%
Expected to graduate late	1.0%	0.2%
Dropout 1	10.6%	4.8%
Dropout 2	21.8%	12.2%
Sample size	46,603	53,151

²⁵The models described below were also estimated using two additional definitions: Dropout3 adds Exit_Status = blank to Dropout1, and Dropout4 adds Exit_Status = blank to Dropout2. Results were quite similar to those reported here.

time” year or later than it; and had dropout rates that were approximately twice as large as the later cohort.

Results. Table 11A.10 provides the estimated coefficients. It contains eight columns of estimates because we estimated the model for two cohorts, two comparison groups (those with only one CTE class and more than one CTE class), and two definitions of dropouts. In seven of the eight models, the sign and significance show that attending a skill center reduces the likelihood of dropping out. The coefficient in the third column of estimates is the one that is not negative, and in this case, it is statistically insignificant.

The coefficients in the table are estimated with logit regression. They can be converted to approximate marginal effects by multiplying by $p(1 - p)$, where p is the probability of dropping out. To calculate these effects, the coefficients in columns 1 and 3 should get multiplied by 0.0948; columns 2 and 4 by 0.1705; columns 5 and 7 by 0.0457; and columns 6 and 8 by 0.1071. The

Table 11A.10 Estimation Results

Variable	99/00 Sophomores Cohort				01/02 Sophomores Cohort			
	Comparison Group 1		Comparison Group 2		Comparison Group 1		Comparison Group 2	
	Dropout 1	Dropout 2	Dropout 1	Dropout 2	Dropout 1	Dropout 2	Dropout 1	Dropout 2
Attended Skill Ctr.	-1.14***	-2.02***	0.10	-0.20***	-1.27***	-2.62***	-0.49***	-0.94***
Female	-0.19*	-0.08	-0.18***	-0.01	-0.30**	-0.05	0.01	0.10***
Eth_white	-0.26***	-0.26***	-0.14***	-0.04	0.17	-0.17*	0.15***	0.10**
Disability	0.32***	0.23**	0.17***	0.07	-0.52**	-0.35**	-0.13	-0.14**
Low SES	0.25**	0.29***	0.10*	0.18***	0.11	0.22*	0.20***	0.25***
Limited English	--	--	--	--	0.64**	0.36*	0.57***	0.62***
West	0.28***	0.023	0.31***	0.08*	0.19	0.18*	0.39***	0.26***
Urban	-0.08	0.16**	-0.03	0.13***	-0.26	-0.26***	0.03	0.07*
Unemp. rate	0.03**	0.06**	0.06***	0.04***	-0.14*	-0.14***	-0.08***	-0.06***
GPA Soph.	-1.27***	-1.10***	-1.59***	-1.39***	-1.22***	-1.04***	-1.57***	-1.26***
Reading, scale	--	--	--	--	0.03	-0.37	-0.57***	-0.43***
Writing, scale	--	--	--	--	-0.08*	-0.07**	-0.01	-0.04***
Math, scale	--	--	--	--	-0.76**	-0.30*	-0.37***	-0.18**
Exp. grad. early	1.11**	0.67***	0.81***	0.79***	0.67***	0.50***	0.76***	0.72***
Exp. grad. late	-0.41	1.12***	-0.06	1.71***	1.70**	1.57***	0.49	0.97***
Sample size	5,135	7,366	32,646	35,697	4,257	5,086	41,794	44,934
Mean dep. variable	0.285	0.502	0.113	0.189	0.069	0.221	0.058	0.123

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

marginal effects of attending a skill center on the dropout rate ranges from -2.2 percentage points to -34.4 percentage points for the seven models in which the coefficient estimate is significant. The preferred specification is comparison group two and dropout definition one. This is preferred because the second comparison group uses students who took more than one CTE class, and thus are more comparable to the students who were motivated to go to a skill center. The first dropout definition, using codes D and U is the accepted definition of dropouts by OSPI. Thus, the estimates in the third and seventh column are preferred, which suggests that the effect of attending a skill center on dropping out is between 0 and -2.2 percentage points.

Among the covariates in the equations, there are some interesting patterns in the results. Students' grades at the end of their sophomore years are consistently negatively related to dropping out. Similarly, in the later cohort, test scores are negatively related to dropping out. Higher gpa's and test scores on the WASL imply lower dropout rates. The datasets have a variable that is year of expected high school graduation. The largest share of students has this coded as "on time," meaning 2002 for the earlier cohort and 2004 for the later cohort. However, a number of observations have a year that is earlier than those years, and a few observation have a year that is later. Having expected graduation year be early is positively related to dropping out in all of the models, and having it be late is also positively related to dropping out. However in three of the models, this variable is not significant.²⁶

Among the demographic variables, having low SES is consistently related to dropping out, as is being from western Washington. In the second cohort, when we have the variable, having limited English proficiency increases the likelihood of dropping out. The other variables have effects that

²⁶The positive impact on dropping out of having an early expected graduation date seems counterintuitive. All of the models were re-estimated with the expected graduation dates omitted from the model separately and together. These results are available from the authors on request. They did not appreciably alter the other coefficients in the model.

switch signs in the various models, so it is hard to draw conclusions about their impacts on dropping out. Interestingly, the unemployment rate, has a strong positive effect on dropping out in the earlier cohort and a strong negative effect in the later cohort. These estimates are consistent with the notion that the labor market was “soft” for the earlier cohort (unemployment rates were relatively high), so some individuals may have dropped out because they got employed. In the more recent cohort, the labor market “tightened,” i.e. the unemployment rates dropped, which may have kept students from dropping out.

12 DIVISION OF VOCATIONAL REHABILITATION PROGRAMS

Housed within the Department of Social and Health Services, the Division of Vocational Rehabilitation (DVR) offers training and other services to help eligible individuals with disabilities become employed. The primary objective is competitive, full-time employment. However, depending on the individual's disability and functional limitations, other outcomes are more appropriate such as part-time employment, self-employment, or sheltered or supported employment. The services that are provided on a customized basis include assessment, counseling, vocational training, physical and restorative services (including corrective surgery), and job search and placement assistance. Eligibility requirements include certification that the individual:

- has a physical, mental, or sensory impairment that constitutes or results in a substantial impediment to employment,
- can benefit in terms of an employment outcome from the provision of vocational rehabilitation services, and
- requires vocational rehabilitation services to prepare for, enter into, engage in, or retain gainful employment.

Note that approximately 90 percent of active clients in the program have severe disabilities.

Participant Characteristics

As with the high school CTE completers, we were able to use the same data base for treatment and comparison group cases for the DVR programs. The administrative data had a field that identified eligible clients who did not get served. These individuals became the comparison group pool.²⁷ Table 12.1 provides descriptive data that compare the individuals in the treatment group to those in the comparison group pool. The first two columns of numbers compare the DVR

²⁷We also matched the DVR participants who had been served to individuals on the LE file who were 16–60 years old. However, the participation model and the quality of the matches were not as believable or as statistically robust as the models using the non-served clients.

Table 12.1 Descriptive Statistics for Vocational Rehabilitation Treatment Group and Comparison Group Pool

Characteristics	2001/2002		2003/2004	
	Had VOC Rehabilitation Services	No VOC Rehabilitation Services	Had VOC Rehabilitation Services	No VOC Rehabilitation Services
<u>Demographics and Education</u>				
Female	46.5%	43.3%	44.0% ^{††}	43.9% ^{††}
Minority	21.3%	23.8%	22.3% ^{††}	23.6% ^{††}
Mean, age at registration	35.8 ^{††}	36.2 ^{††}	36.8	36.0
No formal education	0.0%	0.1%	0.4% ^{††}	0.6% ^{††}
Grades 1 through 8	2.0%	3.8%	3.1%	4.8%
Grades 9 through 12, no diploma	13.6%	21.4%	21.6%	24.6%
High school graduate	59.5%	55.6%	43.9%	40.2%
Some college, no degree	9.6%	7.9%	15.1% ^{††}	16.6% ^{††}
College certificate or associate degree	8.3%	6.3%	8.6% ^{††}	8.4% ^{††}
Bachelor degree	5.4%	4.2%	5.9%	4.1%
Master degree or more	1.5%	0.7%	1.4%	0.7%
Limited English proficiency	5.8% ^{††}	4.9% ^{††}	7.1% ^{††}	6.3% ^{††}
West WA	72.4% ^{††}	74.0% ^{††}	77.5% ^{††}	77.7% ^{††}
Urban county	55.9% ^{††}	55.8% ^{††}	50.8%	46.3%
<u>Employment and Earnings (prior to registration)</u>				
Ave. percentage of (prior) quarters with employment ^a	46.9%	43.5%	48.6%	42.2%
Average quarterly earnings ^{a, b}	\$1,407 ^{††}	\$1,369 ^{††}	\$1,602	\$1,317
Mean, earnings trend ^c	-\$48.3 ^{††}	-\$40.3 ^{††}	-\$30.7 ^{††}	-\$34.1 ^{††}
Mean, earnings variance ^c (in 10 ⁶ \$)	\$2.3 ^{††}	\$2.9 ^{††}	\$3.0	\$2.8
Mean, number of quarters with job change ^b	1.5	2.0	2.4	2.7
Had earnings dip	43.3% ^{††}	44.0% ^{††}	45.0% ^{††}	43.6% ^{††}
Mean, number of quarters since dip at registration ^b	1.5 ^{††}	1.5 ^{††}	1.5 ^{††}	1.6 ^{††}
Ave. earnings dip ^b	36.5% ^{††}	37.9% ^{††}	38.1% ^{††}	37.7% ^{††}
Sample size	2,446	4,576	4,362	2,980

NOTE: Monetary data in 2000 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.

^bAverages include observations with values of zero.

^cTrend and variance calculations include quarters with zero earnings, if any.

^{††}Differences in means are not statistically significant at 0.05 level (t-test).

exitors in 2001/2002 to the remaining (unserved) individuals in the sample. The final two columns compare the 2003/2004 exitors to their comparison group pool of eligible, but unserved individuals.

The two populations are quite similar to each other. Many of the differences in characteristics are not statistically significant. The educational backgrounds of the treatment group seem a little stronger; a little over 15 percent of the treatment group in 2001/2002 and a little under 25 percent of the treatment group in 2003/2004 had less than a high school education compared to over 25 percent and over 30 percent for the comparison group pool in 2001/2002 and 2003/2004,

respectively. Furthermore, about 25 percent of the treatment group in 2001/2002 and 31 percent of the treatment group in 2003/2004 have some college as compared to just under 20 percent and just under 30 percent for the comparison group pool in 2001/2002 and 2003/2004, respectively. The individuals who received services also had slightly higher percentages of (prior) quarters with employment and average quarterly earnings compared to the individuals who did not receive services.

Participation Model

Table 12.2 provides the results from the logit estimation of participation. Using the DVR administrative data, we estimated a model of being in the treatment group. That was the dependent variable, which took on a value of 1 for the treatment group, and 0 for the other graduates. The table provides the logit coefficient estimates and standard errors. While the magnitude of the coefficients is not particularly meaningful, the sign and statistical significance are. If the coefficient is negative, then a (positive) change in that variable will decrease the likelihood of having received services.

The coefficient estimates seem quite reasonable. The following variables are significantly correlated with being in the treatment group (i.e., an eligible individual who received services) in both years of data: being a high school graduate, having attended some college (with or without earning a degree), LEP, and percentage of quarters with employment. The following variables are significantly correlated with being in the comparison group pool: age at registration (not significant in 2003/2004), average quarterly earnings, and turnover.

Table 12.2 Coefficient Estimates from a Logit Model of Participation in Vocational Rehabilitation Programs

Characteristics	2001/2002		2003/2004	
	Coefficient	Std. Error	Coefficient	Std. Error
<u>Demographics and Education</u>				
Female	0.057	0.053	-0.012	0.050
Minority	-0.085	0.063	-0.026	0.058
Age at registration	-0.009***	0.002	0.004*	0.002
No formal Education	—	—	-0.034	0.367
Grades 9 through 12, no diploma	0.146	0.179	0.356***	0.134
High school graduate	0.725***	0.169	0.548***	0.130
Some college, no degree	0.933***	0.187	0.390***	0.139
College certificate or associate degree	1.027***	0.191	0.471***	0.150
Bachelor degree	1.064***	0.204	0.774***	0.169
Master degree or more	1.627***	0.299	1.044***	0.289
Limited English proficiency	0.199*	0.115	0.173*	0.102
West WA	-0.112*	0.059	-0.068	0.060
Urban county	0.001	0.053	0.164***	0.050
<u>Employment and Earnings (prior to registration)</u>				
Percentage of quarters with employment	0.009***	0.001	0.010***	0.001
Average quarterly earnings ^a	-0.007***	0.002	-0.004*	0.002
Earnings trend ^a	-0.017*	0.009	0.001	0.010
Earnings variance ^b	-0.710	0.535	0.002	0.417
Number of quarters with job change	-0.109***	0.013	-0.066***	0.009
Had earnings dip	0.250	0.185	0.095	0.176
Number of quarters since dip at registration	-0.008	0.020	-0.021	0.019
Percent of earnings dip	-0.147	0.184	0.019	0.173

NOTE: Model included last industry of employment prior to registration and an intercept term. Samples sizes were 7,022 and 7,342 for 2001/2002 and 2003/2004, respectively.

^aScaled in \$100 (2000 \$).

^bScaled in \$10⁸ (2000 \$)

*Significant at the 0.10 level; **significant at the 0.05 level; ***significant at the 0.01 level (two-tailed test).

Propensity Score Statistics

The propensity score for an observation is the predicted probability using the estimated coefficients and the observation's actual data. If the logit model has substantial predictive capability, then the mean propensity score for the comparison group should be small (near zero) and should be much less than the mean score for the treatment. As argued earlier, a measure of how well the logit model discriminates between comparison group members and treatment group members is the cumulative percentile for the comparison group at the propensity score that is the 20th percentile.

Table 12.3 provides these data for the DVR program participant group. The mean propensity scores for the treatment groups are roughly 0.38 and 0.61 whereas they are 0.17 and 0.23 for the comparison group for 2001/2002 and 2003/2004 respectively. The 20th percentile indicator is approximately 35 percent for 2001/2002 and 31 percent for 2003/2004. The means and the 20th percentile statistics indicate that the logit model of participation did not discriminate well between treatment and comparison group observations. We could have used the entire comparison group pool for the analyses.

Table 12.3 Indicators of Propensity Score Model Quality for Vocational Rehabilitation Program Analyses

Statistic	2001/2002	2003/2004
Mean p-score, VOC Rehabilitation	0.375	0.605
Mean p-score, No VOC Rehabilitation	0.334	0.578
Percentile No VOC Rehabilitation Services, at 20th percentile VOC Rehabilitation	34.62%	31.11%

Statistical Match

Nevertheless, we performed a match. For every observation j in T , we found the observation k in U that minimized the absolute value of the difference between the propensity score for j and k subject to the difference being within the caliper. We then added k to the comparison group sample. The statistical match was done with replacement, so some observations in U were the “matches” for more than one observation in the treatment group. Table 12.4 provides data about the sample sizes, number of matched observations that were duplicates, and a comparison of descriptive statistics between the treatment group, comparison group, and pool of observations from which the comparison group was chosen. Notice that means for the comparison group are quite close to the

Table 12.4 Matching Algorithm Statistics and Post-Match Comparison of Characteristics for Vocational Rehabilitation Programs

Statistic/Characteristic	2001/2002		2003/2004	
	Had VOC Rehabilitation Services	No VOC Rehabilitation Services	Had VOC Rehabilitation Services	No VOC Rehabilitation Services
Sample size	2,446	4,576	4,362	2,980
Sample size used in match	2,446	4,568	4,362	2,980
Matched sample size	2,444	1,576	4,350	1,873
Number of observations used once	—	1,013	—	772
Number of observations used multiple times	—	563	—	1,101
Maximum number of repeats	—	9	—	14
<u>Demographics and Education</u>				
Female	46.5%	46.4%	44.0%	44.4%
Minority	21.2%	22.4%	22.2%	22.5%
Mean, age at registration	35.8	35.4	36.8	36.6
No formal education	0.0%	0.0%	0.3%	0.4%
Grades 1 through 8	2.0%	1.9%	3.1%	3.0%
Grades 9 through 12, no diploma	13.6%	14.1%	21.7%	21.7%
High school graduate	59.5%	60.6%	44.0%	43.7%
Some college, no degree	9.7%	9.0%	15.1%	15.5%
College certificate or associate degree	8.3%	8.2%	8.7%	8.9%
Bachelor degree	5.4%	4.9%	5.9%	5.4%
Master degree or more	1.5%	1.4%	1.3%	1.4%
Limited English proficiency	5.8%	5.2%	7.0%	6.9%
West WA	72.3%	72.5%	77.5%	76.6%
Urban county	55.9%	54.4%	50.8%	50.8%
<u>Employment and Earnings (prior to registration)</u>				
Percentage employed prior to registration	46.8% **	44.0% **	48.5%	48.0%
Average quarterly earnings ^a	\$1,405	\$1,331	\$1,600	\$1,569
Mean, earnings trend ^b	-\$44.7	-\$46.2	-\$30.9	-\$29.3
Mean, earnings variance ^b (in 10 ⁶ \$)	\$2.3	\$2.3	\$3.0	\$3.2
Mean, number of quarters with job change ^a	1.5	1.4	2.4	2.3
Had earnings dip	43.3%	41.0%	45.0%	44.5%
Mean, number of quarters since dip at registration ^a	1.5	1.4	1.5	1.6
Ave. earnings dip ^a	36.5%	34.6%	38.1%	37.2%
Sample size	2,444	2,444	4,350	4,350

NOTES: Monetary data in 2000 \$.

^aAverages include observations with values of zero.

^bTrend and variance calculations include quarters with zero earnings, if any.

** Difference in means is statistically significant at the 0.05 level (t-test).

treatment group—only one characteristic exhibits a difference in means that is statistically significant.

Net Impacts

The major purpose of the study was to estimate the net impacts of the education and training programs on clients. Tables 12.5 and 12.6 provide the estimated net impacts for receiving services

Table 12.5 Net Impact Estimates for Vocational Rehabilitation Programs for 2001/2002 Cohort

Outcome	Block	Matched Sample		Comparison Sample				
	Matching	Estimator		Means				
	Estimator	Wtd. Diff. in	Diff. in	Regr.	Full Sample		Matched Sample	
		Means	Means	Adj.	With 0	W/O 0	With 0	W/O 0
Employment								
Short term (%)		16.2***	18.5***	19.6***	26.7	--	25.9	--
Ever employed - longer term (%)		9.9***	12.0***	11.5***	34.2	--	33.4	--
Percent of quarters, longer term		9.6***	11.9***	11.4***	26.6	--	25.8	--
Percent of quarters, longer term, diff-in-diff		8.9***	9.1***	11.0***	-8.0	--	-8.7	--
Average hourly wage								
Short term (\$)		2.18***	2.39***	2.32***	2.99	10.85	2.89	10.92
Short term diff-in-diff (\$)		2.00***	1.89***	2.08***	-0.98	0.49	-0.86	0.37
Longer term (\$)		1.30***	1.55***	1.48***	3.02	10.68	2.91	10.84
Longer term, diff-in-diff (\$)		1.11***	1.04***	1.22***	-0.95	0.33	-0.84	0.92
Average quarterly hours								
Short term		56.4***	62.7***	60.1***	82.8	300.9	81.9	309.9
Short term, diff-in-diff		53.3***	54.7***	59.5***	-20.2	52.0	-23.2	60.5
Longer term		39.1***	48.1***	45.7***	87.2	280.9	83.8	282.7
Longer term, diff-in-diff		35.8***	39.9***	44.8***	-15.8	37.2	-21.3	32.1
Average quarterly earnings								
Short term (\$)		752***	816***	784***	921	3345	900	3403
Short term, diff-in-diff (\$)		723***	720***	761***	-245	636	-242	803
Longer term (\$)		568***	680***	651***	994	3166	932	3116
Longer term, diff-in-diff (\$)		536***	582***	626***	-172	519	-210	523
Unemployment Insurance Benefits (average quarterly)								
Percent receiving, short-term		1.8***	1.9***	1.4***	3.6	--	3.3	--
Benefits - short term (\$)		25.2**	28.4**	27.0**	61.2	1686.5	51.3	1548.7
Percent receiving, longer term		2.6***	3.2***	2.6***	4.6	--	3.6	--
Benefits - longer term (\$)		20.4***	25.5***	24.7***	24.5	1083.5	16.5	951.3
Public Assistance and Medicaid (average quarterly)								
Percent receiving TANF, short term		-1.3**	-2.0***	-1.3***	5.9	--	6.1	--
TANF benefits - short term (\$)		-18.3***	-25.5***	-24.9***	65.4	1105.1	67.5	1100.5
Percent receiving TANF, longer term		-1.4**	-1.3**	-0.8**	6.1	--	5.6	--
TANF benefits - longer term (\$)		-4.5	-3.8	-3.0	46.1	958.3	41.6	923.3
Percent receiving FS, short term		-5.6***	-5.6***	-5.6***	33.5	--	31.0	--
FS benefits - short term (\$)		-25.2***	-34.8***	-34.6***	113.4	338.8	115.2	371.5
Percent receiving FS, longer term		-4.9***	-4.0***	-3.9***	40.8	--	37.0	--
FS benefits - longer term (\$)		-13.3***	-13.2**	-12.4**	112.2	313.4	103.2	316.2
Percent enrolled Medicaid, short-term		-3.6***	-4.4***	-4.1***	50.7	--	50.4	--
Percent enrolled Medicaid, longer term		-3.0**	-3.4**	-3.0*	51.6	--	50.7	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 12.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

Table 12.6 Net Impact Estimates for Vocational Rehabilitation Programs for 2003/2004 Cohort

Outcome	Block Matching Estimator	Matched Sample Estimator		Comparison Group Means			
	Wtd. Diff. in Means	Diff. in Means	Regr. Adj.	Full Sample		Matched Sample	
				With 0	W/O 0	With 0	W/O 0
Employment							
Short term (%)	7.9***	6.0***	6.8***	29.2	--	33.6	--
Average hourly wage							
Short term (\$)	0.87***	0.67***	0.67***	3.08	10.06	3.58	10.32
Short term diff-in-diff (\$)	0.50**	0.18	0.29*	-0.58	-0.02	-0.61	0.28
Average quarterly hours							
Short term	29.5***	25.4***	25.1***	86.6	282.7	99.5	286.5
Short term, diff-in-diff	17.6***	13.3***	16.3***	-4.2	45.5	-12.0	30.4
Average quarterly earnings							
Short term (\$)	347***	315***	309***	873	2849	1012	2916
Short term, diff-in-diff (\$)	232***	160***	202***	-180	378	-262	236
Unemployment Insurance Benefits (average quarterly)							
Percent receiving, short term	0.2	-0.3	-0.2	1.9	--	2.6	--
Benefits - short term (\$)	-0.7	-5.4	-6.2	18.6	974.6	27.9	1057.2
Public Assistance and Medicaid (average quarterly)							
Percent receiving TANF, short term	-1.2**	-0.9*	-0.6**	6.3	--	5.1	--
TANF benefits - short term (\$)	-16.4***	-10.2*	-10.2**	68.6	1086.6	53.8	1045.0
Percent receiving FS, short term	-3.9***	-3.6***	-3.7***	40.3	--	37.1	--
FS benefits - short term (\$)	-22.6***	-17.5***	-17.4***	142.5	353.4	126.7	341.8
Percent enrolled Medicaid, short-term	-0.4	0.5	1.0	53.7	--	49.9	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in rows 2 and 3 of Table 12.4.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test) -- means not applicable.

from DVR. As with comparable tables in the prior chapters, the first table displays the short-term (3 quarters after exit) and the longer-term (9–12 quarters after exit) outcomes for the 2001/2002 cohort of program exiters. The second table is limited to the short-term net impacts for the 2003/2004 cohort. The first column in each of the tables presents the estimates from the block matching technique, which uses the full comparison set (i.e., *U*) and the treatment group. The second column presents a comparison of means between the treatment group and the matched comparison group. The third column presents an estimate from a regression adjustment of that mean. This column represents the preferred specification, although for some programs we use the levels of the outcome

variables as the dependent variable and, for others, we use difference-in differences. The coefficient estimates that are in “boxes” represent the final, “official” estimates using the preferred specification as chosen by WTECB staff. The final columns of the tables provide the means of the comparison group, both the full comparison group pool and the matched comparison group. These columns are provided so that the net impacts can be estimated on a percentage basis.

The DVR programs are estimated to have substantial payoffs for the individuals who participate in them relative to those who are not served. The short-term impacts include increases in employment (6.8 percentage points), hourly wage (\$0.29), hours working (16.3 hours in a quarter), and quarterly earnings (\$202). Furthermore, in the short term, the treatment group has a substantial decrease in public assistance. The economic advantages persist, and even grow, in the longer term. The employment net impact estimate is 11.0 percentage points; the hourly wage increases by \$1.22 per hour; the hours worked increase by 44.8 hours per quarter; and earnings increase by about \$626.

Furthermore the reductions in public assistance are larger in the longer-term estimates than in the short-term.

Subgroup Analysis

Tables 12.7 and 12.8 provide net impact estimates for the individuals who were served by the DVR programs and who completed the programs. As with previous subgroup analyses, the tables show the net impact for the noncompleter group in the first column and the estimated net impact for the subgroup of completers in the second column. The final column has the comparison group means.

Note that the results for the program completers “swamp” the noncompleters’ net impact estimates. The first rows in table 12.7 show that the longer-term employment and earnings impacts

Table 12.7 Selected Longer-Term Net Impact Estimates for the Subgroups of DVR Program Completers, 2001/2002 Cohort

	Subgroup		Matched Comparison Group Mean
	Noncompleters	Completers	
Employment	-4.5%**	27.4%**	20.7%
Hourly Wage	-\$0.71**	\$3.22**	\$2.55
Hours Worked	-12.3	104.5**	72.8
Earnings	-\$67	\$1,345**	\$963
UI Receipt	0.2%	5.4%**	3.3%
TANF Receipt	0.5%	-1.7%**	4.7%
Food Stamps Recipient	2.2%	-10.2%**	39.5%
Medicaid Enrollment	0.7%	-7.0%**	51.1%
Subgroup Sample Size	1,253	1,191	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

Table 12.8 Selected Short Term Net Impact Estimates for the Subgroups of DVR Program Completers, 2003/2004 Cohort

Outcome	Subgroup		Matched Comparison Group Mean
	Noncompleters	Completers	
Employment	-13.0%**	36.8%**	22.3%
Hourly Wage	-\$1.53**	\$2.92	**42
Hours Worked	-43.1**	101.9**	64.1
Earnings	-\$432**	\$1,107**	\$685
UI Receipt	-0.6%**	0.7%	1.5%
TANF Receipt	-0.1%	-1.4%**	5.7%
Food Stamps Receipt	4.7%**	-15.4%**	41.4%
Medicaid Enrollment	5.9%**	-6.7%**	55.2%
Subgroup Sample Size	2,572	1,778	—

NOTE: Monetary data in '00 \$.

**Significant at the 0.05 level (two-tailed test).

for the completers are all positive and sizeable. These same outcomes are negative for noncompleters. In table 12.8, the same pattern occurs, but the differences in the impacts are even larger. Both the short-term and longer-term net impacts for earnings for program completers are on the order of 30 to 35 percent.

In both the longer-term and short term net impact estimates, there are sizeable reductions in public assistance for the completers, whereas there are increases for noncompleters. That is, the completers are likely to go off the welfare rolls and noncompleters actually increase their likelihood of being on the rolls.

13 DEPARTMENT OF SERVICES FOR THE BLIND (DSB) PROGRAMS

The Department of Services for the Blind (DSB) provides vocational rehabilitation services to individuals who are blind or visually impaired including information, assessment, and referrals; vocational counseling including guidance, referral and placement; and training in adaptive skills, job skills, and assistive technology. It may provide occupational licenses, tools, equipment, technological aids, and other goods and services that can be reasonably expected to help participants achieve employment. The primary outcome measure is successful employment.

Participant Characteristics

As with the high school CTE completers and DVR program participants, we were able to use the same data base for treatment and comparison group cases for the DSB programs. The administrative data had a field that identified eligible clients who did not get served. These individuals became the comparison group pool.²⁸ Table 13.1 provides descriptive data that compare the individuals in the treatment group to those in the comparison group pool. The first two columns of numbers compare the DSB exiters in 2001/2002 to the remaining (unserved) individuals in the sample. The final two columns compare the 2003/2004 exiters to their comparison group pool of eligible, but unserved individuals.

Very small sample sizes limit the statistical precision of the comparison of means. For virtually every characteristic, the means for the individuals who received services and for the individuals who did not receive services are not statistically different. Just examining the means

²⁸We also matched the DSB participants who had been served to individuals on the LE file who were 16–60 years old. However, the participation model and the quality of the matches were not as believable or as statistically robust as the models using the non-served clients.

Table 13.1 Descriptive Statistics for Department of Blind Services Programs Treatment Group and Comparison Group Pool

Characteristics	2001/2002		2003/2004	
	Received services	No services	Received services	No services
<u>Demographics and Education</u>				
Female	46.2% ^{††}	37.7% ^{††}	39.2% ^{††}	32.9% ^{††}
Minority	19.0% ^{††}	13.0% ^{††}	18.5% ^{††}	18.4% ^{††}
Mean, age at registration	40.6 ^{††}	38.3 ^{††}	40.4 ^{††}	41.4 ^{††}
No formal education	0.6% ^{††}	0.0% ^{††}	0.0% ^{††}	1.3% ^{††}
Grades 1 through 8	1.3% ^{††}	2.6% ^{††}	0.9% ^{††}	2.6% ^{††}
Grades 9 through 12, no diploma	12.0% ^{††}	13.0% ^{††}	11.0% ^{††}	11.8% ^{††}
High school graduate	34.8% ^{††}	28.6% ^{††}	26.9%	40.8%
Some college, no degree	19.6% ^{††}	20.8% ^{††}	21.6% ^{††}	19.7% ^{††}
College certificate or associate degree	9.5% ^{††}	15.6% ^{††}	11.5% ^{††}	13.2% ^{††}
Bachelor degree	17.7% ^{††}	16.9% ^{††}	18.5%	5.3%
Master degree or more	4.4% ^{††}	2.6% ^{††}	9.7% ^{††}	5.3% ^{††}
West WA	79.7% ^{††}	85.7% ^{††}	80.2% ^{††}	67.1% ^{††}
Urban county	52.5% ^{††}	63.6% ^{††}	58.1% ^{††}	48.7% ^{††}
<u>Employment and Earnings (prior to registration)</u>				
Percentage of (prior) quarters with employment ^a	50.4% ^{††}	46.1% ^{††}	50.2% ^{††}	43.7% ^{††}
Average quarterly earnings ^{a, b}	\$2,904 ^{††}	\$2,965 ^{††}	\$3,163 ^{††}	\$2,664 ^{††}
Mean, earnings trend ^c	\$4.4 ^{††}	\$18.8 ^{††}	\$21.4 ^{††}	-\$64.6 ^{††}
Mean, earnings variance ^c (in 10 ⁶ \$)	\$3.6 ^{††}	\$2.2 ^{††}	\$10.9 ^{††}	\$4.6
Mean, number of quarters with job change ^b	0.9 ^{††}	1.2 ^{††}	1.2 ^{††}	1.7 ^{††}
Had earnings dip	28.5% ^{††}	35.1% ^{††}	26.9% ^{††}	31.6% ^{††}
Mean, number of quarters since dip at registration ^b	0.9 ^{††}	1.3 ^{††}	1.0 ^{††}	1.1 ^{††}
Ave. earnings dip ^b	23.7% ^{††}	27.0% ^{††}	21.1% ^{††}	29.5% ^{††}
Sample size	158	77	227	76

NOTE: All differences in means are statistically significant at the 0.05 level (t-test). Monetary data in 2000 \$.

^aObservations with no quarters of prior earnings were excluded from analyses.

^bAverages include observations with values of zero.

^cTrend and variance calculations include quarters with zero earnings, if any.

^{††}Differences in means are not statistically significant at 0.05 level (t-test).

suggests that the individuals who received services tended to be disproportionately female, have at least a bachelor's degree, and had slightly higher employment rates prior to receiving services.

Again, however, the sample sizes are only 235 in the 2001/2002 group of program exiters and 303 in the 2003/2004 exiters, so analyses were quite limited. In fact, we did not estimate a participation model or attempt a statistical match. Instead the net impacts were estimated directly from the administrative data using all of the records.

Net Impacts

Table 13.2 provides both the short term and longer-term net impact estimates for the DSB programs. The first two columns of estimates are for the 2001/2002 cohort—the simple difference in means and the regression-adjusted difference in means. The next two columns repeat those estimates for the 2003/2004 cohort. Note that these columns have only the short term net impact estimates. The final two columns have the comparison group means, so that impacts can be calculated on a percentage basis.

DSB services increase significantly the employment rates of participants. In the short term, the employment impact is over 20 percent, and in the longer-term, it is almost exactly 20 percent. The services also increase wages. The point estimates are large and significant; the short-term and longer-term estimates are \$3.90 and \$5.08, respectively. The short-term net impact estimate for hours worked during the quarter is not significant, although it is positive—25.9 hours. The short-term earnings impact of \$622 is also not significant. However, in the longer-term, the hours impact is significant (78.4 hours), and individuals with a positive earnings impact of \$1,357, which is more than 50 percent for that cohort. In addition to the positive employment and earnings impacts, the DSB services apparently reduce the likely of receiving public assistance.

No subgroup analyses were conducted for the DSB services treatment.

Table 13.2 Short Term and Longer Term Net Impact Estimates for Department of Blind Services Programs

Outcome	Full Sample Estimates				Comparison Group Means			
	2001/2002		2003/2004		2001/2002		2003/2004	
	Diff. in Means	Regr. Adj.	Diff. in Means	Regr. Adj.	With 0	W/O 0	With 0	W/O 0
Employment								
Short term (%)	31.9***	30.5***	27.0***	23.7***	14.3	--	19.7	--
Ever employed - longer term (%)	24.8***	20.5***	--	--	19.5	--	--	--
Percent of quarters, longer term	25.3***	20.1***	--	--	13.3	--	--	--
Percent of quarters, longer term, diff-in-diff	20.1***	20.3***	--	--	-26.0	--	--	--
Average hourly wage								
Short term (\$)	6.52***	5.27***	4.07***	3.29**	1.41	9.83	3.57	16.96
Short term, diff-in-diff (\$)	6.97***	5.64***	3.64**	3.90***	-6.60	-6.03	-3.67	1.24
Longer term (\$)	6.11***	4.72***	--	--	1.44	8.90	--	--
Longer term, diff-in-diff (\$)	6.56***	5.08**	--	--	-6.56	-5.69	--	--
Average quarterly hours								
Short term	121.9***	110.1***	90.7***	71.9***	52.0	364.1	79.5	377.5
Short term, diff-in-diff	84.3***	104.2***	27.0	25.9	-85.6	78.8	-30.7	10.9
Longer term	107.1***	84.3***	--	--	42.0	254.5	--	--
Longer term, diff-in-diff	69.3**	78.4***	--	--	-95.7	-51.2	--	--
Average quarterly earnings								
Short term (\$)	2463***	1937***	1518***	1099**	528	3693	1328	6306
Short term, diff-in-diff (\$)	2320***	1776***	554	622	-2301	487	-900	389
Longer term (\$)	2107***	1518***	--	--	411	2408	--	--
Longer term, diff-in-diff (\$)	1960**	1357***	--	--	-2417	-792	--	--
Unemployment Insurance Benefits (average quarterly)								
Percent receiving, short term	3.8**	3.1	2.2**	2.7	0.0	--	0.0	--
Benefits - short term (\$)	74.7**	57.1	9.2*	13.7	0.0	--	0.0	--
Percent receiving, longer term	-2.0	-3.8	--	--	5.2	--	--	--
Benefits - longer term (\$)	-5.9	-11.3	--	--	16.4	840.4	--	--
Public Assistance and Medicaid (average quarterly)								
Percent receiving TANF, short term	-3.9*	-3.9**	-0.4	0.4	3.9	--	3.9	--
TANF benefits - short term (\$)	-44.0	-47.0**	-10.4	11.8	44.0	--	53.1	1345.9
Percent receiving TANF, longer term	-5.2*	-4.6*	--	--	6.5	--	--	--
TANF benefits - longer term (\$)	-50.9*	-45.3*	--	--	58.5	954.1	--	--
Percent receiving FS, short term	-16.5***	-15.7***	-15.7***	-8.2	27.3	--	31.6	--
FS benefits - short term (\$)	-45.1**	-41.7**	-38.5	-4.3	74.3	272.4	87.3	276.6
Percent receiving FS, longer term	-6.3	-4.7	--	--	22.1	--	--	--
FS benefits - longer term (\$)	-26.7	-21.5	--	--	50.7	264.5	--	--
Percent enrolled Medicaid, short term	-4.7	-1.3	-13.9**	-4.9	36.4	--	46.1	--
Percent enrolled Medicaid, longer term	-2.2	3.0	--	--	35.1	--	--	--

NOTE: See Appendix B for explanatory notes. Sample sizes differ for virtually every entry in the table because of observations with missing data. If there were no missing data, the sample sizes would be those displayed in the bottom row of table 13.1. All long term outcome variables have missing entries for 2003/2004.

* significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level (two-tailed test). -- means not applicable.

14 BENEFIT-COST ANALYSES

In addition to the net impact analyses, we conducted benefit-cost analyses for the 11 workforce development programs. This chapter documents the methodology that we used and the results of these analyses.

The essential task of a benefit-cost analysis (BCA) is to measure the benefits and costs of a program, place weights on each, and arrive at a conclusion as to the net benefits of the program. To conduct a BCA, it is necessary to measure the benefits and costs in a common unit, usually dollars. Note that the benefits and costs may differ depending on the decisionmaking groups whose interests are affected by the action. For example, increased earnings are a benefit for individuals, but a cost for employers (who get the benefits of increased production of goods or services). In considering whether the workforce programs that are administered in Washington had net benefits, we explicitly estimated benefits and costs for two groups: (1) the program participants and (2) the rest of society (i.e., taxpayers).

For this project, the benefits that were calculated included the following:

- Increased lifetime earnings (discounted)
- Fringe benefits associated with those earnings
- Taxes on earnings (negative benefit to participants; benefit to society)
- Reductions in UI benefits (negative benefit to participants; benefit to society)
- Reductions in TANF benefits (negative benefit to participants; benefit to society)
- Reductions in Food Stamp benefits (negative benefit to participants; benefit to society)
- Reductions in Medicaid benefits (negative benefit to participants; benefit to society)

The costs included the following:

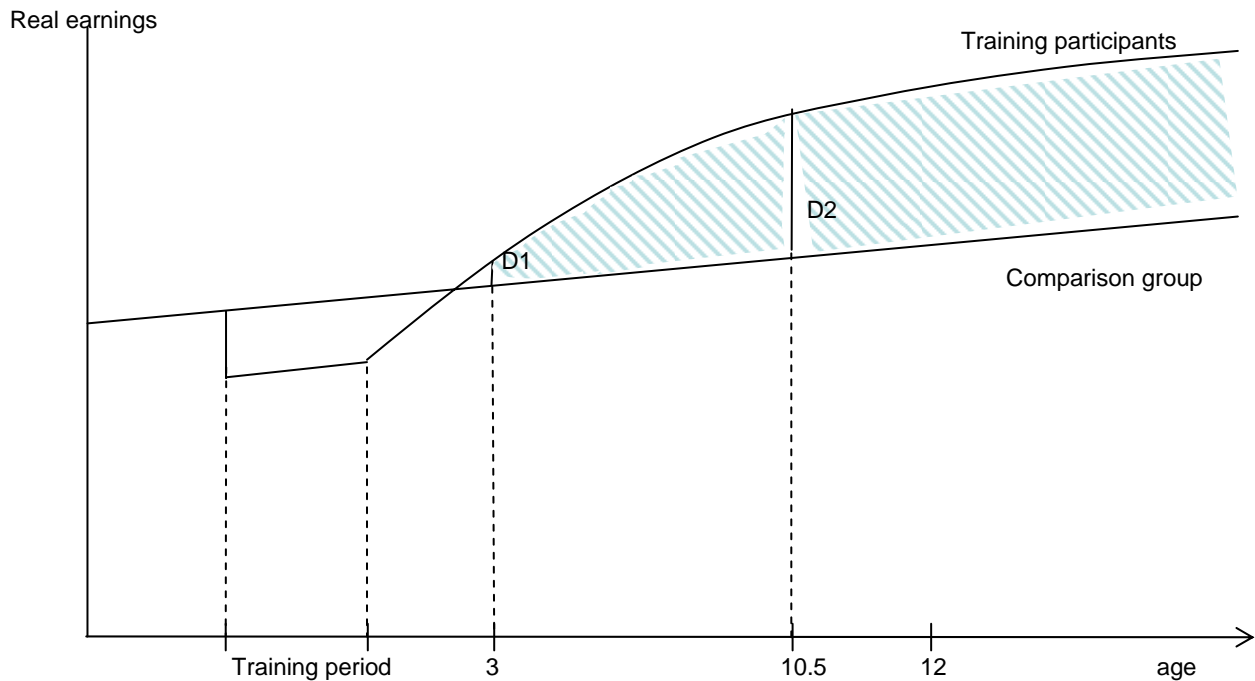
- Foregone earnings (reduced earnings during the period of training)
- Tuition payments
- Program costs

Most of these costs and benefits were derived from the net impact estimates presented in prior chapters or by calculating some simple descriptive statistics from the underlying data. The next sections of the chapter document the assumptions and data that we used to calculate each of those benefits and costs. The final part of the chapter presents the results and discussion.

Lifetime Earnings

Figure 14.1 shows the earnings profiles for the average individual in the treatment group and in the comparison group. The hypothesis used to construct these profiles is that encountering a workforce development program enhances an individual’s skills and productivity (thus increasing wage rates) and increases the likelihood of employment. Thus, after the training period, the treatment earnings profile is above the comparison earnings profile (both hourly wage and employment net impacts are positive.) During the training period, the treatment earnings will be

Figure 14.1 Hypothetical Earnings Profiles of Training Participants and Comparison Group Members



below the comparison earnings, on average. These are the foregone costs of training in the form of wages that are given up by the participant while he or she is receiving training.

The theoretical lifetime earnings benefit would be the shaded area in the graph. The average comparison group member's real earnings grow at some fairly constant rate (increase in productivity), and the average treatment group member's earnings eventually become higher after training and likely grow faster as they accumulate additional human capital in the form of work experience.

The problem that needed to be solved in this project was how to estimate the shaded area. The two lines D1 and D2 represent the difference in average earnings at three quarters after exiting from the training program and at 10.5 quarters after exit. These are essentially the short-term and longer-term net impact estimates that have been documented in the prior chapters. (Note that 10.5 is the midpoint of quarters 9-12). Because the profiles represent the *average* individual, we use the *unconditional* net earnings impacts to calculate these benefits. (They automatically control for employment, hourly wage, and hours worked impacts.)

What is unknown (and unknowable) is the shape of the earnings profiles into the future after the D2 point. The profiles could continue to move apart from each other if the training participants continue to be more and more productive relative to the comparison group member, or the profiles eventually may converge over time if the training effect depreciates. Alternatively, the profiles may become parallel to reflect a scenario in which the training participants gain a permanent advantage, but then their productivity growth eventually matches the comparison group members. Since the earnings benefits are received by the participants in future periods, they need to be discounted. We used a 3 percent real discount rate.

In the prior contract undertaken for WTECB (Hollenbeck and Huang 2004), the empirical strategy that we followed was to use the short-term and longer-term net impact estimates for unconditional earnings from the 2001/2002 data to “fit” a log earnings function. That is, we assumed a “smooth” curve between the three quarters and 10.5 quarters points after exit, and then made a couple of alternative assumptions to extrapolate that smooth curve’s depreciation over time.

In the current study, we used a more eclectic, empirical approach. Since earnings records were available for many quarters, we estimated regression-adjusted net impacts for all of the outcomes for periods three through twelve after exit for the 2001/2002 cohort and for periods two through four for the 2003/2004 cohort. For the most part, we relied on the 10 quarters of results from the earlier cohort to guide the extrapolation of earnings for each of the programs.

For two of the programs, the longer-term net impact estimator for earnings exceeded the short term, and the intervening estimates grew reasonably smoothly, so we used a log-earnings curve extrapolation as we did in the prior study. These two programs were WIA Title I-B youth programs and secondary career and technical education. For adult basic education, the longer-term earnings impacts were not significantly different from zero, so we assumed no earnings increase for the average participant in this program. For three of the programs, the 10 quarters of data cycled up and down more or less randomly. In these cases, we used a constant net impact that was equal to the mean of the impacts for quarters +3 to +12. These three programs were WIA Title I-B dislocated worker programs, Community and Technical College worker retraining, and apprenticeships. Finally for all of the other programs, we assumed a constant rate of exponential decay between quarters +3 and +12. More detail about the specifics is provided in the following paragraphs.

Table 14.1 provides the data that were used for determining the interpolation/extrapolation for WIA Title I-B adult programs. Note that the first column of data provides the net impact

Table 14.1 Earnings Interpolation for WIA Title I-B Adults

Quarter after exit	2001/2002 Cohort		2003/2004 Cohort
	Regression-adjusted estimate	Interpolated estimate used in c/b	Regression-adjusted estimate
+2	—	613	468
+3	613	613	315
+4	603	587	350
+5	470	563	—
+6	393	540	—
+7	333	518	—
+8	452	496	—
+9	403	476	—
+10	411	456	—
+11	385	437	—
+12	419	419	—
Average age at exit		37.8	
Number of quarters until age 65		109	

NOTE: Entries are in 2000 \$. Average age at exit is the arithmetic average of the 2001/2002 cohort average exit age and the 2003/2004 cohort average exit age.

estimates (regression-adjusted) for quarter +3 to +12. In this case, the data seemed to decrease over time, so we calculated a quarterly rate of decay between the 3rd and 12th quarters, which was 0.9586, and used the following equations:

$$(1) \quad EarnImpact(q) = EarnImpact(q-1) * 0.9586; q = 4, \dots, 12$$

$$EarnImpact(1) = EarnImpact(2) = EarnImpact(3) = \$613$$

As noted in the table, the average age at the time of exit of these clients was 37.8, so the interpolation and extrapolation was done for 109 quarters. The second column of the table provides the interpolated estimates used in the cost-benefit analysis. The third column shows the short-term regression adjusted estimates for quarter +2 to +4 that were derived from the 2003/2004 data. In addition to assuming further depreciation after the 12th quarter, we extrapolated the earnings impact at its (constant) value for quarter +12. The estimated lifetime discounted value of future earnings using the two assumptions were \$13,525 and \$27,239, respectively. The preferred specification was the latter one, i.e., no depreciation after the 12th quarter after exit.

Table 14.2 provides the data that were used for determining the interpolation/extrapolation for WIA Title I-B dislocated worker programs. The first column of data provides the net impact estimates (regression-adjusted) for quarter +3 to +12. In this case, the data seemed to cycle up and down with no discernable trend. So in this case, we assumed that the impact was constant at the mean for the estimated net impacts, \$755.

Table 14.2 Earnings Interpolation for WIA Title I-B Dislocated Workers

Quarter after exit	2001/2002 Cohort		2003/2004 Cohort
	Regression-adjusted estimate	Interpolated estimate used in c/b	Regression-adjusted estimate
+2	—	755	1248
+3	679	755	991
+4	986	755	1039
+5	879	755	—
+6	728	755	—
+7	579	755	—
+8	938	755	—
+9	806	755	—
+10	571	755	—
+11	565	755	—
+12	821	755	—
Average age at exit		43.1	
Number of quarters until age 65		88	

NOTE: Entries are in 2000 \$. Average age at exit is the arithmetic average of the 2001/2002 cohort average exit age and the 2003/2004 cohort average exit age.

As noted in the table, the average age at the time of exit of these clients was 43.1, so the interpolation and extrapolation was done for 88 quarters. The second column of the table provides the (constant) interpolated estimates used in the cost-benefit analysis. The third column shows the short-term regression adjusted estimates for quarter +2 to +4 that were derived from the 2003/2004 data.

In addition to assuming a constant differential after the 12th quarter, we extrapolated the earnings impact using a quarterly decay rate. When graphed, the net impact estimates displayed a cyclical pattern, and the peaks of those cycles (\$986, \$938, and \$821 at quarters +4, +8, and +12, respectively) decayed at a quarterly rate of 0.9774. So we used that decay for an alternative

extrapolation. The estimated lifetime discounted value of future earnings using the two assumptions were \$41,428 and \$21,632, respectively. The preferred specification was the former one, i.e., no depreciation after the 12th quarter after exit.

Table 14.3 provides the data that were used for determining the interpolation/extrapolation for WIA Title I-B youth programs. Again, the first column of data provides the net impact estimates (regression-adjusted) for quarter +3 to +12. In this case, the net impacts seemed to increase over time, so we fit a log earnings function as we had done in the prior study. In particular, earnings were estimated by equation (2) as follows:

$$(2) \quad EarnImpact(q) = \ln[2.6379 + 1.7084 (q - 3)] * 100; q = 4, \dots, 12$$

$$EarnImpact(1) = EarnImpact(2) = EarnImpact(3) = \$97$$

Table 14.3 Earnings Interpolation for WIA Title I-B Youth

Quarter after exit	2001/2002 Cohort		2003/2004 Cohort
	Regression-adjusted estimate	Interpolated estimate used in c/b	Regression-adjusted estimate
+2	—	97	-172
+3	44	97	-221
+4	97	97	-204
+5	206	147	—
+6	142	180	—
+7	150	205	—
+8	240	225	—
+9	240	241	—
+10	283	255	—
+11	308	268	—
+12	279	279	—
Average age at exit		18.6	
Number of quarters until age 65		186	

NOTE: Entries are in 2000 \$. Average age at exit is the arithmetic average of the 2001/2002 cohort average exit age and the 2003/2004 cohort average exit age.

As noted in the table, the average age at the time of exit of these clients was 18.6, so the interpolation and extrapolation was done for 186 quarters. The second column of the table provides the interpolated estimates used in the cost-benefit analysis. The third column shows the short-term regression adjusted estimates for quarter +2 to +4 that were derived from the 2003/2004 data.

In addition to assuming continued growth in the differential after the 12th quarter, we extrapolated the earnings impact at its (constant) value for quarter +12. The estimated lifetime discounted value of future earnings using the two assumptions were \$41,871 and \$25,269, respectively. The preferred specification was the latter one, i.e., continued extrapolation held constant after the 12th quarter after exit.

Table 14.4 provides the data that were used for determining the interpolation/extrapolation for community and technical college job prep programs. As with the prior tables, the first column of data provides the net impact estimates (regression-adjusted) for quarter +3 to +12. In this case, the data seemed to decrease over time, so we calculated a quarterly rate of decay between the 3rd and 12th quarters, which was 0.9832, and used the following equations:

$$(3) \quad \text{EarnImpact}(q) = \text{EarnImpact}(q-1) * 0.9832; q = 4, \dots, 12$$

$$\text{EarnImpact}(1) = \text{EarnImpact}(2) = \text{EarnImpact}(3) = \$1,132$$

Table 14.4 Earnings Interpolation for Community and Technical Colleges Job Prep

Quarter after exit	2001/2002 Cohort		2003/2004 Cohort
	Regression-adjusted estimate	Interpolated estimate used in c/b	Regression-adjusted estimate
+2	—	1,132	1,533
+3	1,132	1,132	1,420
+4	1,157	1,113	1,505
+5	1,068	1,094	—
+6	1,026	1,076	—
+7	869	1,058	—
+8	913	1,040	—
+9	948	1,023	—
+10	995	1,005	—
+11	874	989	—
+12	972	972	—
Average age at exit		33.4	
Number of quarters until age 65		88,126	

NOTE: Entries are in 2000 \$. Average age at exit is the arithmetic average of the 2001/2002 cohort average exit age and the 2003/2004 cohort average exit age.

As noted in the table, the average age at the time of exit of these clients was 33.4, so the interpolation and extrapolation was done for 126 quarters. The second column of the table provides

the interpolated estimates used in the cost-benefit analysis. The third column shows the short-term regression adjusted estimates for quarter +2 to +4 that were derived from the 2003/2004 data.

In addition to assuming further depreciation after the 12th quarter, we extrapolated the earnings impact at its (constant) value for quarter +12. The estimated lifetime discounted value of future earnings using the two assumptions were \$42,406 and \$82,280, respectively. The preferred specification was the latter one, i.e., no depreciation after the 12th quarter after exit.

Table 14.5 provides the data that were used for determining the interpolation/extrapolation for community and technical college worker retraining programs. Note that the first column of data provides the net impact estimates (regression-adjusted) for quarter +3 to +12. The net impact results for worker retraining exhibited no trend, so as with the WIA Title I-B dislocated workers, we used a constant quarterly net impact of \$321, which is the mean of the estimates.

Table 14.5 Earnings Interpolation for Community and Technical College Worker Retraining

Quarter after exit	2001/2002 Cohort		2003/2004 Cohort
	Regression-adjusted estimate	Interpolated estimate used in c/b	Regression-adjusted estimate
+2	—	321	341
+3	216	321	340
+4	416	321	429
+5	343	321	—
+6	417	321	—
+7	325	321	—
+8	414	321	—
+9	287	321	—
+10	292	321	—
+11	167	321	—
+12	333	321	—
Average age at exit		40.6	
Number of quarters until age 65		98	

NOTE: Entries are in 2000 \$. Average age at exit is the arithmetic average of the 2001/2002 cohort average exit age and the 2003/2004 cohort average exit age.

As noted in the table, the average age at the time of exit of these clients was 40.6, so the interpolation and extrapolation was done for 98 quarters. The second column of the table provides the (constant) interpolated estimates used in the cost-benefit analysis. The third column shows the

short-term regression adjusted estimates for quarter +2 to +4 that were derived from the 2003/2004 data.

In order to provide an alternative extrapolation pattern in addition to assuming a constant differential after the 12th quarter, we extrapolated the earnings impact using a quarterly decay rate. When graphed, the net impact estimates displayed a concave (upside-down u-shaped) pattern. The latter portion of the graph decayed at a quarterly rate of approximately 0.9212. So we used that decay for an alternative extrapolation. The estimated lifetime discounted value of future earnings using the two assumptions were \$19,218 and \$3,727, respectively. The preferred specification was the former one, i.e., no depreciation after the 12th quarter after exit.

For the purpose of completeness, we have included table 14.6 that documents the interpolation/extrapolation for ABE programs at community and technical colleges. Note that the estimated net impacts are somewhat random with a mean of -\$40. These estimates are not statistically significant, so we assumed no lifetime earnings gains for this program. (The short-term estimates in the third column are positive and significant, but they are decaying at a rapid rate, so we did not think there was adequate empirical evidence of an earnings impact from those data either.)

Table 14.7 provides the data that were used for determining the interpolation/extrapolation for private career school programs. As with the prior tables, the first column of data provides the net impact estimates (regression-adjusted) for quarter +3 to +12. Again, the data seemed to decrease over time, so we calculated a quarterly rate of decay between the 3rd and 12th quarters, which was 0.9756, and used the following equations:

Table 14.6 Earnings Interpolation for ABE at Community and Technical Colleges

Quarter after exit	2001/2002 Cohort		2003/2004 Cohort
	Regression-adjusted estimate	Interpolated estimate used in c/b	Regression-adjusted estimate
+2	—	0	350
+3	14	0	181
+4	37	0	145
+5	7	0	—
+6	-35	0	—
+7	-178	0	—
+8	-79	0	—
+9	-44	0	—
+10	39	0	—
+11	-61	0	—
+12	-4	0	—
Average age at exit		31.9	
Number of quarters until age 65		132	

NOTE: Entries are in 2000 \$. Average age at exit is the arithmetic average of the 2001/2002 cohort average exit age and the 2003/2004 cohort average exit age.

Table 14.7 Earnings Interpolation for Private Career Schools

Quarter after exit	2001/2002 Cohort		2003/2004 Cohort
	Regression-adjusted estimate	Interpolated estimate used in c/b	Regression-adjusted estimate
+2	—	398	703
+3	398	398	619
+4	441	388	640
+5	411	379	—
+6	377	370	—
+7	293	361	—
+8	393	352	—
+9	399	343	—
+10	343	335	—
+11	205	327	—
+12	312	319	—
Average age at exit		31.2	
Number of quarters until age 65		135	

NOTE: Entries are in 2000 \$. Average age at exit is the arithmetic average of the 2001/2002 cohort average exit age and the 2003/2004 cohort average exit age.

$$(4) \quad EarnImpact(q) = EarnImpact(q-1) * 0.9756; q = 4, \dots, 12$$

$$EarnImpact(1) = EarnImpact(2) = EarnImpact(3) = \$398$$

As noted in the table, the average age at the time of exit of these clients was 31.2, so the interpolation and extrapolation was done for 135 quarters. The second column of the table provides

the interpolated estimates used in the cost-benefit analysis. The third column shows the short-term regression adjusted estimates for quarter +2 to +4 that were derived from the 2003/2004 data.

In addition to assuming further depreciation after the 12th quarter, we extrapolated the earnings impact at its (constant) value for quarter +12. The estimated lifetime discounted value of future earnings using the two assumptions were \$11,091 and \$27,033, respectively. The preferred specification was the latter one, i.e., no depreciation after the 12th quarter after exit.

Table 14.8 provides the data that were used for determining the interpolation/extrapolation for apprenticeship programs. The net impact estimates (regression-adjusted) for quarter +3 to +12 displayed in the first column of the table seem to complete a cycle. They increase for the first few quarters, then decrease, and then return to approximately the same value as they started. Given this pattern, we decided to set the net impact at a constant value of \$2,210.

Table 14.8 Earnings Interpolation for Apprenticeships

Quarter after exit	2001/2002 Cohort		2003/2004 Cohort
	Regression-adjusted estimate	Interpolated estimate used in c/b	Regression-adjusted estimate
+2	—	2,210	2,893
+3	2,201	2,210	2,699
+4	2,385	2,210	2,767
+5	2,384	2,210	—
+6	2,323	2,210	—
+7	2,011	2,210	—
+8	2,148	2,210	—
+9	2,218	2,210	—
+10	2,048	2,210	—
+11	1,932	2,210	—
+12	2,212	2,210	—
Average age at exit		31.6	
Number of quarters until age 65		134	

NOTE: Entries are in 2000 \$. Average age at exit is the arithmetic average of the 2001/2002 cohort average exit age and the 2003/2004 cohort average exit age.

As noted in the table, the average age at the time of exit of apprentices was 31.6, so the interpolation and extrapolation was done for 134 quarters. The second column of the table provides the (constant) interpolated estimates used in the cost-benefit analysis. The third column shows the

short-term regression adjusted estimates for quarter +2 to +4 that were derived from the 2003/2004 data.

In order to provide an alternative extrapolation pattern in addition to assuming a constant differential after the 12th quarter, we extrapolated the earnings impact using a quarterly decay rate. If the third quarter after exit is ignored, the data exhibit a (slow) decay at a quarterly rate of 0.9917. So we used that decay for an alternative extrapolation. The estimated lifetime discounted value of future earnings using the two assumptions were quite large: \$187,223 and \$130,725, respectively. The preferred specification was the former one, i.e., no depreciation after the 12th quarter after exit.

Table 14.9 provides the data that were used for determining the interpolation/extrapolation for secondary CTE completion. Note that the first column of data provides the net impact estimates (regression-adjusted) for quarter +3 to +12. As was the case with WIA Title I-B youth, the estimates increase. So, we again estimated a log-linear curve, given in equation (5).

Table 14.9 Earnings Interpolation for Secondary CTE

Quarter after exit	2001/2002 Cohort		2003/2004 Cohort
	Regression-adjusted estimate	Interpolated estimate used in c/b	Regression-adjusted estimate
+2	—	237	216
+3	237	237	194
+4	257	237	243
+5	244	271	—
+6	361	297	—
+7	328	317	—
+8	350	334	—
+9	293	349	—
+10	418	361	—
+11	372	372	—
+12	432	382	—
Average age at exit		18.0	
Number of quarters until age 65		188	

NOTE: Entries are in 2000 \$.

$$(5) \quad EarnImpact(q) = \ln[10.6579 + 4.3954 * (q-3)] * 100; q = 4, \dots, 12$$

$$EarnImpact(1) = EarnImpact(2) = EarnImpact(3) = \$237$$

We did not have birth date available for this data set, so we assumed that the students were 18.0 when they graduated, so the interpolation and extrapolation was done for 188 quarters. The second column of the table provides the interpolated estimates used in the cost-benefit analysis. The third column shows the short-term regression adjusted estimates for quarter +2 to +4 that were derived from the 2003/2004 data.

In addition to assuming continued growth in the differential after the 12th quarter, we extrapolated the earnings impact at its (constant) value for quarter +12. The estimated lifetime discounted value of future earnings using the two assumptions were \$50,633 and \$34,603, respectively. The preferred specification was the latter, i.e., continued extrapolation with a constant differential after the 12th quarter after exit.

Table 14.10 provides the data that were used for determining the interpolation/extrapolation for Division of Vocational Rehabilitation (DVR) programs. Note that the first column of data provides the net impact estimates (regression-adjusted) for quarter +3 to +12. In this case, the data seemed to decrease over time, so we calculated a quarterly rate of decay between the 3rd and 12th quarters, which was 0.9849, and used the following equations:

$$(6) \quad \text{EarnImpact}(q) = \text{EarnImpact}(q-1) * 0.9849; q = 4, \dots, 12$$

$$\text{EarnImpact}(1) = \text{EarnImpact}(2) = \text{EarnImpact}(3) = \$774$$

As noted in the table, the average age at the time of exit of these clients was 39.4, so the interpolation and extrapolation was done for 102 quarters. The second column of the table provides the interpolated estimates used in the cost-benefit analysis. The third column shows the short-term regression adjusted estimates for quarter +2 to +4 that were derived from the 2003/2004 data. In addition to assuming further depreciation after the 12th quarter, we extrapolated the earnings impact at its (constant) value for quarter +12. The estimated lifetime discounted value of future earnings

using the two assumptions were \$31,868 and \$41,705, respectively. The preferred specification was the latter one, i.e., no depreciation after the 12th quarter after exit.

Table 14.10 Earnings Interpolation for DVR Programs

Quarter after exit	2001/2002 Cohort		2003/2004 Cohort
	Regression-adjusted estimate	Interpolated estimate used in c/b	Regression-adjusted estimate
+2	—	774	179
+3	774	774	206
+4	788	762	224
+5	741	751	—
+6	636	739	—
+7	671	728	—
+8	638	717	—
+9	601	706	—
+10	627	696	—
+11	662	685	—
+12	675	675	—
Average age at exit		39.4	
Number of quarters until age 65		102	

NOTE: Entries are in 2000 \$. Average age at exit is the arithmetic average of the 2001/2002 cohort average exit age and the 2003/2004 cohort average exit age.

The last program for which we needed to extrapolate lifetime earnings was Department of Services for the Blind (DSB) programs. Table 14.11 provides the data that were used for determining the interpolation/extrapolation for those programs. Note that the first column of data provides the net impact estimates (regression-adjusted) for quarter +3 to +12. As with many of the other program, the earnings impacts seemed to decrease over time, so we calculated a quarterly rate of decay between the 3rd and 12th quarters, which was 0.9680, and used the following equations:

$$(7) \quad \text{EarnImpact}(q) = \text{EarnImpact}(q-1) * 0.9680; q = 4, \dots, 12$$

$$\text{EarnImpact}(1) = \text{EarnImpact}(2) = \text{EarnImpact}(3) = \$1,778$$

Table 14.11 Earnings Interpolation for DSB Programs

Quarter after exit	2001/2002 Cohort		2003/2004 Cohort
	Regression-adjusted estimate	Interpolated estimate used in c/b	Regression-adjusted estimate
+2	—	1,778	656
+3	1,778	1,778	622
+4	1,567	1,721	705
+5	1,450	1,666	—
+6	1,215	1,613	—
+7	1,301	1,561	—
+8	1,400	1,511	—
+9	1,412	1,463	—
+10	1,400	1,416	—
+11	1,372	1,371	—
+12	1,327	1,327	—
Average age at exit		43.6	
Number of quarters until age 65		86	

NOTE: Entries are in 2000 \$. Average age at exit is the arithmetic average of the 2001/2002 cohort average exit age and the 2003/2004 cohort average exit age.

As noted in the table, the average age at the time of exit of these clients was 43.6, so the interpolation and extrapolation was done for 86 quarters. The second column of the table provides the interpolated estimates used in the cost-benefit analysis. The third column shows the short-term regression adjusted estimates for quarter +2 to +4 that were derived from the 2003/2004 data.

In addition to assuming further depreciation after the 12th quarter, we extrapolated the earnings impact at its (constant) value for quarter +12. The estimated lifetime discounted value of future earnings using the two assumptions were \$46,407 and \$71,341, respectively. The preferred specification was the latter one, i.e., no depreciation after the 12th quarter after exit.

Fringe Benefits

With additional earnings, workers will also accrue additional fringe benefits in the form of paid leave, paid insurances, retirement/savings plan contributions, and other non-cash benefits. We did a literature search on fringe benefit estimates, and found no more recent estimates than the ones we had used in the prior study. Consequently, we used those again. In that study, we relied on two

sources of data that provided estimates of the ratio of fringe benefits (defined as paid leave plus paid insurances plus retirement plan contributions plus other) to gross wages and salaries (including supplemental pay such as overtime) that were in the 20 to 25 percent range. Specifically, the U.S. Department of Labor Bureau of Labor Statistics, *News*, No. 02-346, June 19, 2002, reports this ratio to be 23.3 percent for “All U.S.” and 20.4 percent for the “West Census Region.” The U.S. Chamber of Commerce report, *The 2001 Employee Benefits Study*, 2001, reports a ratio of 24.3 percent for the Pacific region (Table 5 of that report). Under the assumption that workforce development program participants are less likely to get fringe benefit coverages than the average worker, and to be conservative in our benefit estimation, we used the assumption that this ratio would be 20 percent (applied to the discounted annual earnings increments).

Employee Tax Liabilities

Higher earnings will lead to payment of increased payroll, sales/excise, and federal income taxes.²⁹ The increased taxes are a cost to participants and a benefit to the public. We used average (marginal) tax rates for each of the three types of taxes and applied these rates to the annual earnings changes.

Payroll Taxes

Payroll taxes include social security and Medicare tax rates. The current rate of 7.65 percent was used to estimate the future liabilities. This requires three assumptions: this rate will not increase in future years, all participants will be employed in covered employment (not self-employed), and that none of the participants will exceed the maximum earnings levels against which this payroll tax

²⁹Washington does not have state income taxes.

is applied. The assumption that the rate will remain fixed at its current rate seemed like a reasonable compromise since it is likely that the rate will continue to increase somewhat over time as it has in the past, but it is also likely that some participants will work in non-covered employment (such as agriculture) and that a few participants will exceed the taxable earnings maximums. Thus we may be underestimating future tax rates, but overestimating the taxable base.

Note that, under FICA, employers also pay additional payroll taxes. However, these taxes do not need to be factored into the benefit-cost analysis since they are a transfer from employers to the public. Similarly, the document W. Vroman, *Tax Equity Study*, 1999, showed that employers bore, on average, a payroll tax rate of 2.13 percent for unemployment insurance taxes. But, these also represent a transfer from employers to the public that do not affect participants.

Sales/Excise Taxes

We used a methodology similar to the payroll tax estimation to calculate these tax liabilities, but in this case used a rate of 4.6 percent for all of the programs except WIA Title I-B dislocated workers, community and technical college worker retraining, and apprenticeships. For the latter programs, in which recipients had higher incomes, we used a rate of 8.35 percent. These rates were derived from a table titled, “Current Tax System: Tax Burden on Households, Major State and Local Taxes” from an online document prepared by a State of Washington analyst, Rick Peterson, accessed at <http://www1.leg.wa.gov/documents/opr/2005/Tax%20Alternatives%20Model%2020055%ver2.xls> in March 2006. Table 14.12 reproduces a portion of that table along with a calculation of marginal tax rates. The rate that we used for all of the programs except the three mentioned above is the first entry in the marginal tax column (4). The rate used for the programs with participants who

have higher household incomes, 8.35 percent, is the arithmetic average of the next two entries in that column.

Table 14.12 Marginal Sales/Excise Tax Rate Calculations

Total household income (1)	Total sales and excise taxes (2)	Approximate average income (3)	Marginal tax rate (4)
\$0–\$20,000	\$1,769	\$12,457	0.046
\$20–\$30,000	2,344	24,936	0.0903
\$30–\$40,000	3,184	34,236	0.0767
\$40–\$50,000	4,028	45,258	

Federal Income Tax

We again used a simple average (marginal) tax rate, which is applied to the change in earnings. The source used was the U.S. Department of Commerce, *2006 U.S. Statistical Abstract*, Table 474, p. 326. This table showed average tax payments for the years 2000 and 2002. Table 14.13 includes some of that data (for 2002 only), and displays marginal tax rates. Note that the rows of the table are in categories of adjusted gross income (AGI) and not total income. In general, AGI is less than household income. The average of the marginal tax rates for AGI classes less than \$17,000 is 0.0466, and the average of the marginal tax rates for AGIs between \$17,000 and \$40,000 is 0.1002. Based on these two numbers, we decided to use a (marginal) tax rate of 0.05 for all the programs except WIA Title I-B dislocated workers, community and technical college worker retraining, and apprenticeship. For the latter three programs, we use 0.10.

Unemployment Compensation

Unemployment compensation benefits in the future may increase for participants if programs increase employment (and therefore the probability of receiving UI) or increase earnings (and

therefore benefits) or they may decrease if programs decrease the likelihood of unemployment or decrease duration of unemployment spells. Increased UI benefits in the future would be a discounted benefit to participants and cost to the public.

Table 14.13 Marginal Federal Income Tax Rate Calculations

Total adjusted gross income (1)	Average tax liability, 2002 (2)	AGI midpoint (3)	Marginal tax rate (4)
\$1,000 – 2,999	\$ 94	\$2,000	-0.0050
\$3,000 – 4,999	84	4,000	0.0305
\$5,000 – 6,999	145	6,000	0.0395
\$7,000 – 8,999	224	8,000	0.0175
\$9,000 – 10,999	259	10,000	0.0910
\$11,000 – 12,999	441	12,000	0.0850
\$13,000 – 14,999	611	14,000	0.0680
\$15,000 – 16,999	747	16,000	0.1005
\$17,000 – 18,999	948	18,000	0.1064
\$19,000 – 21,999	1,214	20,500	0.1113
\$22,000 – 24,999	1,548	23,500	0.0845
\$25,000 – 29,999	1,886	27,500	0.0981
\$30,000 – 39,999	2,622	35,000	

NOTE: Average tax liability in (2) is conditional on having a liability. Marginal tax rate calculated as the (Δ average tax liability) / (Δ midpoint).

SOURCE: U.S. Census Bureau, *Statistical Abstract of the U.S.: 2006*, Table 474, p. 326.

We used a similar empirical strategy as we did for lifetime earnings to interpolate and extrapolate. In particular, we estimated the unconditional UI benefit net impacts for each of the first 12 quarters after exit for the 2001/2002 cohort. We used these estimates as the average impact for the program in those quarters. Then we used the estimate for the 12th quarter after exit to extrapolate for 28 more quarters for all of the programs except WIA Title I-B youth programs and secondary CTE programs, for which we extrapolated an additional 40 quarters. In other words, we

assumed that the UI benefit gain or loss would dampen to 0 after 10 years for most of the programs and after 20 years for the two youth programs.

Table 14.14 exhibits the precise estimates that we used in the cost-benefit analyses. The typical pattern for the workforce development programs is that in the short term, unemployment compensation benefits are decreased for participants who exit because, for the most part, employment rates increase—at least, some individuals leave the UI rolls. However, as time progresses, some workers begin to lose employment, and the groups UI net impact benefits become positive, although of relatively small magnitude. There are some exceptions to this general pattern; for some of programs (i.e., job prep and private career schools), the estimated impacts continue to be negative over the entire period. For apprentices, the estimates are quite sizeable and positive, which suggests that a larger share of the workers become unemployed and collect benefits as well as the fact that earnings are large, so benefits are relatively large.

Table 14.14 Interpolation/Extrapolation of UI Net Benefits, by Program

Quarter after exit	Program										
	WIA Adult	WIA DW	WIA Youth	Job Prep	Worker Retrain.	ABE	Priv. Career	Appren.	Secon. CTE	DVR	DSB
1	-386	-1,251	-29	-809	-405	-410	-593	-389	-1	-10	-95
2	-190	-741	-13	-518	-227	-282	-379	-42	0	10	84
3	-111	-458	-7	-354	-171	-194	-269	137	3	27	57
4	-52	-402	-2	-262	-185	-127	-197	167	-1	36	44
5	24	-202	1	-139	-85	-78	-119	230	0	41	51
6	78	-50	19	-41	-2	-31	-43	319	3	72	81
7	85	20	17	-14	2	-20	-18	296	8	74	39
8	62	22	16	-10	24	-15	-19	252	2	34	-8
9	66	33	13	-11	38	-11	-12	222	1	34	-7
10	45	54	6	-18	20	-11	-21	236	2	22	-25
11	27	27	-2	-15	20	-12	-18	173	3	21	-6
12	7	5	-17	-19	3	-10	-21	148	3	21	-6
13-40 or 13-80	0	0	-17	-20	0	-10	-20	150	3	21	-6

NOTE: Entries are in 2000 \$. Extrapolation periods were 40 quarters for all programs except WIA Youth and Secondary CTE, for which they were 80 quarters.

Income-Related Transfer Payments

The maintained hypothesis was that participation in the workforce development programs would decrease the probability of receiving TANF and Food Stamps, and the probability of enrolling in Medicaid. In addition, increased earnings may have resulted in reductions in benefit levels for TANF and Food Stamps. Finally, if individuals no longer receive TANF or Food Stamps, they would not receive any support services such as child care or other referrals.

TANF/Food Stamps

We followed the same empirical strategy as we did for unemployment compensation. We estimated net impacts for unconditional TANF benefits and Food Stamp benefits for the twelve quarters after program exit for the 2001/2002 cohort, and then we extrapolated beyond that period using the estimate from quarter +12. We again assumed that on average, the program participants may receive these benefits (or lose these benefits) for up to 40 quarters (or 80 quarters for the youth programs) even though TANF is time limited to 20 quarters. The reason for going beyond 20 quarters is that these are averages for the entire program group, and the dynamics of reciprocity will be assumed to continue for up to 10 years.

Table 14.15 exhibits the precise estimates that we used in the cost-benefit analyses. The typical pattern for the workforce development programs is that in the short term, TANF benefits are decreased for participants who exit because, for the most part, employment rates increase—at least, some individuals leave the rolls. However, as time progresses, some workers begin to lose employment, or become single and have dependent children, and the group's TANF net impact benefits become positive, although of relatively small magnitude. There are some exceptions to this general pattern, however, for some of programs (i.e, secondary CTE, DVR and DSB programs), the

estimated impacts continue to be negative over the entire period. For DSB programs, the decreases in benefits are quite sizeable.

Table 14.15 Interpolation/Extrapolation of TANF Net Benefits, by Program

Quarter after exit	Program										
	WIA Adult	WIA DW	WIA Youth	Job Prep	Worker Retrain.	ABE	Priv. Career	Appren.	Secun. CTE	DVR	DSB
1	-178	-11	-50	17	-4	-12	-19	-24	-7	-36	-64
2	-71	-2	-44	17	-1	21	-4	-11	-6	-25	-44
3	-32	-1	7	16	4	37	8	-8	-5	-25	-48
4	-24	-2	23	16	3	50	13	-8	-5	-19	-41
5	-12	1	35	17	2	44	13	-4	-3	-18	-41
6	3	2	13	16	4	49	13	2	-1	-15	-34
7	-9	4	40	16	7	51	14	-2	-3	-8	-28
8	1	-1	42	15	5	47	14	-5	-3	-7	-24
9	3	-5	15	14	5	43	15	-7	-3	-2	-31
10	6	1	29	14	8	36	13	-9	-5	-3	-40
11	10	3	24	13	6	36	12	-8	-3	-5	-53
12	11	3	-14	10	4	0	6	-5	0	-3	-64
13-40 or 13-80	11	0	-14	10	4	30	10	-5	-3	-3	-52

NOTE: Entries are in 2000 \$. Extrapolation periods were 40 quarters for all programs except WIA Youth and Secondary CTE, for which they were 80 quarters.

Support costs in TANF were estimated by WTECB personnel to be 131.28 percent of each case's cash benefits. (Personal communication from E. Hawkins, dated April 21, 2006). This estimate was derived from a document referred to as the Economic Services Administration (ESA) Briefing Book. Data in that source were used to estimate annual TANF benefit payments of \$282.3 million and annual child care and other support costs (such as transportation) of \$370.7 million. The support inflation factor of 1.3128 is the ratio of these two state expenditures.

Thus the quarterly increases or decreases in TANF benefits from the interpolation/extrapolation functions were inflated by 131.28 percent to reflect total programmatic costs per participant. The increases (or decreases) in TANF benefits for the average participant were exactly offset by decreases (or increases) in public benefits.

We followed a similar empirical strategy for Food Stamps as we did for TANF. We estimated net impacts for unconditional benefits for the twelve quarters after program exit for the

2001/2002 cohort, and then we extrapolated beyond that period using the estimate from quarter +12. We again assumed that on average, the program participants may receive these benefits (or lose these benefits) for up to 40 quarters (or 80 quarters for the youth programs).

Table 14.16 exhibits the precise estimates that we used in the cost-benefit analyses. The typical pattern for the workforce development programs parallels the TANF net impacts. In the short term, food stamp benefits are decreased for participants who exit because, for the most part, employment rates increase—at least, some individuals leave the rolls. However, as time progresses, some workers begin to lose employment and the group’s food stamp net impact benefits become positive, although of relatively small magnitude. There are some exceptions to this general pattern, however, for some of programs (i.e, apprenticeship, secondary CTE, DVR and DSB programs), the estimated impacts continue to be negative over the entire period. For DSB programs, the decreases in benefits are quite sizeable.

Table 14.16 Interpolation/Extrapolation of Food Stamps Net Benefits, by Program

Quarter after exit	Program										
	WIA Adult	WIA DW	WIA Youth	Job Prep	Worker Retrain.	ABE	Priv. Career	Appren.	Secon. CTE	DVR	DSB
1	-120	-18	-16	8	3	21	-12	-24	-7	-30	-37
2	-68	13	9	10	7	47	-5	-13	-7	-31	-49
3	-35	-10	30	10	11	62	6	-10	-7	-34	-41
4	-36	-8	29	11	10	68	8	-10	-5	-29	-55
5	-21	-6	46	12	11	61	8	-7	-4	-27	-57
6	-13	-4	34	11	8	64	6	-1	-5	-22	-38
7	-13	-2	44	13	9	68	10	-3	-9	-21	-34
8	-5	-7	44	13	6	69	11	-7	-11	-22	-26
9	7	-8	51	12	6	63	9	-11	-9	-12	-20
10	6	-6	48	12	9	68	8	-13	-12	-8	-35
11	11	-7	34	12	10	67	8	-11	-10	-16	-17
12	15	-2	-2	6	5	4	3	-9	0	-11	-19
13-40 or 13-80	15	0	-2	9	5	60	5	-8	-6	-12	-20

NOTE: Entries are in 2000 \$. Extrapolation periods were 40 quarters for all programs except WIA Youth and Secondary CTE, for which they were 80 quarters.

Medicaid

Our data did not have benefit/usage information for Medicaid, so we estimated net impacts of actually being enrolled in Medicaid. The working hypothesis was that training participants will tend to decrease their enrollment rates as they become better attached to the labor force over time and lose eligibility. The average state share of Medicaid expenditures per enrollee was estimated to be \$145.11 per month (in 2000\$) (personal communication from E. Hawkins, dated March 16, 2006, who cited Laura Piliairis of the Washington State Medical Assistance Administration). Each enrolled individual was assumed to average 2.15 persons per case. So the decrease (increase) in per participant Medicaid expenditures per quarter was estimated to be the net impact estimate for Medicaid enrollment times \$435.33 (three months at \$145.11 per month) times 2.15. This was a benefit to the participant and a cost to the public. To interpolate/extrapolate the net impact of a program on Medicaid eligibility, we either averaged or fit a linear equation to the short term and longer-term estimate from the 2001/2002 cohort. Table 14.17 provides the data and constant or linear parameters that were employed.

Table 4.17 Interpolation/Extrapolation of Medicaid Costs, by Program

Program	Short term net impact estimate	Longer-term net impact estimate	Constant/linear equation used to interpolate/extrapolate eligibility impacts
WIA Adults	-0.075	0.020	$-0.1131 + 0.0127 * q; q=1 \dots 40$
WIA Dislocated Workers	-0.009	-0.008	-0.009 (all quarters, 1 ... 40)
WIA Youth	0.086	0.065	$0.0953 - 0.0029 * q; q=1 \dots 80$
Job Prep	0.005	-0.002	0.005 (all quarters, 1 ... 40)
Worker Retraining	0.011	0.011	0.011 (all quarters, 1 ... 40)
ABE	0.051	0.060	0.050 (all quarters, 1 ... 40)
Private Career Schools	-0.002	0.004	$-0.0044 + 0.0008 * q; q=1 \dots 40$
Apprenticeships	-0.019	-0.014	-0.020 (all quarters, 1 ... 40)
Secondary CTE	-0.002	-0.004	-0.003 (all quarters, 1 ... 80)
DVR	-0.041	-0.030	-0.035 (all quarters, 1 ... 40)
DSB	-0.013	0.030	$-0.0288 + 0.0056 * q; q=1 \dots 40$

Costs

Two types of costs were estimated for each of the programs. The first was foregone earnings, which would be reduced earnings while the participants were actually engaged in the training programs. The second type of cost was the actual direct costs of the training. In some cases this involved tuition or fee payments by the participants, and in all cases it involved state subsidies for delivering the training. The data sources for these types of costs are considered in turn.

Foregone Earnings

Foregone earnings represent the difference between what workforce development program participants would have earned if they had not participated in a program (which is unobservable) and what they earned while they did participate. The natural estimate for the former is the earnings of the matched comparison group members during the length of training. Specifically, we used (8) to estimate mechanistically the foregone earnings. Note that we did not discount foregone earnings, but did calculate them in real \$. Specifically, we calculated $Foregone_i$ for both 2001/2002 and 2003/2004 exiters and averaged them. Table 14.18 displays the data as tabulated from administrative records. Table 14.19 displays the estimated foregone earnings.

$$(8) \quad Foregone_i = \left[0.5 \times (\hat{E}_{-1_i} + \bar{E}_{-1_i}) - \bar{E}_{0_i} \right] \times d_i \quad ,$$

where, \bar{E}_{-1}, \bar{E}_0 = avg. quarterly earnings (uncond.) for treatment group in quarter -1 and during training period, respectively.

\hat{E}_1 = avg. quarterly earnings in 1st post-exit period for matched comparison group

d = avg. training duration

i = indexes program

Table 14. 18 Average Quarterly Earnings and Average Training Duration, by Program

Program	\bar{E}_{-1}		\bar{E}_0		\hat{E}_1		d (in quarters)	
	2001/2002	2003/2004	2001/2002	2003/2004	2001/2002	2003/2004	2001/2002	2003/2004
WIA Adults	1,237	1,489	1,967	1,922	1,707	2,257	3.55	3.64
WIA Disloc. Workers	5,866	5,934	3,105	2,793	3,780	3,416	4.85	5.49
WIA Youth	300	288	719	639	809	1,240	3.74	4.88
CTC Job Prep	1,443	1,226	794	665	710	962	5.60	6.12
CTC Worker Retraining	3,241	3,719	2,524	1,896	2,788	2,790	5.21	6.01
CTC ABE	1,911	1,880	2,012	1,779	1,692	1,840	1.97	1.97
Priv. Career Schools	1,520	842	1,060	753	678	1,073	2.23	2.17
Apprentice.	3,885	3,845	4,864	5,261	1,315	1,460	8.25	9.58
Secondary CTE	570	489	986	900	1,368	1,312	3.31	3.32
DVR Progs.	939	936	1,063	955	866	1,082	9.89	8.65
DSB Progs.	2,719	2,970	2,059	1,608	661	1,337	8.83	9.33

NOTE: Average quarterly earnings data in columns (1)–(6) are in '00 \$. Median earnings are used instead of means for CTC job prep, private career schools, and apprenticeships.

Table 14.19 Estimated Foregone Earnings, by Program

Program	Foregone		
	2001/2002 (1)	2003/2004 (2)	Average (3)
WIA Adults	-1,753	-176	-964
WIA Disloc. Workers	8,348	10,306	9,327
WIA Youth	-617	613	0
CTC Job Prep	1,582	2,617	2,100
CTC Worker Retraining	2,542	8,183	5,362
CTC ABE	-416	163	-127
Priv. Career Schools	89	446	267
Apprenticeships	-18,670	-24,986	-21,828
Secondary CTE	-58	2	-28
DVR Programs	-1,588	471	-558
DSB Programs	-3,250	5,088	919

NOTE: Dollars in '00 \$.

There is wide variation in these foregone earnings estimates. As might be expected, the largest foregone earnings occur for WIA dislocated workers and CTC worker retraining participants. These individuals typically lost relatively high paying jobs, and spent several quarters to be retrained. Usually, their new jobs pay only a fraction of what their old jobs did. Job preparation training at community and technical colleges also entailed a significant loss in earnings during the training period. All of the other programs, except for apprenticeships, had foregone earnings that were between -\$1,000 and \$1,000. These are relatively small, and suggest that the participants in the programs were earning approximately the same amount as their comparison group counterparts.

(Note that a negative value for foregone earnings means that the program participants were actually earning more than the comparison group; there was a subsidy for training!!) Apprentices had a very large training subsidy of about \$22,000. This means that the apprentices were earning significantly more than their comparison group counterparts during their apprenticeships.

Program Costs

For the most part, the program costs were supplied to us by the State. The WIA costs were calculated from administrative microdata on days in the program and cost data from the program (personal communication from C. Wolfhagen, January 19, 2006). Specifically, he estimated the average duration in days of individuals in WIA Title I-B adult programs, dislocated worker programs, and youth programs for the 2001/2002 and 2003/2004 cohorts. Furthermore, he derived estimates of daily costs for each of these programs for the two cohorts. Multiplying these two estimates provides an estimate of the total program cost per average participant. We used the arithmetic average of per participant costs for the 2001/2002 and 2003/2004 cohorts. These data are displayed in table 14.20. These costs were assigned to the public. There were no programmatic costs for participants.

Table 14.20 WIA Costs per Participant, by Program

Program	2001/2002			2003/2004			Cost used in c/b analysis (in 2000\$)
	Ave. duration (in days)	Ave. daily cost (nominal)	Total cost (in 2000\$)	Ave. duration (in days)	Ave. daily cost (nominal)	Total cost (in 2000\$)	
WIA Adults	327	\$16.50	\$5,252	333	\$15.13	\$4,720	\$4,986
Dislocated Workers	440	\$13.94	\$5,972	501	\$13.47	\$6,322	\$6,146
Youth	341	\$15.25	\$5,063	446	\$15.38	\$6,424	\$5,743

Community/Technical College Costs. Staff from the State Board for Community and Technical Colleges (SBCTC) supplied the cost data for the ABE, Job Preparation, and Worker Retraining programs to the WTECB. The data were passed on to us in a private communication from E. Hawkins on January 26, 2006. In particular, SBCTC supplied the following average nominal costs for the state support and tuition for a full-time resident student:

<u>Year</u>	<u>State Cost</u>	<u>Tuition</u>
FY2001	\$3,850	\$1,641
FY2002	3,870	1,743
FY2003	3,839	1,983
FY2004	3,705	2,142

Per state staff's suggestion, we assumed that job prep students averaged 1.9 years; worker retraining participants averaged 1.3 years; and ABE participants average 1.0 years of full-time equivalent coursetaking. We furthermore assumed that ABE students did not pay tuition.

To derive the program and private costs used in the cost-benefit calculations, we deflated all of the costs to 2000\$, and we used FY2002 data for the 2001/2002 cohorts and FY2004 data for the 2003/2004 cohort. Finally, we took the arithmetic average of the two cohorts' costs. Thus the public (state) costs for job prep = \$6,877. This is $1.9 \text{ ftes} * 0.5 (\$3,768 + \$3,471)$. The public cost for worker retraining = \$4,705 [$1.3 \text{ ftes} * 0.5 (\$3,768 + \$3,471)$]; and the public cost for ABE = \$3,620 [$1.0 \text{ fte} * 0.5 * (\$3,768 + \$3,471)$]. The private (tuition) costs for job prep = \$3,519 [$1.9 \text{ ftes} * 0.5 (\$1,697 + \$1,896)$] and for worker retraining = \$2,408 = [$1.3 \text{ ftes} * 0.5 (\$1,697 + \$1,896)$]. Note that we are not including any other educational expenses such as books or transportation; nor are we factoring in any sort of financial aid. In the case of ABE, there are no tuition or supply costs to participants by assumption.

Private Career Schools. Because of the tremendous variation in tuitions and fees at private career schools, we did not include private costs in the cost-benefit analysis. By assumption, the public cost is \$0.

Apprenticeships. The data on tuition and state subsidies from SBCTC were used to calculate private and public apprenticeship costs. Information from LNI was given to the WTECB and passed on to us in private communication from E. Hawkins on February 2, 2006 concerning the share of costs borne by apprentices and the full-time equivalent coursetaking. The assumptions that were used were that apprentices are “charged” one-half of the full-time tuition as their share of costs, that they take 144 hours of classroom instruction per year (= 0.16 fte), and that they take formal classroom instruction for 4.0 years. Using these assumptions, we estimated an average public support of apprentices = \$2,316 [4.0 years * 0.16 ftes/year * 0.5 (\$3,768 + \$3,471)]; and the average private tuition cost = \$593 [4.0 years * 0.16 ftes/year * 0.50 * .5 (\$1,697 + \$2,007)]. Again, the private costs do not include books, tools, equipment, or transportation.

Secondary Career and Technical Education. The Office of the Superintendent of Public Instruction provided a state and federal cost per FTE student of \$719 for FY2002 and \$742 for FY2004 (private communication from E. Hawkins received on March 23, 2006.) These figures were in nominal terms. We deflated them to 2000\$ and assumed that the individuals who were being analyzed, who were classified as completers, had received 1.0 full-time equivalents. Finally, we averaged the support for the two cohorts. Thus our assumed program cost was \$704 and no private costs.

Division of Vocational Rehabilitation and Department of Services for the Blind. Very similar procedures were followed for the programs from these two agencies as for the other programs documented in the preceding paragraphs. The agencies provided cost data to the WTECB,

which was forwarded to us by Evelyn Hawkins. In these cases, there were a number of email exchanges, so we cannot document an exact date, but generally the data were received between January and March, 2006. In the case of DVR programs, we were given a fixed cost per participant (for management and other supports) and a monthly cost. In nominal terms, these were \$2,487 for the fixed cost and \$183 for the monthly cost for FY2002 (used for the 2001/2002 cohort); and \$3,743 for the fixed cost and \$161 for the monthly cost for FY2004 (used for the 2003/2004 cohort). Furthermore, we were given 26.45 as the average case duration in months. Deflating the costs to 2000\$ and using the average cost for the two cohorts gave us a public support for each DVR client of \$7,381.

For the DSB clients, we were given nominal costs per exiter of \$22,917 for the 2001/2002 cohort and \$21,316 for the 2003/2004 cohort. Deflating these to 2000\$ and averaging them gave us a public cost for the average client of \$21,142.

Results

Tables 14.21 – 14.31 provide the benefit-cost analyses for the workforce development system programs. Each table has an estimate for the first ten quarters after exiting the program and an estimated lifetime benefits and costs. In all cases, the benefits were discounted to 2000 using a 3.0 percent annual rate.

Table 14.21 Participant and Public Benefits and Costs per Participant in WIA Adult Programs

Benefit/Cost	First 2.5 years		Lifetime (until 65)	
	Participant	Public	Participant	Public
Benefit				
Earnings	5,270	0	27,239	0
Fringe Benefits	1,054	0	5,448	0
Taxes	-909	909	-4,699	4,699
Transfers				
UI	-389	389	-358	358
TANF	-715	715	-84	84
FS	-293	293	77	-77
Medicaid	-396	396	583	-583
Costs				
Foregone earnings	-964	0	-964	0
Program costs	0	4,986	0	4,986

NOTE: '00 \$.

Table 14.22 Participant and Public Benefits and Costs per Participant in WIA Dislocated Worker Programs

Benefit/Cost	First 2.5 years		Lifetime (until 65)	
	Participant	Public	Participant	Public
Benefit				
Earnings	7,253	0	41,428	0
Fringe Benefits	1,451	0	8,286	0
Taxes	-1,886	1,886	-10,771	10,771
Transfers				
UI	-2,930	2,930	-2,901	2,901
TANF	-32	32	11	-11
FS	-79	79	-87	87
Medicaid	-81	81	-291	291
Costs				
Foregone earnings	9,327	0	9,327	0
Program costs	0	6,146	0	6,146

NOTE: '00\$.

Table 14.23 Participant and Public Benefits and Costs Per Participant in WIA Youth Programs

Benefit/Cost	First 2.5 years		Lifetime (until 65)	
	Participant	Public	Participant	Public
<u>Benefit</u>				
Earnings	1,564	0	25,269	0
Fringe Benefits	313	0	5,054	0
Taxes	-270	270	-4,359	4,359
<u>Transfers</u>				
UI	18	-18	-828	828
TANF	233	-233	-1,323	1,323
FS	303	-303	235	-235
Medicaid	715	-715	-608	608
<u>Costs</u>				
Foregone earnings	0	0	0	0
Program costs	0	5,743	0	5,743

NOTE: '00 \$.

Table 14.24 Participant and Public Benefits and Costs per Participant in Community and Technical College Job Prep Training Programs

Benefit/Cost	First 2.5 years		Lifetime (until 65)	
	Participant	Public	Participant	Public
<u>Benefit</u>				
Earnings	12,411	0	82,280	0
Fringe Benefits	2,482	0	16,456	0
Taxes	-2,141	2,141	-14,193	14,193
<u>Transfers</u>				
UI	-2,137	2,137	-2,629	2,629
TANF	351	-351	933	-933
FS	107	-107	331	-331
Medicaid	45	-45	161	-161
<u>Costs</u>				
Foregone earns.	2,100	0	2,100	0
Program costs	3,519	6,877	3,519	6,877

NOTE: '00 \$.

Table 14.25 Participant and Public Benefits and Costs per Participant in Community and Technical College Worker Retraining Programs

Benefit/Cost	First 2.5 years		Lifetime (until 65)	
	Participant	Public	Participant	Public
Benefits				
Earnings	3,083	0	19,218	0
Fringe Benefits	617	0	3,844	0
Taxes	-802	802	-4,997	4,997
Transfers				
UI	-977	977	-957	957
TANF	72	-72	105	-105
FS	77	-77	207	-207
Medicaid	91	-91	355	-355
Costs				
Foregone earns.	5,362	0	5,362	0
Program costs	2,408	4,705	2,408	4,705

NOTE: '00 \$.

Table 14.26 Participant and Public Benefits and Costs per Participant in Community and Technical Colleges ABE Programs

Benefit/Cost	First 2.5 years		Lifetime (until 65)	
	Participant	Public	Participant	Public
Benefit				
Earnings	0	0	0	0
Fringe Benefits	0	0	0	0
Taxes	0	0	0	0
Transfers				
UI	-1,156	1,156	-1,407	1,407
TANF	810	-810	2,550	-2,550
FS	566	-566	2,066	-2,066
Medicaid	449	-449	1,615	-1,615
Costs				
Foregone earnings	-127	0	-127	0
Program costs	0	2,231	0	2,231

NOTE: '00 \$

Table 14.27 Participant and Public Benefits and Costs per Participant in Private Career Schools Programs

Benefit/Cost	First 2.5 years		Lifetime (until 65)	
	Participant	Public	Participant	Public
<u>Benefit</u>				
Earnings	4,276	0	27,033	0
Fringe Benefits	855	0	5,407	0
Taxes	-738	738	-4,663	4,663
<u>Transfers</u>				
UI	-1,638	1,638	-2,135	-2,135
TANF	174	-174	746	-746
FS	46	-46	171	-171
Medicaid	0	0	362	-362
<u>Costs</u>				
Foregone earnings	267	0	267	0
Program costs	—	0	—	0

NOTE: '00 \$.

Table 14.28 Participant and Public Benefits and Costs per Participant in Apprenticeship Programs

Benefit/Cost	First 2.5 years		Lifetime (until 65)	
	Participant	Public	Participant	Public
<u>Benefit</u>				
Earnings	25,363	0	187,223	0
Fringe Benefits	5,073	0	37,445	0
Taxes	-6,594	6,594	-48,678	48,678
<u>Transfers</u>				
UI	1,341	-1,341	5,095	-5,095
TANF	-170	170	-464	464
FS	-96	96	-299	299
Medicaid	-180	180	-646	646
<u>Costs</u>				
Foregone earns.	-21,828	0	-21,828	0
Program costs	593	2,316	593	2,316

NOTE: '00 \$.

Table 14.29 Participant and Public Benefits and Costs per Completer in Secondary CTE Programs

Benefit/Cost	First 2.5 years		Lifetime (until 65)	
	Participant	Public	Participant	Public
<u>Benefit</u>				
Earnings	2,753	0	34,603	0
Fringe Benefits	551	0	6,920	0
Taxes	-475	475	-5,969	5,969
<u>Transfers</u>				
UI	16	-16	168	-168
TANF	-91	91	-442	442
FS	-73	73	-380	380
Medicaid	-27	27	-169	169
<u>Costs</u>				
Foregone earns.	-28	0	-28	0
Program costs	0	704	0	704

NOTE: '00 \$.

Table 14.30 Participant and Public Benefits and Costs per Participant in DVR Programs

Benefit/Cost	First 2.5 years		Lifetime (until 65)	
	Participant	Public	Participant	Public
<u>Benefit</u>				
Earnings	7,134	0	41,706	0
Fringe Benefits	1,426	0	8,341	0
Taxes	-1,231	1,231	-7,194	7,194
<u>Transfers</u>				
UI	324	-324	847	-847
TANF	-355	355	-533	533
FS	-223	223	-521	521
Medicaid	-314	314	-1,130	1,130
<u>Costs</u>				
Foregone earns.	-558	0	-558	0
Program costs	0	7,381	0	7,381

NOTE: '00 \$.

Table 14.31 Participant and Public Benefits and Costs per Participant in DSB Programs

Benefit/Cost	First 2.5 years		Lifetime (until 65)	
	Participant	Public	Participant	Public
<u>Benefit</u>				
Earnings	15,666	0	71,341	0
Fringe Benefits	5,259	0	5,506	0
Taxes	-2,702	2,702	-12,306	12,306
<u>Transfers</u>				
UI	213	-213	63	-63
TANF	-1,141	1,141	-4,135	4,135
FS	-378	378	-872	872
Medicaid	15	-15	2,599	-2,599
<u>Costs</u>				
Foregone earns.	919	0	919	0
Program costs	0	21,142	0	21,142

NOTE: '00 \$.

APPENDIX A

LONGITUDINAL DATA FILE EDITING

Multiple participant records for a education or training program. The State supplied us with individual-level data for each of the eleven programs. In some of the program files, we found duplicate records, despite the fact that the file specifications indicated that each individual would have a single record. In the case of WIA adult and dislocated worker programs, there were only a handful individuals that had multiple records, and most of them were records of individuals with different spells of getting in and out of the program. For these people, we kept the record with the latest exit date. There was no multiple record problem in the WIA youth data file.

However, multiple records in Job Prep, Worker Retraining, ABE, Private Career School, Apprenticeship, DVR, and DSB were different stories. This occurred because people might be in the program with different providers, or with the same provider multiple times during the period that we observed them. In some cases, we combined information from different records, although problems arose when different records contained inconsistent information. This problem also existed in the higher education files. Our goal was to maintain one record with a unique end date for each person.

Before the selection/deletion of any records, we made sure some basic demographic characteristics were consistent across the records for the same person. Processing of duplicate/multiple records was done in the steps described below:

- A. Gender and race had to be the same across records for the same person. If they were not, we excluded the person from the analysis. If birth dates were different, the rule of thumb was to choose the earlier one as the person's birth date. This rule was applied to birthdates in both the demographic file and higher education file except when some data problems arose. The problems were threefold:

1. In both demographic and higher education files, some people with multiple birth dates appeared to have one of the dates in very early 1900s. The more recent dates were obviously better choices in this case.
2. In the demographic file, there were people with birth dates in the early 1900s that we could find more reasonable dates (more recent dates) from higher education file. In these cases, using the later birth dates from higher education file will result in much more reasonable data for age. In most groups, there are always just a few people with records like this. However, there are more than 400 cases in Job Prep 0304 and more than 250 cases in WR 0304 files.
3. There were also people with ancient birth dates such as dates in the 16th century. The worst case happened in the Labor Exchange 2003/2004 file, where there are 90 people with apparent erroneous birthdates.

The following rules were used to deal with these problems and they are referred to as “1935 rules”:

- Force dates before 1900 to Jan. 1st, 1900.
- Always select the birth dates that are after 1935, if such date is available.
- Select the earliest date if all multiple birthdates are after 1935.
- If all the dates are before 1935, select the most recent one.

Why 1935? We eliminated people older than 60 in the comparison group and top-coded age to 60 for all the treatment groups. The employment history starts in 1995 so the earliest start date in our analysis is 1995. Any one with birth year earlier than 1935 will either be deleted or the age will be top-coded. So, if a birth date earlier than 1935 is found, we checked if there were a date later than 1935 somewhere (in the multiple records or in higher education file) that we could use so deletion or top-coding was not necessary.

There was also a problem with birth dates that were too recent. This was the “young people” problem. If the birth date was in the 1990s in the demographic file, we checked to see if there was any better date in the higher education file. In the case that the dates in the higher education file were also in the 1990s, we stuck with the demographic file date. In general, we prefer information in the demographic file unless there is strong reason not to.

B. Once we had consistent demographic information, the following rules were applied in order to select one record for each person:

- If the program completion code was available, we kept the record with the highest achievement level.
- If completion codes were the same, or were not available, the record with the most recent end date was selected.
- If end dates were the same, the record with the earliest start date was selected.
- If all of the above failed, we selected one record randomly.

Missing or “out of bounds” quarterly hours data in earnings records. Records that had missing hours, zero hours (despite having reported earnings), and hours greater than 990 in the employment records had hours imputed. The imputation was done in three steps. The first step was to impute the hours using reported (non-imputed) information from adjacent quarters. The same rule was applied as was used by the State contractor, which was basically an interpolation of data from adjacent records. For records that still had missing or zero hours, the next step in the algorithm was to assign the median working hours by the individual's industry and earnings class. If the industry was not available, the last step was to assign the population median working hours by earnings class. When hours exceeded 990, they were truncated to 990. Table A.1 shows the percentage of records for which hours were imputed by us. The State had imputed data on about 3 percent of the records; we imputed data for about 5 percent of the records; which means that about 92 percent of the records did not have imputed hours.

Table A.1 Percentage of Records with Imputed Hours

Program	2001/2002	2003/2004
WIA Adult	6.8%	6.6%
WIA Dislocated Worker	7.0	6.3
WIA Youth	6.0	4.6
Job Prep	6.1	5.9
Worker Retraining	7.1	6.6
Adult Basic Education	7.2	6.0
Private Career Schools	7.7	6.7
Apprenticeships	6.0	5.3
High School CTE	5.2	3.1
Vocational Rehabilitation	7.2	6.5
Services for the Blind	6.8	5.6
Labor Exchange	6.8	6.6

Earnings and wage outliers. The quarterly earnings provided by the State were top-coded at \$99,999. For the derived hourly wage, we top-coded the high and low wages at the top and bottom 1 percent value for each program/cohort.

Comparison group records that have received prior intervention. In order to keep the comparison group from being contaminated by the training program experience, we excluded the following individuals from the Labor Exchange sample:

- A. Labor Exchange participants who ever were in other training programs in the same cohort - They were identified by matching Labor Exchange participants with participants in all 11 training programs in the same cohort.
- B. Labor Exchange participants in 2001/2002 cohort who participated in any other training program in 2003/2004 cohort – They were identified by matching 2001/2002 Labor Exchange participants with all training program participants in 2003/2004.
- C. Labor Exchange participants who received case managed WIA services in the cohort and beyond - The WIA services include WIA Adult, WIA Youth in school, WIA Youth out of school, WIA Dislocated Worker (local funding), WIA Rapid Response, WIA Dislocated Worker Statewide, WIA National Reserve Grant, NAFTA Assistance, and Trade Adjustment Assistance. The last six services are different types of dislocated worker services.
- D. Labor Exchange participants, in the years following exit, with higher education CIP code indicating they were in apprenticeships, private career schools, and the

vocational training type program in community and technical colleges, as well as people who had higher education with unknown CIP codes.

The numbers of excluded individuals are broken down by the four types of exclusion rules and are listed in Table A.2 below. Note that more than one exclusion rule could be applied to the same individual so the number of participants excluded is smaller than the sum of A through D.

Table A.2 Number of Deleted Labor Exchange Participants, by Exclusion Rules

	Number of participants before deletion	Exclusion				Number of participants excluded	Number of participants after deletion
		A	B	C	D		
2001/02	245,100	12,105	8,887	10,809	30,383	46,090 (19%)	199,010
2003/04	217,171	16,960	0	12,699	22,023	40,398 (19%)	176,773

Start date problems. The program start dates in Labor Exchange 2001/2002 cohort are the same as exit dates for all the participants in the program. We redefined the start date as three quarters (273 days) before the exit date. The other start date problem occurs in ABE 2003/2004 cohort. Everyone in the program had July 1, 2003 as the start date. We redefined it using the mean program duration from ABE 2001/2002 cohort. The new start date is 180 days before the exit date for everyone.

APPENDIX B

EXPLANATORY NOTES

FOR NET IMPACT ESTIMATE TABLES AND PRICE DEFLATORS

Outcomes

Table entries in the first three columns give net impact estimates for each outcome calculated three different ways. The column labeled, “Diff. in Means,” gives unadjusted differences in means calculated as treatment group minus comparison group. Column (1) gives the block matching weighted differences in means (treatment group minus comparison group) estimate. The column labeled, “Regr. Adj.” provides coefficients on the treatment dummy in an OLS-estimated model of the outcomes (for continuous variables). The entries in the row for outcomes that are binary are logit coefficients transformed to be marginal effects.

Two types of outcomes measured at two time periods, are displayed in the tables. The two time periods are three quarters after program exit (short term) and average of quarters 8–12 or reciprocity during one of the quarters (longer-term). The two types of outcomes are levels and difference-in-differences. Levels measure the outcomes at the particular time period. “Diff-in-diff” differences the levels at the post-training period minus a base-period measure. In particular, quarters 3–6 before entry were used as the base period.

“Employment” means having earnings in the quarter \geq \$100 (2000 \$). “Ever employed” means being employed in at least one quarter of the time period. “Employment – longer term” means arithmetic average of employment during quarters 9–12 after exit. “Employment – diff-in diff” means (employment – longer term) minus (employment – base period).

Receipt means non-zero quarterly benefits for UI, TANF, and food stamps. Receipt means enrollment for Medicaid.

Monetary outcomes measured in 2000 \$.

Regression Adjustment

The independent variables used in the regression adjustments of outcomes are displayed in table B.1. They varied somewhat by program (and cohort). All of the models had a treatment dummy. In addition, all had a set of demographic variables, regional variables, and employment and earnings history/labor market variables. All of the programs except ABE and apprenticeship used educational variables in the adjustment equations.

The set of demographic variables included age, sex, and minority status for all programs save secondary CTE, for which there was no variation in age. In addition, we used the following variables if they were in the administrative data: veteran status, disability status, limited English proficiency, and single parent status. Secondary CTE had an indicator of low SES background, which we used as well.

All of the adjustments used two regional variables: residence in urban county and residence in western WA. The exception here was the 2003/2004 cohort for ABE, which did not have county of residence.

The educational variables differed considerably by program. The WIA programs had enrolled at time of program registration and prior years of education. As noted above, ABE and apprenticeship had no education variables. Secondary CTE had 12th grade GPA and a high school graduate dummy variable. All of the other programs had a number of educational group dummy

Table B.1 Independent Variables Used in Regression Adjustments of Outcomes, by Program

Program	Type of Variable			Employment and Earnings History/Labor Market
	Demographic	Educational	Regional	
WIA Adults, Dislocated Workers, and Youth	Age, sex, minority, veteran, disability, LEP, single parent (03/04 only)	Enrolled at registration, years of education	Urban county, western WA	8 prior employment/earnings, employed at registration on public assistance at registration, county unemployment rate
CTC Job Prep and WR	Age, sex, minority, disability, LEP	< high school (reference), h.s. grad, some college, Assoc./certificate, bachelor +	Urban county, western WA	8 prior employment/earnings county unemployment rate
CTC ABE	Age sex, minority, disability	—	Urban county (01/02 only) Western WA (01/02 only)	8 prior employment/earnings on public assistance at registration (01/02 only) county unemployment rate (01/02 only)
Private Career Schools	Age, sex, minority, disability (03/04 only)	< high school (reference) h.s. grad/GED (01/02 only) h.s. grad (03/04 only) GED (03/04 only) some college, Assoc./certificate, bachelors, masters, doctorate	Urban county western WA	8 prior employment/earnings county unemployment rate
Apprenticeship	Age, sex, minority	—	Urban county western WA	8 prior employment/earnings county unemployment rate
Secondary CTE	Sex, minority, disability, LEP, lower SES	GPA, graduate	Urban county western WA	8 prior employment/earnings county unemployment rate
DVR and DSB	Age, sex, minority, LEP (DVR only)	< grade 8 (reference) 9–12, h.s. grad, some college, Assoc./certif., bachelor, master, +	Urban county western WA	8 prior employment/earnings county unemployment rate

variables. We always used the lowest level of education as the omitted reference group in the regressions.

Finally, all of the models used the eight employment and earnings history variables that were used in the statistical matching. They are described fully in the text, but are listed here: percentage employment prior to registration, average prior quarterly earnings, prior earnings trend, variance of prior earnings, number of quarters with job changes prior to registration, earnings dip prior to registration, number of quarters between dip and registration, and percentage dip in earnings. All of the models used the current unemployment rate in the county of residence (except for ABE in

2003/2004). The rate for the 3rd quarter after exit was used for short-term outcomes, and the average of quarters 9–12 were used for longer-term outcomes. In addition to these variables, we used employment status and public assistance status at time of program registration if we had those variables.

Comparison Group Means

The last two columns of the tables present the means for the comparison groups for the outcome variable measurement periods (post-training). They are given so that impacts can be gauged on a percentage basis.

Price Indices

Table B.2 provides the price indices used to inflate/deflate earnings, benefits, and wages.

Table B.2 Price Indices

Year	Quarter	Price Index	Year	Quarter	Price Index
1995	1	90.909	2001	1	101.502
1995	2	91.412	2001	2	102.146
1995	3	91.801	2001	3	102.291
1995	4	92.185	2001	4	102.437
1996	1	92.758	2002	1	102.673
1996	2	93.352	2002	2	103.385
1996	3	93.725	2002	3	103.841
1996	4	94.352	2002	4	104.268
1997	1	94.781	2003	1	105.051
1997	2	94.961	2003	2	105.220
1997	3	95.218	2003	3	105.734
1997	4	95.536	2003	4	106.071
1998	1	95.610	2004	1	107.084
1998	2	95.771	2004	2	108.089
1998	3	96.088	2004	3	108.484
1998	4	96.443	2004	4	109.326
1999	1	96.687	2005	1	109.936
1999	2	97.319	2005	2	110.832
1999	3	97.855	2005	3	111.815
1999	4	98.438			
2000	1	99.296			
2000	2	99.777			
2000	3	100.239			
2000	4	100.687			

SOURCE: <http://www.bea.gov/bea/dn/nipawcb/TableView.asp#Mid>. Table 2.3.4 Price Indexes for PCE by Major Type of Product; (Index Numbers, 2000 = 100); seasonally adjusted.

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